

Analysis of common bean seed value chain and marketing channels in south western Uganda agro-ecological zone

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A research thesis project report is submitted to Van Hall Larenstein University of Applied Sciences Velp Netherlands in partial fulfilment of the requirements of the Degree of Master of Science in Agricultural Production Chain Management, specialization Horticulture Chains.

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List of acronym

AfDB: African Development Bank

CAGR: Compound annual growth rate

CIAT: International Center for Tropical Agriculture

COMESA: Common Market for Eastern and Southern Africa

DRC: Democratic Republic of the Congo

DUS: Distinctness, Uniformity and Stability

EAC: East African Community

EGS: Early Generation Seeds

FAO: Food and Agriculture Organization

GDP: Gross Domestic Product

ISSD: Integrated Seed Sector Development

ISTA: International Seed Testing Association

MAAIF: Ministry of Agriculture, Animal Industry and Fisheries

MbaZARDI: Mbarara Zonal agricultural research development institute

MoFPED: Ministry of Finance, Planning and Economic Development

NAADS: National Agriculture Advisory Services

NaCRRI: National Crops Resources Research Institute

NARO: National Agricultural Research Organization

NSCS: National Seed Certification Services

NGOs: Non-government organizations

QDS: Quality declared seed

UBOS: Uganda Bureau of Statistics

ZARDI: Zonal agricultural research development institutes

DECLARATION

I declare and certify that this thesis has been composed by myself and the work presented in it has not been submitted in support of another degree or qualification from this or any other university or institute of learning, except where indicated by referencing.

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DEDICATION

This thesis report is dedicated to my son Jayson as you embark into adulthood and discover that life is not all about money, don't forget you are respected because someone had invested a lot in you. Learn to reflect and respect their positions in your life. May you grow and fulfil the recommendations of this piece of work into practise. Also I dedicate this piece of work to my father in-law who died on 31st July 2020. RIP and you will forever be missed.

ABSTRACT

Common bean is a vital legume essential crop in Uganda. Annual National consumption of common beans is projected at approximately 58 kg per capita (MAAIF, 2017). In Uganda the area planted under common beans was estimated at 683,120 Ha with a total harvest of 1,104,770 MT in 2016. Common bean seed marketing and accessibility is the major concern in south western agro-ecological zone for both small-scale farmers and seed producers. An acute element in attaining higher crop yield is better access to key farming inputs by farmers and specifically sufficient volumes of quality improved common beans seed. The gap among the common bean seed producers and farmers can't be bridged if no one knows what farmers want or if no-one knows what seed producers have. This research sought to provide knowledge to bridge the gap among stakeholders in the common bean seed value chain. This was done through; (i) identifying constraints, opportunities and suggest pathways to upgrade and mainstream the common bean seed value chain, (ii) Assessing the marketing channels of common bean seeds and find effective marketing channels for small-scale farmers seed acquisition. (iii) To enhance the farmers' adoption, purchase and use of quality seeds through strengthening of common bean seed producers.

Purposive sampling procedure was used to select the study location (south western agro-ecological zone). However three district of Mbarara, Sheema and Isingiro were randomly selected out of 14 districts within the region. A structured questionnaire was administered to a total sample size of 74 respondents to represent the entire study population. It consisted of random selected 45 farming households. Besides, a stratified random sampling procedure was used to select 12 seed producers, 3 Agro-input dealers and 3 local common bean traders while 11 Key informants (experts) included agricultural extension technical staff, NGOs and staff from NARO. Due to COVID-19 pandemic situation and international travel restrictions, 3 enumerators (who were agriculture extension officers in the region) collected data from respondents and uploaded to online Google forms questionnaires for submission. Data was analysed using Rapid chain appraisal procedure, value chain approach, SWOT approach and SPSS.

The results indicated that 62 % of farmers are female and 38% are male while most farmers attained formal education. Key actors and functions in seed value chain include EGS producers (NARO), seed production and marketing (done by registered seed companies, LBS, ZARDI, NARO holdings and individual farmers), and farmers as the main seed consumers. The chain is supported by NGOs (ACORD, ISSD and Bioversity international), USTA and MAAIF. Key chain challenges are poor and inadequate quantity of EGS, lack of adequate amount of common bean seed breeders, climate change and seed producers lack adequate technical knowledge on seed production. Results indicated planting and growing stage as the most critical stage at which losses occurs due to poor quality seed and poor germination caused by prolonged droughts. Other critical stages include post-harvest stages due to lack of appropriate post-harvest technologies.

Furthermore on current bean seed security situation, results showed that farmer's access seed from multiple sources such as seed aid (67%), own saved seed (62%), agro-input dealer (45%), local market

(19%) and neighbours (10%). In general most farmers (76%) reported that the time of seed availability is always at start of the season and mid-season. This results into late planting because farmers start land preparations the moment they have acquired seeds. Therefore late planting is caused by land preparations at the start of the season which takes time and farmer gets low yields at the harvesting time. On seed quality farmers said no impurities and no damage (81%), some impurities and no damage (17%) some impurities and damage (2%). Most farmers stated that general seed germination is good from all sources. Conversely 83% of seed producers produce certified seed and 17% produce seeds which are not certified seeds while 93% of seed producers are aware of seed certification and 7% are not aware of seed certification.

Farmers identified 72 common bean varieties of which only 7 varieties are officially released by government breeding agencies. Farmers commonly grow NARO bean 3, NARO bean 2 and NABE 16 because of their high market demand and they are profitable to farmers. While seed producers and Agro-input dealers reported NARO bean 3, NARO bean 2, NABE 16, NABE 19, NABE 16 and Kabanyardwanda are the top most demanded common bean seed varieties by farmers.

Farmers obtain seed from 7 different market channels which include local traders, individual farmers, local bean seed business groups, schools, farmers' cooperative society, agro-input dealers and seed companies while seed producers preferred marketing seed through individual farmers (55%), agro-dealers (45%) and national registered seed companies (5%).

The conclusion of the research was that the common bean seed value chain is poorly coordinated challenged with uncertified fake seed on market, and lack of appropriate technical knowledge on seed production. NARO will need to develop appropriate methodology for seed demand assessment at different levels of the seed value chain to determine the appropriate quantities of seed required per season at all levels.

CHAPTER ONE: INTRODUCTION

The common bean (*Phaseolus vulgaris* L.) plays an important role in human nutrition and market economies in most Eastern Africa countries. In Eastern African countries, beans provide the second most substantial source of protein after maize and 3rd most vital source of calories after maize and cassava (Pachico, 1993).

Common bean is a vital legume essential crop in Uganda. Annual National consumption of common beans is projected at approximately 58 kg per capita (MAAIF, 2017). In Uganda the area planted under common beans was estimated at 683,120 Ha with a total harvest of 1,104,770 MT in 2016. The national common beans export increased from 157,152 MT in 2015 to 200,000 MT in 2017. Common beans produced on small-scale mostly on less than 2 acres accounting between 60–90% with average yield of 250kg per acre despite potential yield of 700 to 1500kg per acre depending on the common bean variety and season. The common bean production system is characterized by low input use mostly poor quality seed with most of the farmers using seed saved from previous harvest (MAAIF, 2017).

An acute element in attaining higher crop yield is better access to key farming inputs by farmers and in specifically quality improved common beans seed. The use of high quality seed is the basis of agricultural development in Uganda. However, regardless of the apparent awareness of the use of high quality seed, significant government and donor support over years to develop stronger seed system, only 10–15 percents of farmer's access and use high quality improved seed. Many questions arising why, after so much support by the government, are the seed sub-sector still struggling in Uganda (Joughin, 2014)? This research will provide knowledge gap through the analysis of the common bean seed marketing channels in south western Uganda.

Farmer's ability to increase food security is affected by sustainable seed accessibility and availability at the right time. Availability of quality seed is the basis of continuous food production and increased crop yields (Setimela *et al.*, 2004). According to FAO, 2012, certified seed should be included in electronic voucher in the guidelines for providing humanitarian agricultural assistance programmes. This can increase the quality standards of supplied to farmers.

The e-voucher system is a flexible market development tool that allows farmers to buy certain types of inputs from agro-dealers that accept the e-vouchers as partial payment (FAO, 2012). The agro-dealers redeem the e-vouchers based on a settlement report that is produced every two weeks by the electronic system. To escape market biases the prices of the seed available at the agro-dealer's shops are in line with the prevalent market prices in the specific region (FAO, 2012).

1.1 Research problem

Regardless of the apparent awareness of using high quality seeds, extensive government intervention and donor assistance to breed and multiply high quality seeds over period of years, approximately 10–15 per cent of farmers' in Uganda can easily access and plant high quality seed and several seed producers find it challenging to break-even (Joughin, 2014).

It is often observed that the connection between common bean seed producers (seed supplier) and common bean seed buyer (farmers) is not, or not easily been established. Even though for most common bean seed varieties have been released, high quality common bean seeds are often still in

short supply, too expensive, too far away from or not adapted to the production zones where the common bean seeds are needed. Most small scale farmers in Uganda often find difficult in accessing high quality common bean seeds. The gap among the common bean seed producers and farmers can't be bridged if there is no one knows what farmers want or if no-one knows what seed producers have. This research sought to provide knowledge to bridge the gap among stakeholders in the common bean seed value chain.

1.2 Problem owner

The problem owner is National Agricultural Research Organization (NARO) which is mandated to “Coordinating, overseeing and guiding agricultural research in Uganda. NARO is responsible for Co-ordination, collation, analysis of data and information on agricultural technology development research with the main aim to suggest appropriate intervention to the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) on transfer of agriculture technologies in Uganda (MAAIF, 2020). NARO will provide appropriate solution for seed security and suggest intervention to MAAIF. MAAIF is mandated to formulate, review and implement national agricultural policies, plans, strategies, regulations and standards and enforce laws, regulations and standards along the value chain of crops, livestock and fisheries in Uganda (MAAIF, 2020).

1.3 Main research Objective

The overall objective of the research is to contribute to information aimed at improving the common bean seed security and develop effective seed marketing channels in south western Uganda.

1.3.1 Specific objective

Specific objective One

- To identify constraints, opportunities and suggest pathways to upgrade and mainstream the common bean seed value chain.

Specific objective Two

- To enhance the farmers' adoption, purchase and use of quality seeds through strengthening capacities of common bean seed producers.

Specific objective Three

- To assess the marketing channels of common bean seeds and find effective marketing channels for small-scale farmers seed acquisition.

1.4 Justification of the study

Seeds are recognized as a key input to crop production. Ensuring that high quality seeds are available to all small scale farmers is one of the main tools in agricultural development. However, unlike other inputs, seeds are a living material and this introduces many risks in the seed production and seed marketing chain. Consequently, the expected benefits of supplying “quality seed” have not always been achieved in practice (FAO, 2018).

Major concern in agricultural development context has been observed that good quality seed of improved varieties are not always available and accessible to small-scale farmers in time (Joshi, 2001). Regionalisation in seed multiplication and supply can increase the availability of good quality seed to small scale farmers and boost general agricultural production (Joshi, 2001). However, the difficulties of organizing effective common bean seed delivery channels to small-scale farmers have often been underestimated in comparison with the attention and support given to other seed industry activities (Monyo, 2014). Solidification of private common bean seed producer groups can improve local seed demand by small scale famers and increase supply of high quality seed to satisfy the national seed demand (Juan et al, 2014). The research sought to provide knowledge on the obstacles that inhibit common bean seed producers from producing and marketing high quality common bean seed year in year out and small scale farmers from accessing and planting high quality common bean seeds.

1.5 Research Questions

Main Question One What are the features that influence the common bean seed value chain in south western agro-ecological zone Uganda? This research question was used to achieve objective one

Sub-questions

- 1.1 Who are the stakeholders in the common bean seeds value chain?
- 1.2 What are the roles and functions of common bean seed stakeholders in facilitating farmers' purchase of quality seeds in the value chain?
- 1.3 What are the constraints and opportunities in the common bean seed value chain?
- 1.4 What are the acute loss stages in the common bean value chain, at which stage do loss take place and why they take place?

Main Question Two: What is the current bean seed security situation regarding availability, access, quality, variety suitability and resilience among small-holder farmers? This research question was used to achieve objective two.

Sub-questions:

- 2.1 What are the factors influencing common bean seed security in south western Uganda?
- 2.2 What are most common bean varieties consumed in south-western Uganda?
- 2.3 What is the difference in quantity of common seed and acreage planted between march-June 2020 season and upcoming season?

Main Question Three: What are the appropriate marketing channels of common bean seeds to small holder farmers? This research question was used to achieve objective three.

Sub-questions:

- 3.1 What are the available market channels for common bean seeds?
- 3.2 What kind of strategies can common bean seed producers and suppliers use to ensure farmers trust in the seed quality?

1.6 Conceptual framework

The concept of common bean seed value chain analysis was analysed in dimensions of functional analysis, financial analysis, marketing channels and upgrade pass ways while Seed security was analysed in the dimensions of current situation on seed quality, seed availability, seed access, seed varietal suitability and seed resilience. Every dimension was further measured in different aspects as shown in figure 1 with main intention of contributing to knowledge aimed at improving the common bean seed security and development effective seed marketing channels in south western Uganda agro ecological zone.

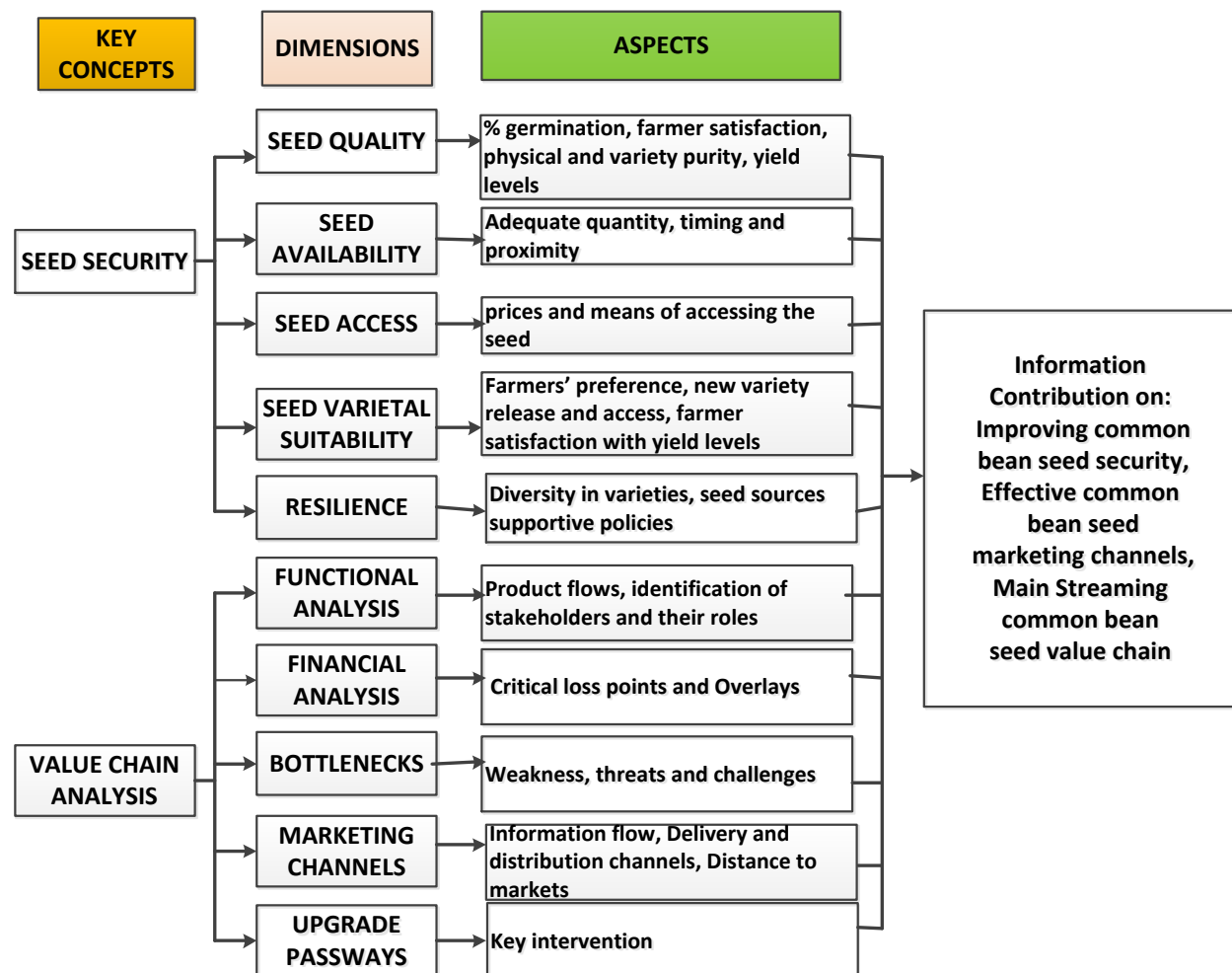


Figure 1: Conceptual framework

1.6.1 Definition of concepts

Seed: This is part of the crop used for propagation of the next generation of the crop (FAO, 2014).

Seed security is defined as seeds always available and accessed by farmers and farming groups, to sufficient amounts of high quality seed, preferred crop varieties by farmers on time under all conditions (FAO, 2020).

Seed quality: Seed that is pure and will germinate well and develop into a good healthy crop. (FAO, 2018).

Seed availability: refers to the supply of seed from both formal and informal sources. This can be measured by key indicators of sufficient amount of seed and proximity by seed sources to farmers (FAO, 2018).

Seed access: it's the ability of farmers to acquire seed through exchange for cash in formal and informal sector, loan or buying. Seed access can be measured by key aspects of prices of seed, farmers' perception on seed costs, means of accessing the seed and means of seed acquisition (FAO, 2018)..

Seed varietal suitability: Means the qualities seed of being right or appropriate for a particular farmer, environmental situation and location. Varietal suitability can be measured by key aspect of adaptability, farmer's preferences, farmer satisfaction and yield levels (FAO, 2018).

Seed resilience: refers to the level to which the farming community seed system can withstand, adjust to stresses which threaten household seed security. This can be further measured in key aspects of diversity in varieties, seed sources and supportive policies (FAO, 2018)..

Seed marketing channel: this presents the underlying principles for valuing and exchanging seeds. These are the ways how seed reaches to farmers from any source (FAO, 2018).

Local seed business: These are farmer group multiplying and distributing cheap quality seed of varieties preferred by farmers (Mastenbroek et al, 2016).

The value chain approach is an accounting framework which uses both the functional and economic analysis (at market prices) of stakeholders in an identified value chain (FAO, 2005).

Value chain mainstreaming: it refers integration of the value chain with strongest links to address challenges faced by chain stakeholders (Carlos, 2007)..

Upgrade pass-ways: means routes improving the chain services through raising seed to a higher standard (Njuk, 2011).

Seed producers: These are Individuals or bodies that grow and multiply a crop with intention of selling seeds (Mastenbroek et al, 2016).

Seed Company: It's registered business body that grows, multiplies and sell seeds to agro-dealers and commercial farmers and other organisations interested in seed (Mastenbroek et al, 2016)

CHAPTER TWO: LITERATURE REVIEW

This chapter introduces the overview of agriculture in Uganda, agricultural markets in Uganda, seed industry of Uganda and overview of dry common beans in Uganda.

2.1 Overview of agriculture in Uganda

Agriculture is the backbone of the Ugandan economy. The agriculture sector employs 70 per cent of the working population and contributes to 23 per cent of national gross domestic product (GDP) (UBOS, 2015). Favourable year-round climatic conditions and large agricultural potential facilitate the cultivation of a wide and diverse range of staple food and cash crops, as well as livestock production. A large proportion of agricultural households engage in both crop production and animal rearing (cattle, small ruminants, and/or poultry) (UBOS 2014). The fishery sector also plays an important role as an income generating activity, with Lake Victoria as the most important catchment area. Capture fishery (tilapia, carps, and other freshwater fish) dominates production since fish farming remains underdeveloped (Dalsgaard *et al*, 2012).

Cooking bananas, cassava, dry beans, sweet potatoes, rice, millet, and sorghum are the main staple foods in Uganda, in terms of area planted and production volume (UBOS, 2014; UBOS 2010). Coffee, tea, cotton, cut flowers, and processed fish are among the main agricultural products exported (MoFPED, 2015). Maize and beans is produced as both a staple food and cash crop and exported to regional markets.

Uganda is self-sufficient in terms of staple food production, and plays a major role in regional food supply and trade. Staple foods are exported to neighbouring structurally deficit countries (Kenya, South Sudan, and the Democratic Republic of the Congo (DRC) (MAAIF, 2013). Therefore, issues affecting the demand, supply, and/or trade of key staples in the broader region, influence market dynamics in Uganda. Regional economic integration through the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) facilitate trade flows (MAAIF, 2013).

Most food production in Uganda takes place at the smallholder and subsistence level, under rain fed conditions, and with low use of agricultural inputs. The resulting productivity levels are generally low. Seasonal production patterns for these crops plays a major role in availability and trade flows. Cassava, cooking bananas, and sweet potatoes are harvested and marketed throughout the year and bean twice a year (FEWS NET, 2010).

Agricultural production in Uganda is limited and consequently in use of inputs, farmers are structurally-deficit and rely on supplies from surplus-producing areas of the country (MoFPED, 2015). Low output levels coupled with a high risk of pest/disease infestation, a weak market information system, limited market access, limited processing and value addition, poor postharvest management, and disregard for quality and phytosanitary standards constrain the performance of staple foods markets nationally and regionally (Chemonics, 2010).

In spite of the broad engagement of households in agriculture, only about a fourth of agricultural households rely on this sector as their only income source (MoFPED, 2015). Most agricultural household's source their food from a combination of own production and market purchases. Casual labour income is essential for covering basic food and non-food needs of poor households, who rely on food purchases to a greater extent than wealthier households (FEWS NET, 2010).

2.1.1 Agricultural markets in Uganda

Although Uganda is generally self-sufficient in terms of domestic food availability, the country does import limited volumes of wheat (and wheat products), vegetable oils, rice, and sugar destined for urban consumers and the food processing industry (FAO, 2003). Imports are sourced directly from international markets and through re-exports from international markets via neighbouring countries. The port of Mombasa in Kenya is the main access point for products imported to the EAC (World Bank, 2010), although use of the port of Dar-es-Sallam is increasing.

Most agricultural harvests are sold by farmers at the farm gate or in local informal markets. Many actors participate along the marketing system, ranging from farmers, traders, central and local governments, to retailers and consumers (private and institutional). The most common pricing method for staple foods is bargaining during spot transactions between buyers and sellers, contributing to spatial and temporal price variation (AfDB, 2014).

According to FEWS NET (2015), markets for locally-produced staple foods are generally competitive, with a large number of buyers and sellers. Constraints on the availability of money required for covering the different marketing costs like storage, transport and trading license fees are among the most important barriers to entry. Traders hardly specialize in individual goods (food and non-food) and rather switch across commodities depending on availability and profitability.

FEWS NET (2015) stated that, the most important domestic markets are Kampala and Busia, both of which also serve as transit points for exports to regional markets. Soroti, Lira, and Gulu serve the structurally-deficit Karamoja sub region. Mbarara and Kasese is the greatest market for common bean in western Uganda. Uganda is a net exporter of its staple foods to Kenya, South Sudan, Tanzania, DRC, and Rwanda is its main trade partners. Exports are seasonal and informal export volumes surpass those of formal trade.

According to Obita *et al* (2015), commercial and humanitarian storage facilities are available in Uganda. The largest humanitarian warehouses are located in the greater Kampala area (capacity up to 18,000 MT per facility). In addition, a number of smaller facilities are scattered across the country with capacities between 350 and 3,000 MT. Most of these facilities are owned and operated by the World Food Programme (WFP) and have an aggregate capacity of about 50,000 MT. Commercial storage is available in the major cities and towns. The aggregate commercial capacity is around 85,000 MT. Public/government-owned storage is not available.

2.2 Seed industry of Uganda

The seed industry in Uganda is characterized by production and marketing of major and minor crop species such as grains and vegetables (ISSD, 2012). In general, the Ugandan seed industry can be described as quite diverse comprised of privately owned seed companies, ranging from small to medium scale companies and a few multinationals. Uganda's seed industry is fully privatized with two distinct seed supply systems, the informal seed supply system, and the formal system. The formal system, which is fully regulated covers 20% of the market at the present, is fast growing, and has registered local and international seed companies operating under this segment (ISSD, 2012).

ISSD 2012 stated that, there are a total of 25 seed companies currently registered and they are mainly involved in producing certified seeds of hybrids and open pollinated varieties (OPVs) of field crops, like maize, sunflower and self-pollinated crops, such as groundnut, rice, and beans. The key seed sector

actors in the country include government agencies under MAAIF, as well as national and multinational seed companies, seed multiplication farmer associations, seed dealers; farmers and the civil society. Farmers obtain nearly 22% of their seeds from the formal system in Uganda. Local market, neighbour exchanges and farmer saved seeds ensure an estimated 78% of the seed supply to farmers.

According to Ebanyat *et al* (2018), in 2014, total commercial maize seed production in Uganda was 25,655 metric tons of, which hybrid maize seeds had an estimated 31% shares. Drought tolerant maize is also fast gaining popularity, production of which reached 2870 metric tons in 2017, recording a CAGR of 32.54% during the period 2013-17. Total production of bean seeds was 90,368 metric tons in 2014, of which 96% of the contribution was of the informal sector. Production of oil crop seeds reached 49,531 metric tons in 2014, recording a CAGR of 12.16% during the period 2010-14. As far as certified seed production is concerned, maize leads with 8000 metric tons of hybrid and 6000 metric tons of open pollinated variety seeds produced in the year 2014.

2.2.1 Common bean seed sub-sector

The government of republic of Uganda through its agency NARO is responsible for developing research capacity and seed breeding, while the private sector carries out seed multiplication/ production, seed conditioning and marketing. The government also heads up the creation of enabling conditions and oversees regulations. The National Agricultural System Act (2005), Seeds and Plant Act (2006) and Plant Variety Protection Act (2014) are in place and operational. The MAAIF, through the Directorate of Crop Production, is the official focal point mandated to regulate the seed industry, with the National Seed Certification Services responsible for seed certification. The Seeds and Plant Act is the principal legislation for the seed industry in Uganda (MAAIF, 2018).

The bean breeding programme in Uganda is focused on producing varieties that are disease resistant (especially root rot and anthracnose which can cause complete yield loss), yield, colour, bean shape and size, taste, and early maturity. A wide range of new varieties have been released by NARO and MAAIF. The most recent are the NABE series bred from the local landrace lines from CIAT which are resistant to anthracnose fungal disease. NARO breeders have to present 2 year on-farm data, on-station data, results of stability tests done, and DUS tests done for at least two seasons (MAAIF, 2018).

In Uganda, the seed law does not impose quality assurance of EGS. For foundation seed, a letter from the breeder certifying that the seed being sold is of good quality is what is required. Often, seed from NARIs has low germination percentages or a high proportion of off-types. According to the ISTA rules, foundation seed also needs to be inspected externally. However, NSCS has limited capacity (financial and staffing) to inspect all seed classes. Another limitation is that simple variety descriptors are not easily accessible (Ntare, 2016).

2.2.2 Seed production, multiplication and distribution

Adokorach *et al* 2020 stated that, in recent decades, Uganda national seed systems have become more diverse through the inclusion of private sector and community based seed actors. Community-based seed actors, such as local seeds business groups (LSBs) and community seed banks (CSBs), have an important role to play in supplying smallholder farmers with quality seed of many food and minor crops, particularly crops that are not of interest to commercial seed companies. Government agencies (NARO, Agricultural universities and NGOs are often involved in providing support services to such community based initiatives. However, across Africa, there is considerable variation in the scale of operations and degrees of success of these community efforts. The scattered panorama of community-based efforts

suggests that there is scope to learn more systematically about past and current efforts, and explore avenues to reach many more smallholder farmers in Africa through the scaling of community Seed banks and farmers' seed enterprises.

Commercial common bean seed production is an unattractive area of investment by many seed companies because farmers rely on the informal market. The private companies are only guaranteed getting viable turnover in the first season of introducing the improved bean variety, or when NGOs and NAADS float tenders for the purchase of certified seed for humanitarian interventions. As a result, breeders promote bean seed production mostly through farmer groups (Mastenbroek *et al*, 2016).

Distribution of improved bean varieties is mainly done through farmer groups who are given free foundation seed by ZARDI of NARO to produce and market Quality Declared Seed. Since 2012, ISSD Uganda has enabled 30 local seed businesses to access foundation seed from NARO at a cost to produce QDS. Efforts are under way to extend this model country wide to cover a wider range of food crops (Mastenbroek *et al*, 2016).

According to Mastenbroek *et al*, (2016), In Uganda 27 Improved bean varieties have been released to date and 25 seed companies are engaged in formal seed production. In the national seed strategy, the target for 2020 is 23,000 MT of which the largest proportion (75%) is produced as quality declared seed (QDS). This huge potential increase in marketed bean varieties, poses a challenge on the EGS system. A more realistic target is 7,000 MT. Seed companies and farmer groups will need 467 MT of foundation seed to produce this 7,000 MT. This is produced using three rounds of bulking. To have a continuous flow of foundation seed available, 408 ha is needed on an annual basis to produce sufficient quantities of foundation seed for the three rounds.

According to ISSD (2012), There are two main categories of seed supply systems currently operating in Uganda; the formal and informal seed sector. The formal seed supply system involves the entire seed production and certification process and is linked to research, production, processing and marketing. It is organized on a commercial basis by both local and international seed companies/enterprises and are fully regulated by government. The seed produced by the formal seed sector is of high genetic value and purity, though only contributing about 15% to the seed supply. On the other hand, the informal seed system's contribution of 85% to the seed supply has no organized seed production chain and is heavily under regulated. In such a situation, many smallholder farmers in Uganda have no access to a reliable supply of quality seeds that can ensure productivity.

2.3. Dry common beans in Uganda

A wide variety of dry common beans are produced predominantly in the Western and Northern regions of Uganda. Depending on the season, beans flow between Uganda and neighbouring countries. Beans are cooked and served as a complement ("sauce") to other staples. Production is relevant for both food consumption and income generation. Most of the beans traded are dry beans, rather than fresh. There are seasonal variations in the direction of trade flows between Uganda and neighbouring countries. However, on aggregate, Uganda is a net exporter of dry beans to regional markets (UBOS, 2014b).

2.3.1 Consumption of dry common beans

Kilimo Trust (2012) highlighted that beans provide 25 percent of total dietary calorie intake and 45 percent of protein intake in Uganda. Beans are cooked and served as a complement ("sauce") to other

staples in both private (household, businesses) and institutional settings (hospitals, prisons, schools/education centers, the military, police, government food assistance/relief distribution, and WFP). Per capita consumption is estimated at 19 kg per year, but a decline in bean consumption has been documented, particularly in urban areas, due to the length in cooking time and the perception of bean meals as an inferior food to meat (Kilimo Trust, 2012). In addition to bean size, shape, and color, factors such as cooking time, thickness in the soup produced, swelling characteristics, taste, and shelf life after cooking influence consumers' preferences for different types of beans (Chemonics, 2010).

2.3.2 Production of dry common beans

Kilimo Trust (2012) stated that, Uganda is among the main producers of beans in the EAC region. Beans are ranked fourth in terms of cropped area, after maize, plantains, and cassava. The area planted remained fairly stable in the past few years, with an average of 660,000 ha under cultivation between 2010 and 2014. Between 2008 and 2014, national production ranged between 850,000 and 1 million MT (Figure 2). Approximately 40 % of total output is produced during the first March to June growing season. The remaining 60% is produced during the second September to November growing season (Kilimo Trust, 2012). The South Western Uganda region is the lead producer, contributing almost half of domestic production. The Northern region follows with about a quarter of total production (UBO, 2010).

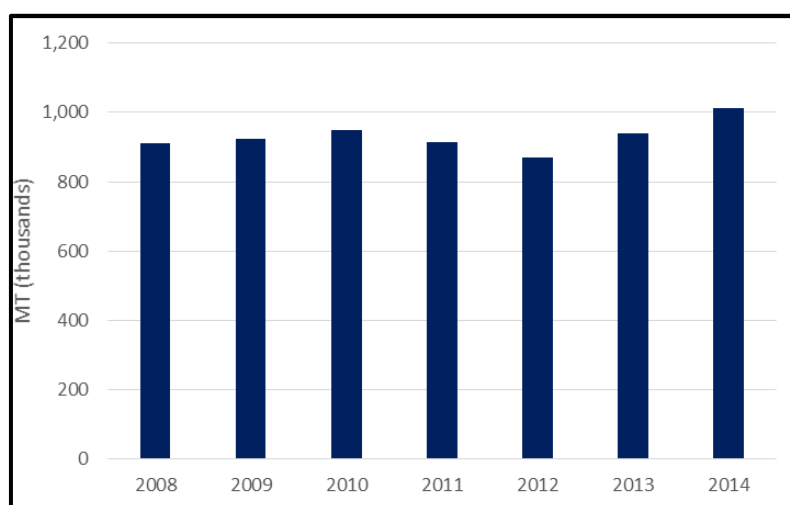


Figure 2: Bean productions in Uganda, 2008-2014 (UBOS, 2015)

Bean production occurs at the smallholder level and with low use of external inputs. Average plot size ranges from 0.25 ha to 1 ha and intercropping with cereals (maize, millet, or sorghum) is frequent (Chemonics, 2010).

Kilimo Trust (2012) stated yields vary across bean varieties, ranging from 0.4–1.5 MT/ha. Bean producers decide which variety(s) to grow depending on taste, preferences, market demand, prices, and productivity. While several improved bean varieties are grown, most producers still rely on non-commercial seed from previous harvests as input. Large grain size varieties are often preferred. Post-harvest practices such as threshing, drying, sorting, cleaning, and packing usually occur at the farm level.

Approximately 70% of the beans produced enter the marketing system. Of these, 98% are traded as dry beans.

Among the most relevant constraints to production are low soil fertility, high incidence of pests and diseases, low use of external inputs (fertilizers and other agrochemicals), and low use of improved varieties (Chemonics, 2010).

2.3.3 Structure of the marketing system of dry common beans

FEWS NET, 2015 stated that, a large number of actors participate in the dry common bean marketing system (Figure 3). Input suppliers (public and private), producers, producer groups or associations, domestic traders of different scales, international traders, processors, private and institutional consumers, and supporting institutions (government, NGOs, research) comprise the supply chain. Producers usually sell the produce at the farm gate to local/small-scale traders, who aggregate local supplies and sell to medium- and large-scale traders and to vendors in open markets. Medium- and large-scale traders purchase directly from farmers, but also from other traders, open markets, or farmer groups.

These traders sell to institutional buyers, exporters, private sector (hotels, restaurants), and retailers. Producer associations and groups support their members by promoting collective production, facilitating access to credit, storage, and collective marketing, providing training, and in some cases, engaging in production of seed (Kilimo Trust, 2012).

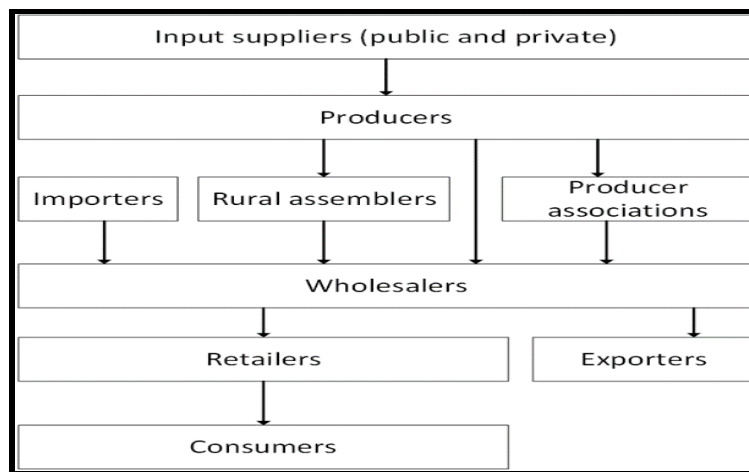


Figure 3: Dry beans marketing channel (FEWS NET, 2015)

Formal and informal exporters and importers are also part of the chain. A large number of exporters (more than 30) participate in formal trade. WFP is the largest exporter of Ugandan beans, which are directed to Rwanda, Burundi, DRC, Kenya and South Sudan (Chemonics, 2010). For the case of formal bean imports, these are controlled by a small number of enterprises (Kilimo Trust, 2012). With respect to informal trade, this sector is composed by a large number of both domestic and foreign traders. These traders typically mobilize small amounts of produce that are carried by foot or bike across the border (Chemonics, 2010).

Small-scale retailers normally handle grain beans. Beans undergo a low level of value addition. The main activities relate to cleaning, sorting, packaging, and storage. In terms of processing, beans are

transformed locally through the elaboration of samosas, pies, cakes, and other products that are sold in local markets. Larger-scale processing is rather limited and concentrated on the production of bean flour. Supermarkets deal with processed products such as canned beans, precooked beans, and packaged grain beans (Kilimo Trust, 2012). FEWS NET (2015) stated that, Price determination is most frequently done by negotiation between buyer and seller, usually at the spot. Overall, the bean market is underdeveloped, with most trade occurring through informal channels. The large number of buyers and sellers guarantees a competitive market. Traders' activities are constrained by lack of credit, needed for ensuring access to storage and for covering other marketing costs. Beans are traded without consideration of any grade or standard. There are no price premiums for good-quality beans.

The majority of dry common bean output is consumed domestically Kampala is the main consumption and transit market in Uganda (FEWS NET, 2015). Beans typically flow from producing areas to Busia (for their export to Kenya and South Sudan) and to Gulu and Lira, from where they are further directed to Kampala and the Karamoja sub-region (FEWS NET, 2015). Net exports represent about 27% of national production. The main destinations are Kenya, South Sudan, DRC, Tanzania, Burundi, the United Kingdom, and the United States (UBOS, 2014). With respect to informal cross-border trade, common beans stand out as the third export product after maize and fish. In the 2010–2013 periods, common beans accounted for about 12% of informal agricultural exports (UBOS, 2014).

CHAPTER THREE: METHODOLOGY AND PROCEDURES

This research employed a mixed of qualitative and quantitative approach based on semi-structured interviews, survey rural chain appraisal and content analysis in order to provide answers to the research questions.

3.1 Study Area

Uganda is Eastern African landlocked country located at the equator with total area of 241 550 km², a north-south extent of about 650 km and a maximum east-west extent of about 500 km (Atwebembeire, *et al*, 2018). The Uganda borders South Sudan to the north, Kenya to the east, the United Republic of Tanzania and Rwanda to the south, and the Democratic Republic of the Congo to the west. The research study was conducted in three districts random selected out of 14 district in south western agro-ecological zone (in the south western Uganda), namely Mbarara, Sheema and Isingiro as shown in figure

4

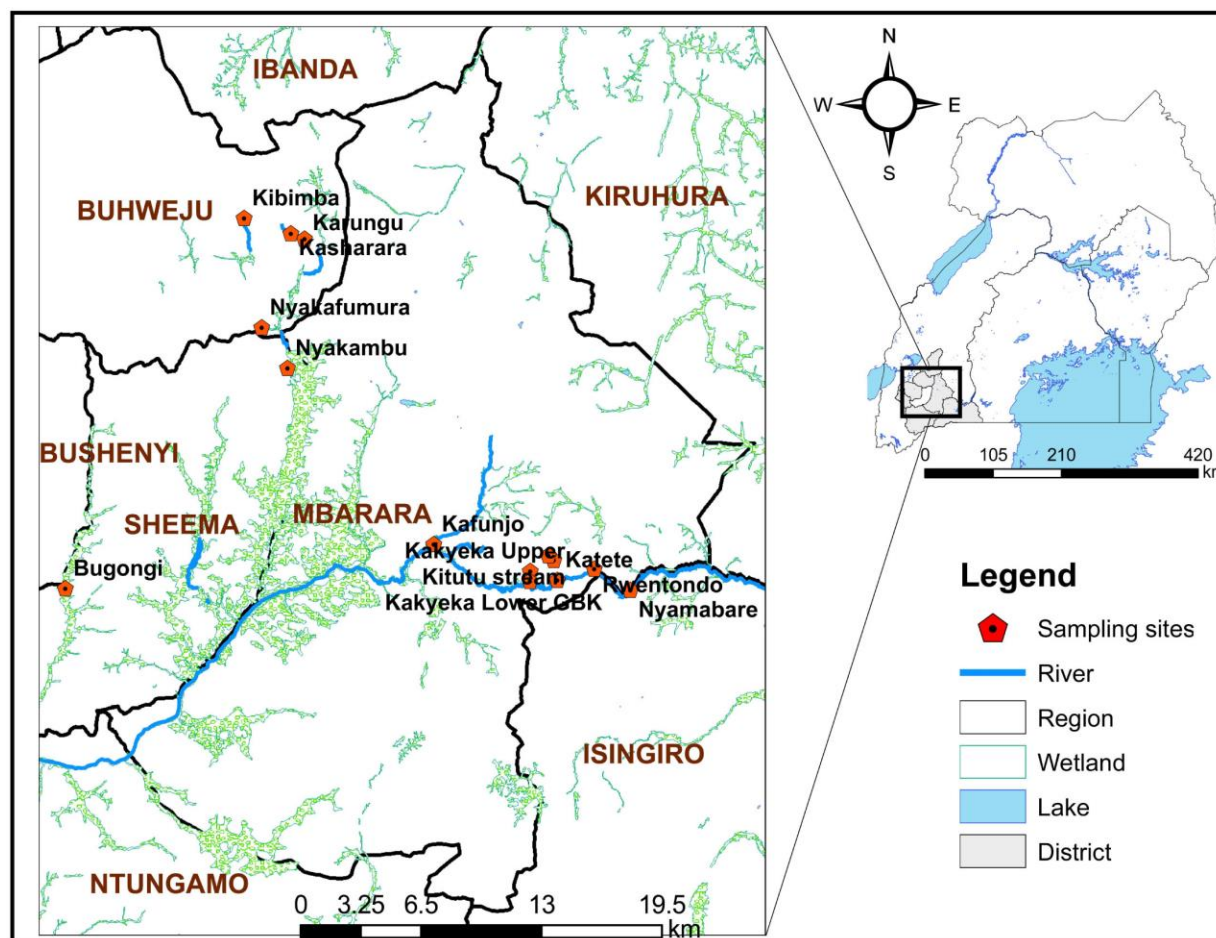


Figure 4: Map of south western agro-ecological zone Uganda showing study districts (Atwebembeire, *et al*, 2018)

3.2 Data collection methods and tools

The study combined both quantitative and qualitative approaches to answer each research question as shown in appendix 1. The research study comprised of primary and secondary data sources. Primary data were collected from the survey questionnaire and interviews. According to Laws *et al* (2013), studying an entire group of people takes time, is costly and is often plagued by other practical considerations such as accessibility so selecting a sample can represent larger group. A total sample size of 74 respondents were selected to represent the entire study population and consisted of 45 farming households, 12 seed producers, 11 Key informants (experts), 3 Agro-input dealers and 3 local common bean traders.

It is usually best to use more than one research technique in any project to triangulate the information collected (Laws et al, 2013). Therefore secondary data were obtained from desk research through the archival document, journals, reports and digital documents on internet search such as Research Gate, Green I and Google Scholar.

More details in appendix 1 on how each question was answered and methods used. To manage time during research study, research activities schedule were developed as detailed in appendix 7.

3.2.1 Desk research

Desk research was carried out to obtain secondary data from existing literature necessary to establish reliable information for the study. In the desk research, the background information on marketing common bean seed in other countries, seed industry in developed countries, seed access information for smallholder farmers, critical loss points in common bean seed industry were searched for.

3.2.2 Key Informative Interviews (KII)

The study also focused on key experts in the common bean seed industry, to understand the general common seed value chain, the roles of different common bean seed actors and other common bean seed production activities, seed policy and regulations information effect on seed security, common bean seed marketing channels, challenges and opportunities in common bean seed sub-sector from an expert opinion. Respondent's numbers were selected depending on Laws et al (2013) as already stated in section 3.2. Therefore, the experts included a total of 11 respondents of which 6 were from local government (LG) Agricultural extension technical staff (extension staff provide trainings to farmers and also participate in seed distribution to farmers). More 2 staff from NGOs that support local seed business (there are only two NGO's in the region ISSD Uganda and Biodiversity international). 1 staff from Zonal Agricultural research development institute who is currently responsible for research on common bean seed technology development (MbaZARDI is the only on agricultural research institute in this region). Also 1 common bean seed breeder from National Crops Resources Research Institute (NaCRRI) (head of the seed breeding programme to provide expert overviews on seed value chain) and 1 staff from research coordination at National Agricultural research organization (also to provide general overviews on common bean seed research coordination in Uganda). Appendix 2 provides details of KII interview guide.

3.2.3 Farming Household Survey

The household survey was conducted in south western agro-ecological zone Uganda where most of common beans are grown. Out of the 14 districts with in the region, three districts were randomly

selected for the study (Sheema, Mbarara and Isingiro districts). However, these three districts are also commonly known for common bean production in the region and community/ group seed production projects have been implemented in these districts for the past 10 years. A total of 45 farming households were randomly selected from the three districts, Sheema with 15 households, Mbarara with 15 households and Isingiro with 15 household. In practice random selection of respondents completely depends on chance or by probability (Laws et al, 2013). “Therefore names of common bean farmers were obtained from district agricultural production office, names were put in box and 15 farmers were picked from the box without looking to get a sample of farmers”. Household farming survey was conducted to achieve measureable insight into the common bean seed security. Household survey was conducted using a questionnaire as detailed in appendix 3. The questionnaire included closed questions as well as open questions with focus on crop production/ seed system profile, seed sources, challenges encountered in accessing common bean seeds, identification of bean loss points at farm level and marketing bean at household level. Also quantitative and qualitative information were obtained.

3.2.4 Seed producer’s interviews

Twelve individuals were selected from seed business groups consisting of 2 local community seed banks, 6 local seeds business groups (LSBs) and 4 certified seed companies were interviewed using a semi-structured questionnaire (appendix 4). In practice, respondents were divided into non-overlapping subgroups of strata using existing information. The aim of interviewing seed multiplication groups/companies was to establish and understand their seed production challenges, seed availability, seed security of the early generation seed of the common beans, common bean seed demand, marketing channels and strategy.

A simple random sample can fail to select respondents from important subgroups, especially if the population is large and the sample size is small. The solution is the use of stratified random sample (Laws et al, 2013). The strata were formed based on members' shared attributes or characteristics. In practice, a list of common bean seed producers was obtained from the district agriculture production office. They were then divided into homogeneous strata. Random samples were then selected from each stratum.

3.2.5 Agro-input dealer’s interviews

As explained in section 3.2, lists of agro-input dealers were obtained from district agricultural office and a total of 3 agro-input dealers were randomly selected with one per each district. Agro-input dealers were interviewed to understand the varieties of common bean they are dealing in, most common bean varieties on high demanded, where they acquire seeds to sell. The interview also examined the amount common bean seed demand and supply, mechanism of feedback, farmer’s response to seeds they sell, challenges and areas for intervention especially in support to small scale farmers. Appendix 6 provides detailed questionnaire for agro-input dealers.

3.2.6 Local common bean market survey

Local common bean market survey was conducted using a structured and semi-structured survey questionnaire (appendix 5). Three local common bean grain market traders were interviewed. The focus was on those who normally sell common bean as seed during the planting season to the farmers. The survey looked at various common bean varieties demand and supply, most common bean varieties liked by farmers.

3.2.7 Enumerators

Oxfam, 2018 stated that, data collection often requires the assistance of a team of data collectors or enumerators, as they are usually called. This may include the following types of research household surveys and other large-scale surveys censuses. Enumerators are typically asked to administer survey questionnaires or collect information using digital or paper collection modes that are designed to capture information around a research or evaluation question. Enumerators are given research tools such as an interview guide, questionnaire, and household survey and asked to collect information in a specific location, area from a certain number of individuals, households and groups.

Due to COVID-19 pandemic situation and lock down of international airports as control measures of the spread of COVID-19, the author was unable to travel back to Uganda and decided to use 3 enumerators to collect data. Google forms questionnaires were designed and given to the enumerators. The enumerators collected and entered data on the Google forms questionnaire and submitted online on daily basis to check the quality and if the questions were filled according to expectations before proceeding to the next day activities. The enumerators were agricultural extension officers resident in the targeted districts. Prior to the survey, the enumerators were online trained by the researcher on the accurate understanding of questions in the survey questionnaire and interviews for them to collect perfect replies from respondents in their respective districts. The enumerators delivered questionnaires to the randomly (as explained in section 3.2.2 to 3.3.6) chosen farmers, key informants, seed producers, Agro-input dealers and local common bean grain sellers who answered the questions with assistance of enumerators. Also Interview questions were sent to key informants through their emails before the date of interview. Experts were interviewed through telephone conversation and other online using WhatsApp and Facebook voice calls with the research.

3.3 Data processing and analysis

Data collected from the field can be processed and analysed quantitatively and qualitatively (Laws et al, 2013). After data collection from the field, Value chain, SWOT approaches were used to analyse qualitative data while SPSS was used to analyse quantitative data. Data was captured in writing, the written notes were later summarised in a report. Data capturing included summarising of results from the questionnaires as transcript and statistics in pre-defined charts, diagrams, graphs and tables. Also enumerators were encouraged to capture field pictures. For open questions, key points in transcriptions were written down for final results and conclusions.

3.3.1 Statistical Package for Social Sciences (SPSS)

The quantitative statistics from household survey and interviews were organized, described, coded and analysed using Statistical Package for Social Sciences version 25 (SPSS) and Microsoft Excel programme was used to derive descriptive statistics such as percentages, averages, frequencies. Bar chart and frequency tables were also used in interpreting the results.

3.3.2 Value Chain approach

The qualitative data obtained from the interviews were analysed using Rapid chain appraisal procedure to enrich the capturing of perceptions and experiences as given by the different respondents.

Carlos (2007) classified that International experiences have often demonstrated that value chain analyses can be important in efforts towards the enhancement of performance of agricultural, food and seed systems. By revealing strengths and weaknesses, such analyses help chain stakeholders and policy-makers to delineate corrective measures and to unleash the development of areas and activities where the potential for growth is identified.

This study employed the value chain analysis approach. The value chain functional analysis was used to define the stakeholders and their functions in the common bean seed and commodity bean seed chain while the value chain financial analysis was used to analyse the economic returns of the different stakeholders in common bean seed subsector.

In the functional analysis, different stakeholders and their roles in the common bean value chain were identified. The functional analysis involved:

- Identification of common bean seed physical flows,
- Identification of technical functions of the common bean seed chain,
- Identification of stakeholders and quantification of seed physical flows.

After the stakeholders in the common bean value chain were mapped and their technical functions were defined, the amounts of common bean seed they are handling were also quantified. The common bean seed flows were traced from production to the end-user (farmers) and quantities attached at each stage in the chain.

The financial analysis also involved identification of the agricultural inputs used in a particular activity in common bean seed value chain and attaching monetary values to them. The aim of financial analysis was to determine whether:

- All actors (breeders, producers, agro-input dealers, farmers) along the common bean seed value chain generates difference in the value added to seeds.
- The difference is sufficient to guarantee sustainability of the actors roles,
- The difference is a enough and satisfactory return on stock,
- The whole chain is profitable,

3.3.3 SWOT analysis

SWOT analysis summarized the challenges in the common bean seed value chain. Both internal and external challenges within the common bean seed value chain were considered. Internal facets were categorized as strengths or weaknesses while the external situational features were secreted as opportunities or threats. Strengths can function as a basis for structuring economical common bean seed value chain, whilst weaknesses might hinder common bean seed value chain. By understanding these challenges in seed valve chain, the common bean seed value chain actors can better leverage their strengths, accurate their weaknesses, take advantage of excellent opportunities, and prevent potentially overwhelming threats.

CHAPTER FOUR: RESULTS FOR FEATURES OF COMMON BEAN SEED VALUE CHAIN

In the South Western Uganda agro-ecological zone, features that influence the common bean seed value chain have been classified as farming household characteristics, key stakeholders, stakeholders roles and functions, main constraints and opportunities, acute loss stages and why these losses take place in the common bean seed value chain.

4.1 Farming household characteristics

Table 1 shows the demographic characteristics of the 42 total number of farming households surveyed. There were more female farmers than male farmers, approximately 62% of the farmers are female and 38% are male. A large number of farmers are over 50 years (40%), 26% are between 36-45 years, 17% are between 46-50 years and 17% are youth between 18-35 years. Also 50% of farmers have accomplished primary level of education, 26% secondary level of education, 14% tertiary level of education and only 10% have not attained formal education.

Table 1: Farming household characteristics

		Number of response (n=42)	Percentage
Gender of farmers	Female	26	62%
	Male	16	38%
	Both female and male		
Average age group of farmers	18-35 years	7	17%
	36-45 years	11	26%
	46-50 years	7	17%
	Over 50 years	17	40%
Education level of farmers	No formal education	4	10%
	Primary level	21	50%
	Secondary level	11	26%
	Tertiary	6	14%

4.2 Stakeholders and their functions

In facilitating farmers' purchase and planting of high quality common bean seed, it has been noted by the key informants (experts) that different stakeholders perform different roles in the common bean seed value chain.

The analysis of the common bean seed value chain was based on functional and financial analysis by identification and mapping of stakeholders in the chain. Also on the opinions of farmers and seed producers since they are the ultimate seed consumers, the largest seed producers in the seed sub sector and key stakeholders in the chain see figure 5. The common bean seed value chain was evaluated at the function level of direct actors and supporting stakeholders. The chain has new variety development, EGS production, and certified seed production, quality declared seed production, seed distribution and marketing. The assessment looked at the actor's performances and the roles of the stakeholders in the chain.

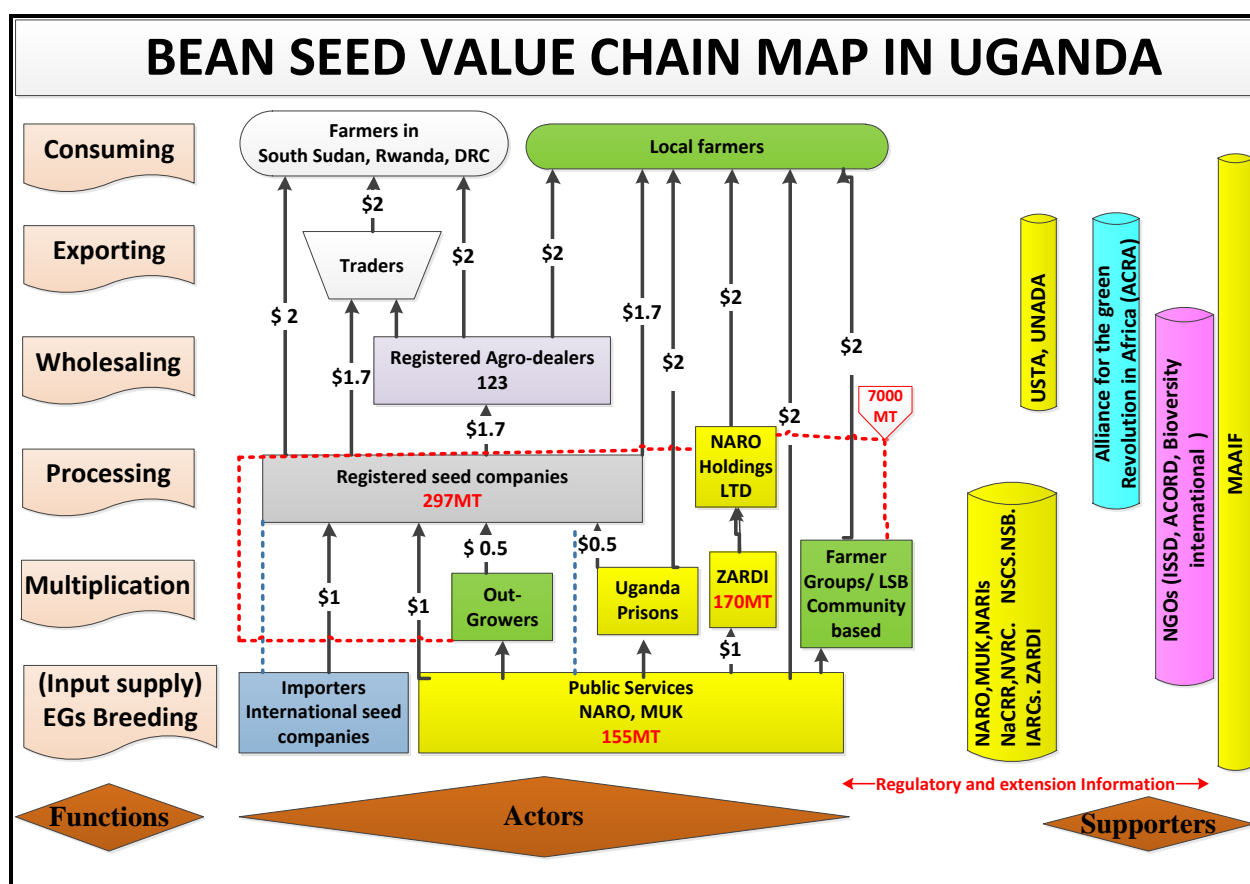


Figure 5: Common bean seed value chain map

4.2.1 Functional Analysis of common bean seed value chain

In the Stakeholders interviews with NARO, ISSD, seed producers and farmer, four functions were acknowledged in the common bean seed value chain: Input supply (Early generation seed production), Production (Seed multiplication), Seed marketing and distribution and Seed consuming.

- **Input supply (Early generation seed production)**

Key informants from NARO and ISSD articulated that public agricultural research organisations are the main actor at this level. The common bean seed production begins with research to development new common bean varieties at National Crops Resources Research Institute- Namulonge of NARO. These new bean varieties are then multiplied and tested by Zonal agricultural research development institutes (ZARDI) suitability before the seed is commercially released to the market. The common bean breeder at NaCRRI informed that NARO is the main producer of EGS for common bean in Uganda, so little quantities of EGS imported by international seed companies. Also NARO plays a role of variety development, variety evaluation, variety selection, and breeder seed production, breeder seed production generation from nucleus seed and variety conservation, research on common bean seed development desired by farmers and release of the common bean seed to market. National seed certification (NSCS) department of MAAIF is responsible for official variety registration, seed inspection and certification.

- **Production (Seed multiplication)**

The District production and marketing officer of Sheema district (Robertson) indicated that actors who play the role of seed multiplication include registered seed companies. Out of 26 registered seed companies only seven companies multiply common bean seeds. Seeds are also multiplied by local seed business groups locally registered with ISSD (Sheema 10 groups, Mbarara 15 groups and Isingiro 7 groups) or cooperatives, contracted individual seed farmers, Zonal agricultural research institutes and NARO holdings institutes of NARO. These actors perform the main role of common bean seed multiplication starting from multiplying the EGS to foundation seed to certified seeds and finally to quality declared seeds. They also take care of seed processing and packaging.

- **Processing and wholesaling (Seed marketing and distribution)**

Maggiore a crop technician and seed multiplication focal person at MbaZARDI of NARO categorized main actors in the seed marketing as agro-input dealers, LSBs, registered seed companies outlets and NARO holdings. Their main roles in the seed chain include distributing seed in different areas of need and the seed is sold on open market either by wholesaling or retailing. Seed marketing is done both at local levels and at international market such southern Sudan and Rwanda.

- **Seed consuming**

Interviewed agricultural extension workers pointed out farmers as the main actors at this level. The roles played by farmers in the seed chain include purchasing seed, improved variety adoption, planting the common bean seed and giving feedback on the seed performance report in case is requested by researchers.

4.2.2 Common bean seed value chain supporters

Actors in the chain described main common bean seed value chain support as:

- NSCS that is responsible for variety registration, official seed inspection and certification.

- Uganda Seed Trade Association (USTA) that is formed of registered seed companies plays the role of facilitating seed trade within the country.
- MAAIF plays the role of providing extension to farmers and seed policy formulation.
- NGOs that play vital roles include ACORD, ISSD and Bioversity international. They offer training to farmers, funding and research.

4.3 Constraints and opportunities

Major constraints and opportunities in the common bean seed value chain were identified during interviewing key informants (experts), the farming household survey and the interviews with agro-input dealers and seed producers.

Input supply of early generation seed (EGS) production

Seed breeders of EGS acknowledged the following constraints in chain: Poor government funding towards common bean variety development and variety promotion. The EGS production has no specific budget and it depends on non-tax revenue (NTR), however the recovery operational costs are very low. There is lack of appropriate information to project the EGS demand in the country. The EGS production is totally under the control of individual breeders with their own priorities which makes the production of adequate quantities of EGS impossible. Also the seed breeders reported weak policies for quality control and assurance of the early generation seeds as critical constraint.

Production and multiplication Seed

Seed producers encounter various challenges during seed multiplication which include; Lack of enough funds to purchase chemicals and fertilizers, and soil infertility that is caused by over cultivation at the same land without fertilizer application. Then seed producer Joy said prolonged droughts makes crops weak and can be easily affected by the pests and diseases in the fields. All seed producers experience the challenge of high costs of purchasing foundation seed and unavailability of seeds at planting time. There is poor quality of EGS available on markets mixed with many off types. Substandard agro-inputs (chemicals, fertilizers and seeds) dominate the markets and are sometimes not available on time when needed. Seed producers encounter a challenge of inadequate knowledge on seed multiplication and when advice is needed from technocrats also they lack practical knowledge to advice seed producers on the best agronomic practices needed in seed production. Pearl Seeds Ltd pointed out that domestic violence is a big challenge among contracted seed farmers leaving gardens not fully planted and harvested. Low adoption of post-harvest technologies in seed production by contracted seed farmers has reduced the quality of seed produced in the region. NASECO (1996) Ltd and East African Seed (U) Ltd encounter a problem of shortage of land to grow seeds on isolated fields. Seed producers face the problem of labour shortage; there are few skilled qualified breeders and seed technologists to produce seed. Seed companies that depend on out growers incur high costs in seed production since smaller holder farmers are scattered and it's difficult to inspect the seed fields. Out-growers lack knowledge on quality seed standards that result in seed counterfeiting. All seed producers rely on NARO for breeder seed supply. However NARO has limited capacity to supply required seed quantities. Lastly seed producers reported that seed production requires several rounds of bulking without sales that is not profitable.

Seed distribution and marketing

Seed dealers have experienced the challenge of low adoption of improved varieties by common bean farmers. This is due to negative publicity by some of the NGOs about the use of improved seeds. The market for common bean seed is unpredictable, it usually depends on NAADS and NGOs that supply seeds to farmers but their orders are not consistent. Local seed demand is challenged by unpredictable weather conditions, implying lesser seed sales and demand during prolonged droughts. Agro-input dealers described that the common bean seed market is dominated by quality declared seeds (QDS) which are poorly packaged and not traceable. There are many uncertified seeds being sold on open markets not controlled by the government. In case there is poor germination or yield agro-input dealers bear the problem and farmers have lost trust of these improved seeds.

Seed consuming

Farmers who grow seed for sale, either on contract or not, experience various constraints which include: Low prices and price fluctuations of quality seeds. Also seed farmers show concerns that graded, uniform grain and mixed grain sometimes are sold at the same price which demoralizes farmers who take time to produce high quality bean seeds. An improved variety doesn't attract better prices compared to the price of local varieties since most farmers don't know the value of growing improved varieties. Farmers also experience poor transportation of the beans to markets. In the region roads are very bad and impassable during rainy season. Traders tend to manipulate the weighing scale and in absence of weighing scale, traders use containers that cheat farmers in weighing the quantity to sold.

A SWOT analysis identified bottlenecks and summarizes the possible entry points for intervention as strength and opportunities in the common bean seed value chain (these constraints have been summarized) see table 2.

Table 2: SWOT of the common bean seed value chain

Strengths	Weaknesses
<ul style="list-style-type: none"> • Farmers engagement in common bean seed multiplication • Farmer groups and cooperatives engaged in common bean grain production. • Availability of different improved varieties from agricultural research organizations 	<ul style="list-style-type: none"> • Inadequate amount of common bean seed breeders. • Low access to financial services for common bean seed production business. • Inadequate amount of early generation seed. • Inadequate knowledge of seed production by both extension workers and seed producers. • Limited capacity of seed producers to produce adequate quantity of seed. • Poorly financed bean breeding research. • Common bean seed multiplication component not priority for research

	institutes
Opportunities <ul style="list-style-type: none"> • Presence of agro-input dealers • High demand of seeds • Existence of public agricultural extension services at every level • Presence of national & Zonal agricultural research institutes • Existence of financial services (Banks, SACCOS) • Presence of NGOs that support community seed production (ISSD-Uganda) 	Threats <ul style="list-style-type: none"> • Pests and diseases • Climate change (prolonged droughts)

4.4 Acute loss stages and causes

Like any other business, losses occur in the common bean seed value chain. Stage at which losses occur and why, have been classified by stakeholders (farmers and seed producers) as: The most critical stages mentioned were especially planting and growing stage (74%), Threshing and winnowing (9%), harvesting and drying stage 7%, distribution or marketing stage 7% and storage stage 3% see figure 6.

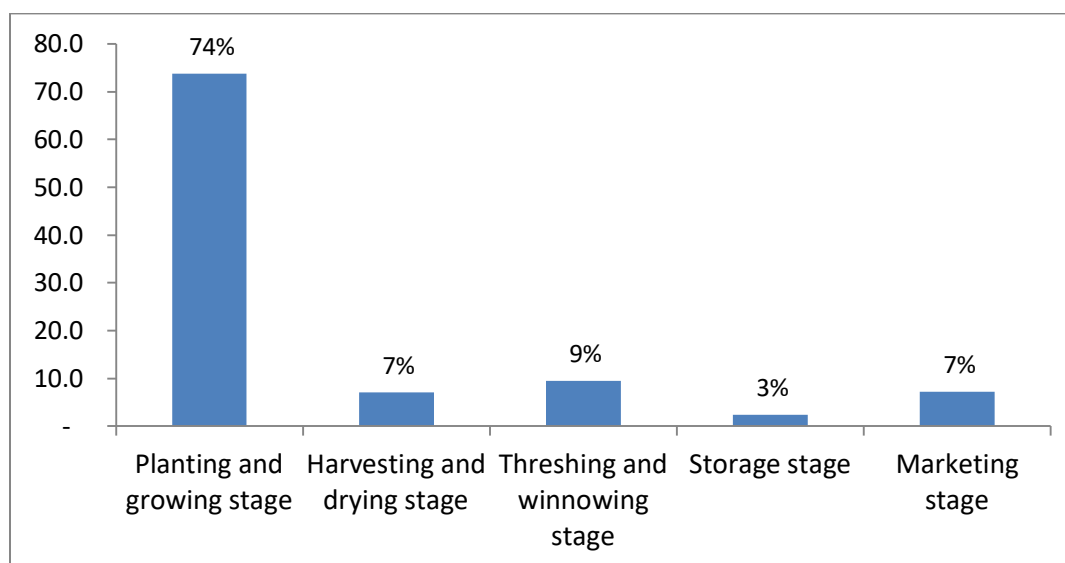


Figure 6: Acute loss stages experienced by farmers and seed producers

Planting and growing stage

Farmers indicated that causes of loss at planting and growing stage include; poor seed germination and prolonged drought results into drying of germinated beans. Besides, farmers showed concerns of pests and diseases that attack the crops so sometimes farmers don't

harvest anything or have reduced yields. Heavy rainfall causes rotting of the pod at bean pod formation stage and hailstones causes breaking of the bean branches. This reduces the quality and quantity of the grain harvested. On the other hand common bean seed producers specified that loss at planting stage is triggered by unpredicted weather changes that cause rotting. Germinated beans dry due to prolonged droughts resulting into low yield. Substandard chemicals cannot control the spread of pests and diseases. This has made the pests to develop resistance to pesticides. Lastly, farmers experience lack of enough funds to purchase pesticides and fertilizers.

Harvesting and dry stage

Farmers reported that scattering of bean happens when hired labour is used to harvest the bean fields. This is because labourers don't care about the volume of beans harvest as they are paid on field size being harvested. Incomplete harvest was also indicated as cause of the loss due to careless harvesting by hired labour. Also farmers highlighted that common beans are left in the field as they are hidden by the overgrown weeds. Rotting of beans in the field is also critical and is caused by heavy rains at harvesting stages. Theft is also a problem, hired labourers sometimes steal common beans from the fields since most of the bean gardens are far away from farmers homestead. Seed producers experience losses at harvesting and drying stage which is a result of drying harvested common bean on bare soil that makes seed contaminated with soil and discoloured. Other problems are lack of enough space to dry seeds during the rainy season causes rotting of the common bean grain and also lack of labour which results to incomplete harvest and drying.

Threshing and winnowing stage

Also farmers noted losses at the threshing and winnowing stage as a result of beating beans with sticks while threshing. Farmers said the mechanical damage (shattering and breakages) of bean grains have been witnessed in many occasions. Threshing by beating the beans with sticks to release common bean grains from the pods also contributes to the scattering of beans. Scattering may cause critical loss if the scattered common bean grains are not gathered together. Also farmers said heavy wind blows away bean grains to the trash during winnowing stage. Seed producers reported incomplete threshing as major cause of loss at this stage. This is due to threshing of not well dried beans and using exhausted labourers since threshing of common bean by beating with sticks requires extra energy.

Storage stage

Also farmers experience weight loss of common beans grain during storage stage. Sometimes beans grain rot and discolouration of the grain happens at this stage. Discolouration has big impact on the quality of the grain and producers end up selling at low prices. Rodents and

bruchids also cause the loss; farmers witnessed that they can easily enter the stores and eat the bean grains or make holes on the grain. Farmer's highlighted thieves are major cause of loss during storage stage because of the many unemployed youth in the region who break in the stores at night and take anything found. Seed producers experience losses at storage stage because of lack of appropriate post-harvest technologies, lack of proper packaging materials that allows rodents to destroy the seed. An inappropriate storage facility to store the processed seed also causes rotting of the seed and makes it difficult to maintain the seed quality.

Marketing stage

Farmers showed concerns of being cheated by traders who use manipulated weighing scale since many farmers cannot read and interpret the weighing scale units. Also farmers said in absence of a weighing scale, traders tend to use basins and other containers to measure the weight of beans which makes it difficult to estimate the quantity produced. Farmers further indicated that in the region common bean markets are unreliable with low prices. Farmers have poor negotiation capacities and are always paid less by seed buyers than what they expect. High cost of transportation and low adoption of improved varieties by farmers is the main cause of loss experienced by seed producers. If produced seed is not all bought by farmers, loss can occur because seed producers can't store seed for more than two years.

CHAPTER FIVE: RESULTS FOR CURRENT BEAN SEED SECURITY SITUATION

The current bean seed security situation is measured on the factors influencing common bean seed security, common bean varieties cultivated in the region, quantity of seed planted and area planted with common beans.

5.1 Factors influencing common bean seed security

In the south western agro-ecological zone factors that influence common bean seed security are categorized as seed accessibility, seed availability, seed quality, seed varietal suitability and seed resilience.

5.1.1 Seed accessibility

Farmers in the districts of Mbarara, Sheema and Isingiro usually access common bean seeds from multiple sources to meet the seeds quantity required for the planting season. The major source of seeds for the season of March –June 2020 accessed by farmers included: seed from seed aid 67%, own saved seed 62%, agro-input dealers 45%, 19% of farmers accessed seed from local market and 10% of farmers accessed seed from friends/neighbours as shown in the figure 7.

The majority of seed producers (80%) access common bean seed from National agricultural research institutes, 10% from seed companies and 10 % from individual farmers see figure 8. Most agro-input dealers (60%) access seeds they sell from individual seed farmers, 30% from seed producing groups and 10 % from seed companies as shown in figure 9.

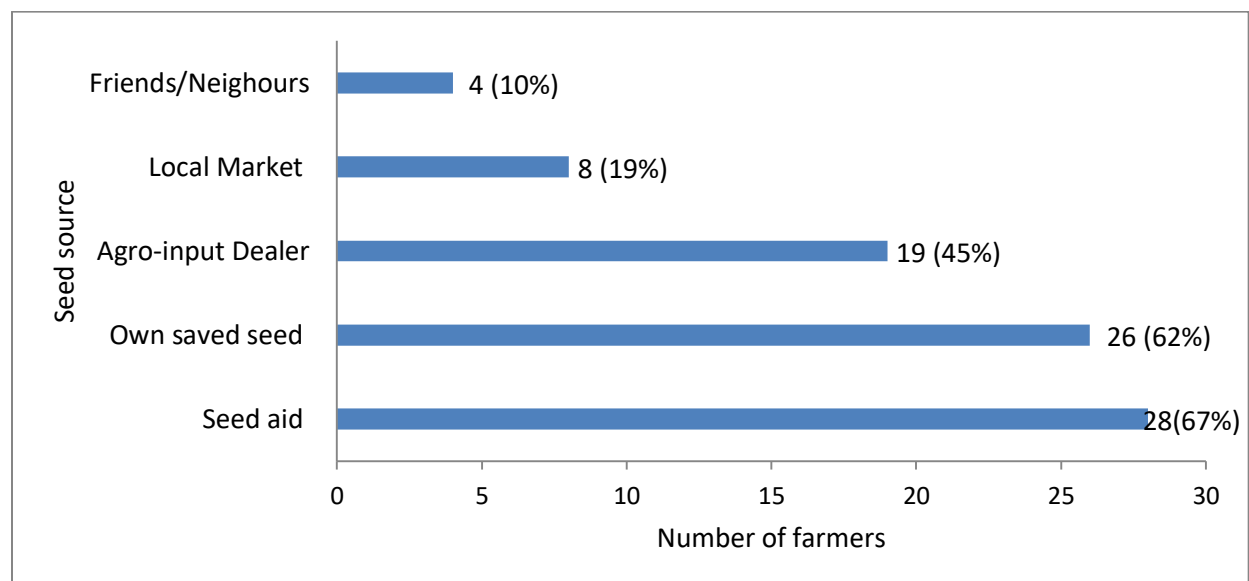


Figure 7: Major Source(s) of common bean seed for the season of March –June 2020

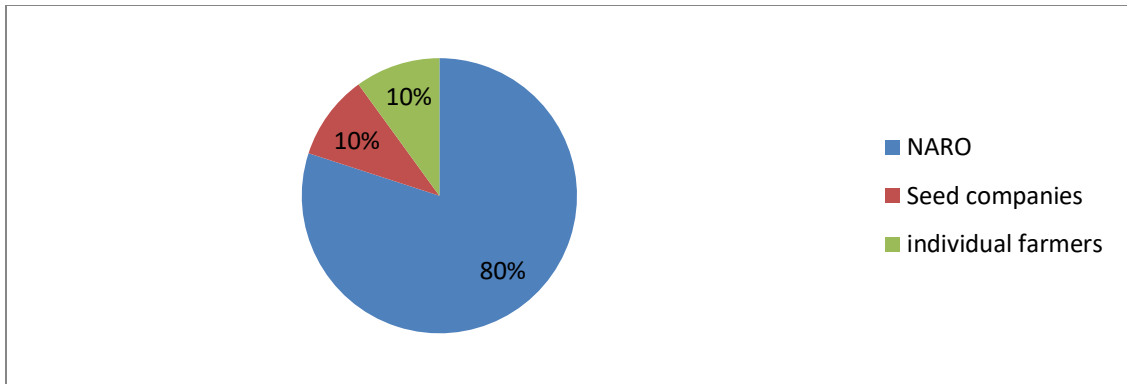


Figure 8: Major sources of seed for seed producers

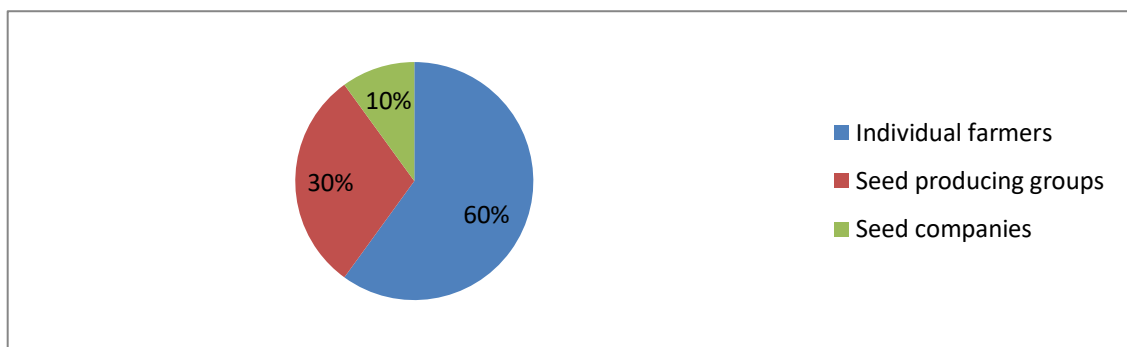


Figure 9: Major sources of seed for agro-input dealers

Also farmers were further asked the methods they use to acquire seeds and it was noted that farmers use multiple seed acquisition options. In the March-June 2020 season, many farmers (83%) acquired seeds through purchase as the main option, 50% self-saved and 7% loaned as indicated in figure 10. Out of the farmers who purchased with cash or loan 48% of farmers found seed affordable, 48% of farmers found the seed expensive while 4% of farmers found the seed very expensive.

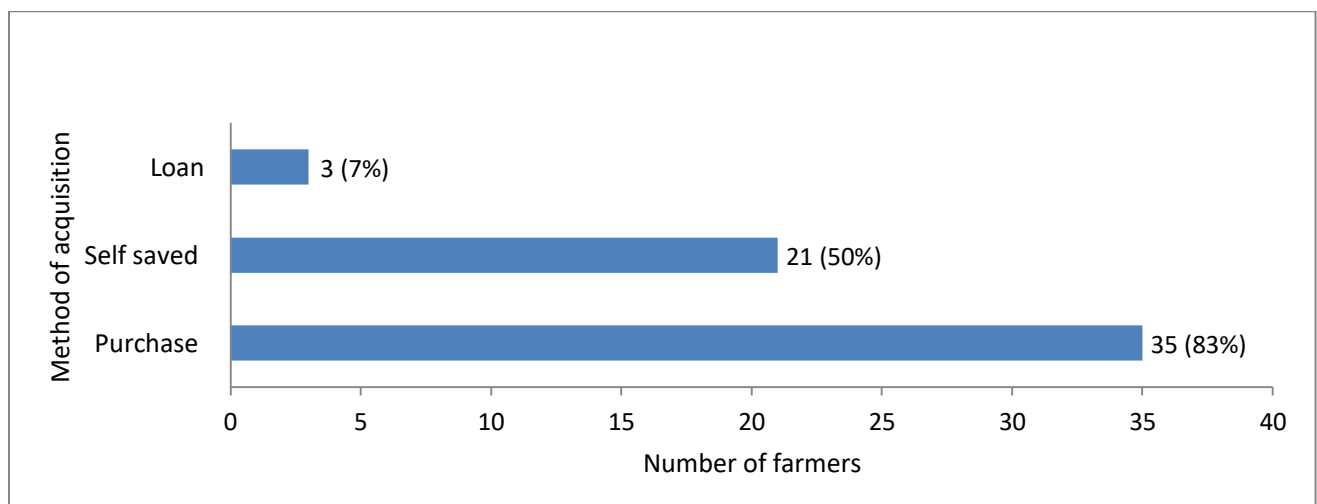


Figure 10: Means of common beans seed acquisition options

Most farmers in the region showed interest to change the main multiple sources for seeds for the season of August-November 2020. As shown in the figure 11, own saved seed (79%) as their main source of seed. Furthermore they will source seed from seed aid source (50%), agro-input deals 33.3% and local market 7%.

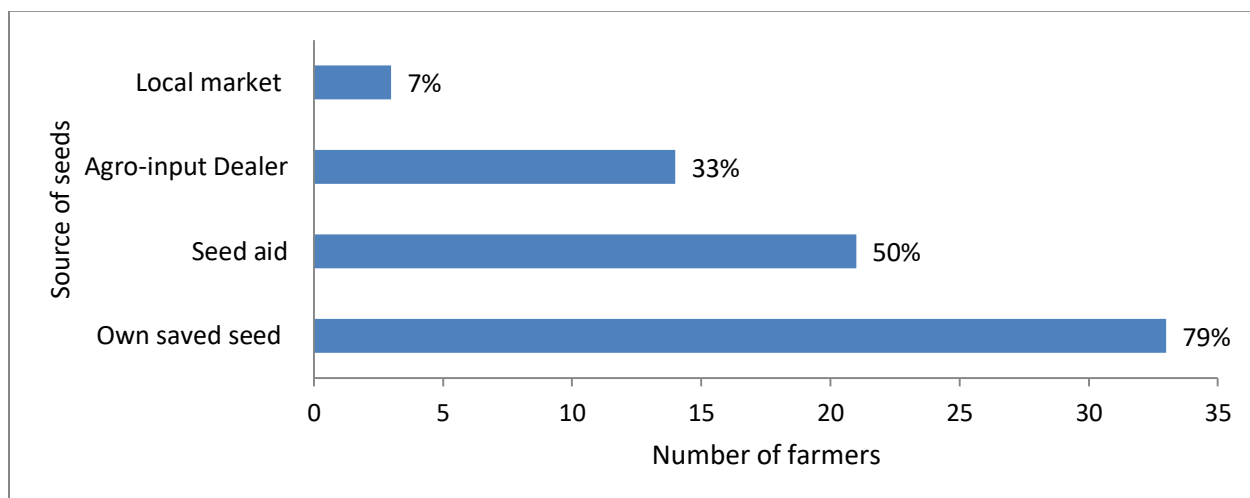


Figure 11: Main source(s) of common bean seed next season August-November 2020

Farmers were further asked the reason why they were willing to change seed sources. Their multiple responses showed farmers would change the seed sources due to: seeds lack of resistance to pests and diseases (55%), bad performance of seeds (44%), increase in seed prices (33%), others (lack of tolerance to prolonged droughts and heavy rains) 22% and lack of seeds from the same source 20% see figure 12.

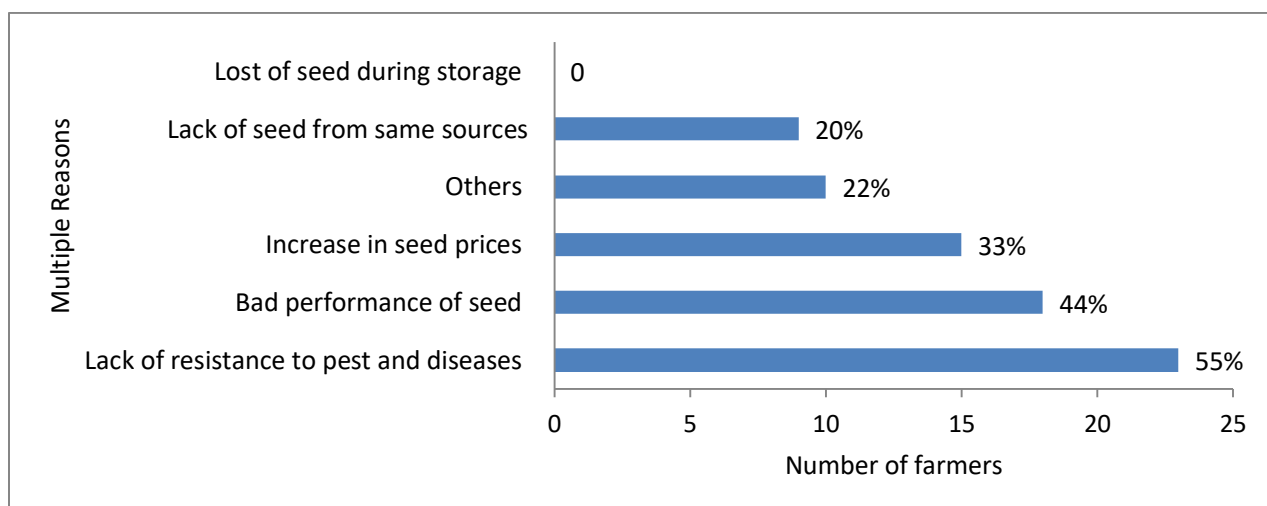


Figure 12: Reasons for change of seed sources

5.1.2 Seed availability

Time of common bean seed availability to the farming households: Since farmers access common bean seeds from multiple sources and grow more than two varieties per season, 56% of the farmers acquired seeds at the start of the season, 24% acquired common bean seeds before the planting season and 20% acquired common bean seed during mid-season see figure 13. Majority of the farmers (42%) reported that mixture of local varieties and improved varieties are always available at start of the season and only 10% improved varieties become available in the mid-season. All seed producers make seed available at start of the planting season and sometimes mid-season. In general, improved varieties are available later than local varieties.

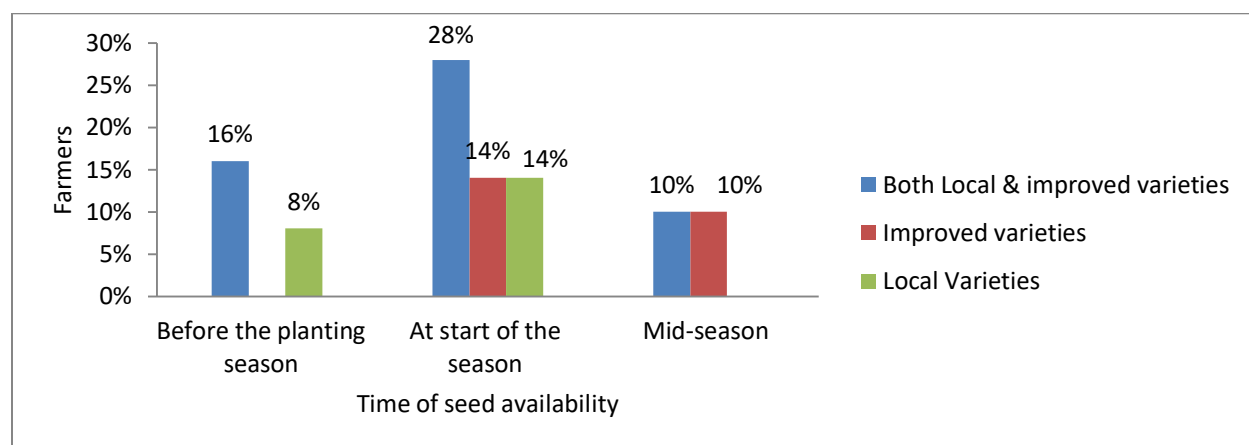


Figure 13: Time of seed availability to farmers

Proximity of common bean seed sources and markets

Seed producers sell 67% of seed above 15 km from where the seed is produced, 17% of seed sold within 11-15 KM, 8 % of seed are sold within 6-10 km and 1-5 km respectively as shown in figure 14.

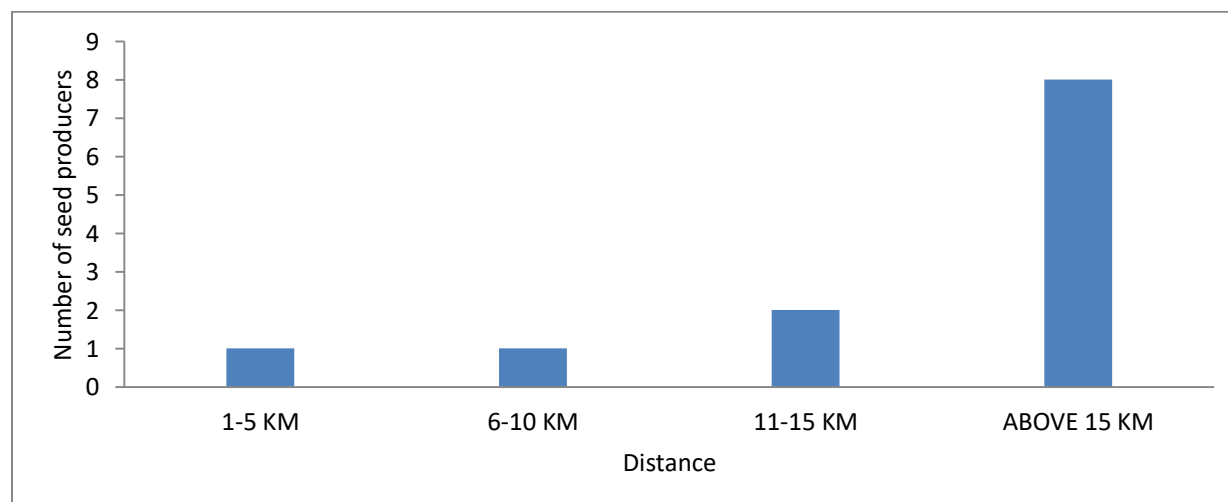


Figure 14: Proximity of seed markets

Farmers collect seeds from multiple proximities: Most farmers (67%) collected seeds within their villages, 38% of farmer collected seed from far away district and 35% of farmers collected seed from neighbouring villages see figure 15.

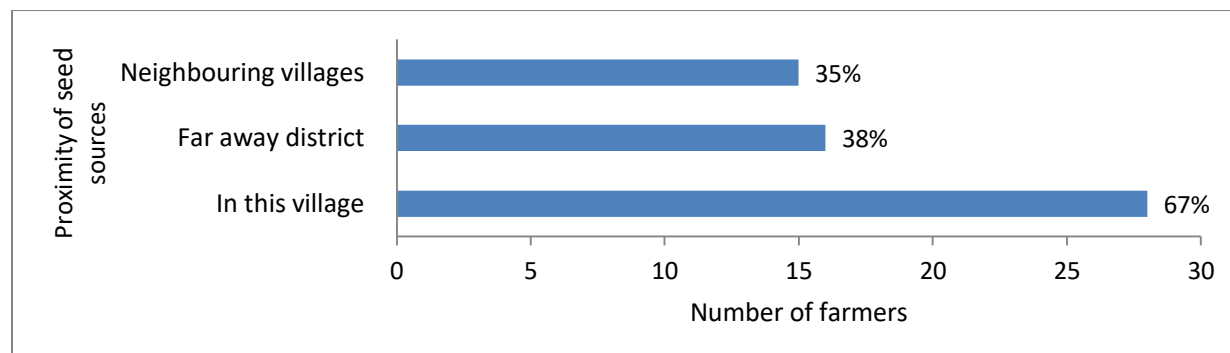


Figure 15: Proximity of seed sources

Common bean variety types available to farmers in different proximities include both local and improved varieties (56%), improved varieties (24%) and also local varieties (20%) as indicated in figure 16 for last season of March –June 2020. Agro-input dealers indicated they sell 50% improved varieties, 40% local varieties and 10% mixed local & improved varieties. About half of the farmers (52%) reported that the quantity of seed available was enough while the other half (48%) farmers reported that seed quantity available was not enough from all sources. Seeds not being available in enough quantities made farmers not to plant the area that had been planned and prepared for common beans for March –June 2020 season. Agro-input dealers testified the inadequate quantity of desired common bean varieties by farmers at planting time. Nevertheless 65% of common bean seed producers obtained foundation seed (both local and improved varieties), 35% obtained early generation seed from NARO with inadequate quantities and desired varieties.

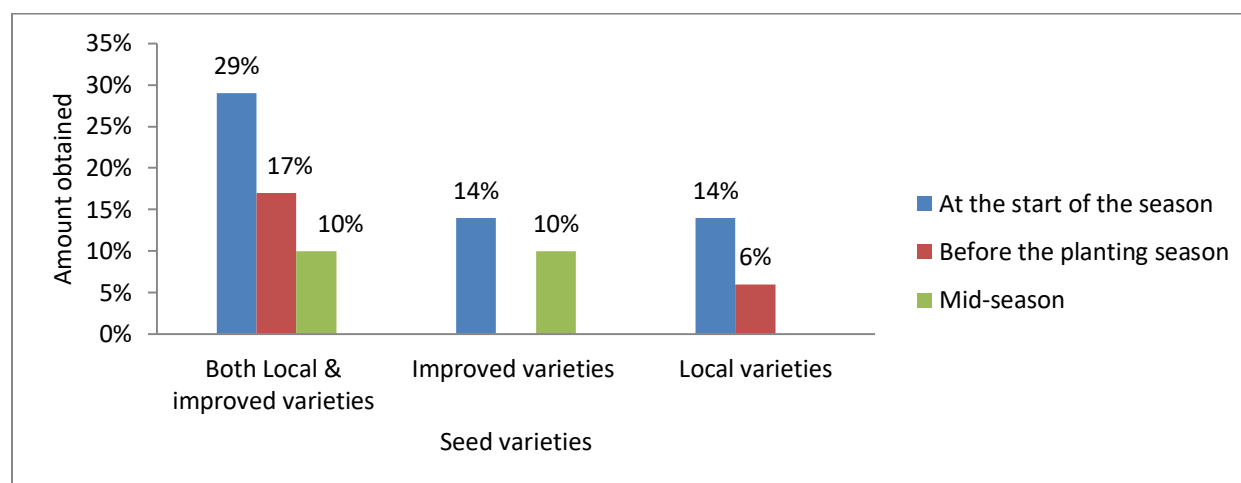


Figure 16: Common bean seed varieties types available

5.1.3 Seed quality

Physical condition of the seeds: Figure 17 shows, the majority of the farming (81%) considered seed from all sources to be good (no impurities and no damage), 17% of farmers considered the seed to be fairly clean (some impurities and no damage) while only 2% of farmers considered the seed not to be clean (some impurities and damages) Though , most (79%) farmers reported that general germination of the common bean seeds from all sources were good and still 21% of farmers considered germination of the seeds to be only fair, regardless of their source.

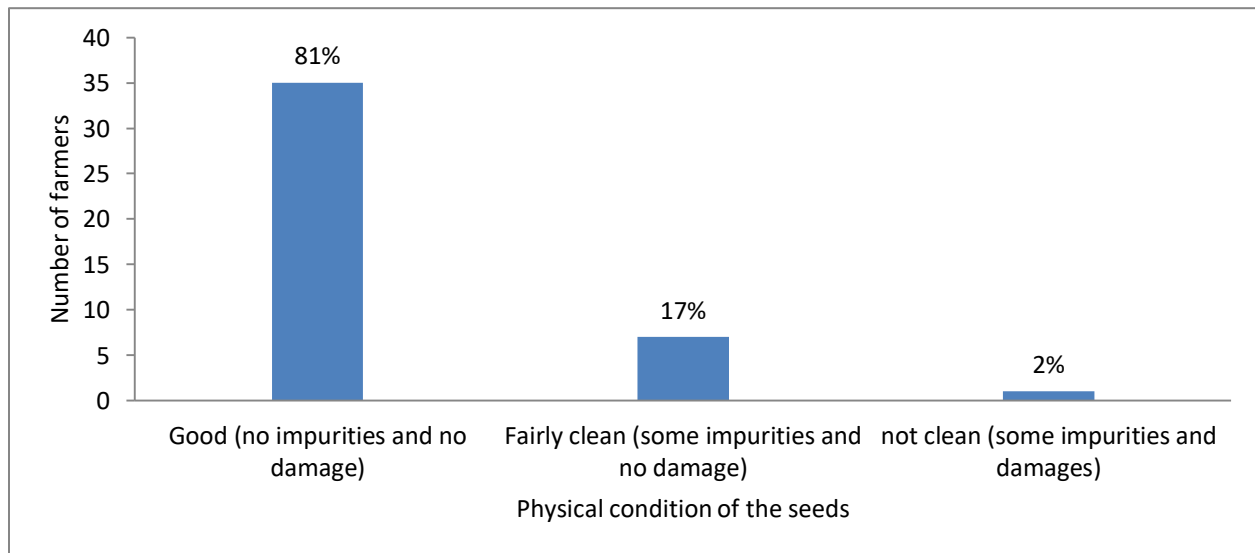


Figure 17: Seed physical condition

Determinates of quality seed

In south western agro-ecological zone, common bean seed producers determine the quality of seed in multiple ways such as: seed with uniform variety 92%, seed with high germination percentage 92%, seed that is disease and pest free 83% and seed from inert material 75%, see figure 18.

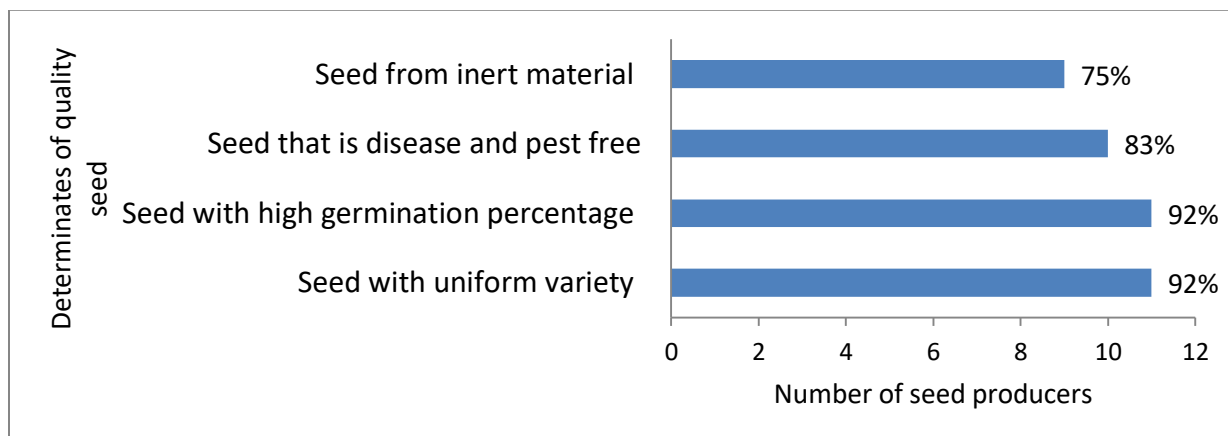


Figure 18: Seed quality characteristic

Seed inspection

Furthermore, 54% of seed producers produce different common bean seed varieties on separate farm and 46% are produce different varieties on the same field. In the field, the quality of seed produced is guaranteed through following the isolation standard distance of 3-4 meters between two gardens with different varieties and guard lines of two meters.

Experts Muhezi Dandus and Twinamasiko David, senior agriculture officers of Sheema and Mbarara districts respectively, clarified that quality of seed produced is maintained by inspecting seed production fields during the growing season and issuing certification certificate by seed inspectors. According to the seed producers as shown in figure 19, 55% of the seed producer's fields are inspected twice per season, 27% once per season, 9% thrice per season and 9% four times per season. Conversely 84% of seed producers produce certified seed and 16% produce seeds which are not certified seeds while 93% of seed producers are aware of seed certification and 7% are not aware of seed certification.

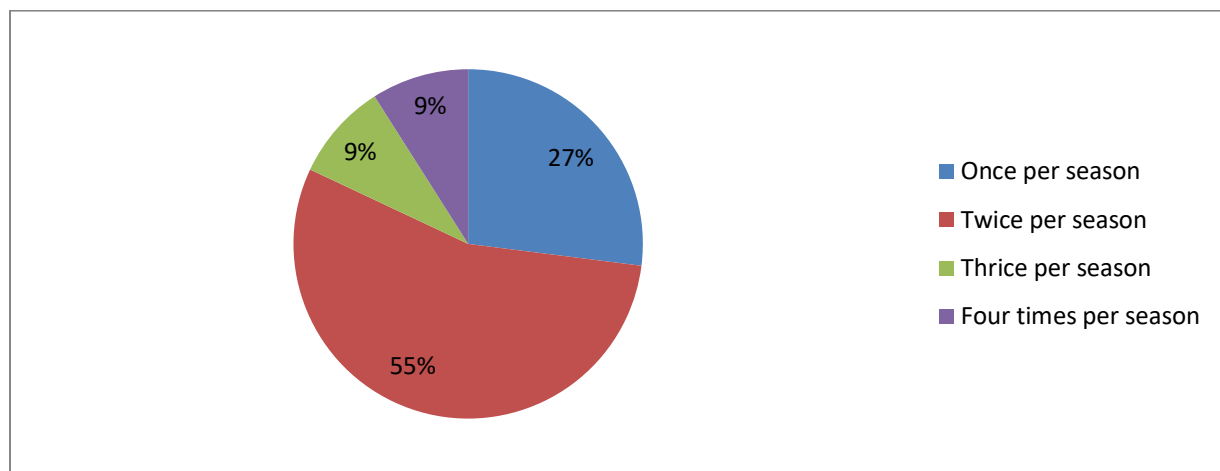


Figure 19: Common bean seed fields inspections

Quality seed production challenges.

Seed producers ranked major challenges influencing production of high quality seed (rank 7 being the highest influence and 1 the least rank) as non-existence of knowledge on seed production (rank 7), struggle in maintenance of seed quality (rank 6), small land size (rank 5), availability of seed market (rank 4), absence of early generation seed (rank 3), lack of group consistency in seed production (rank 2), post-harvest problems (rank 1) see figure 20.

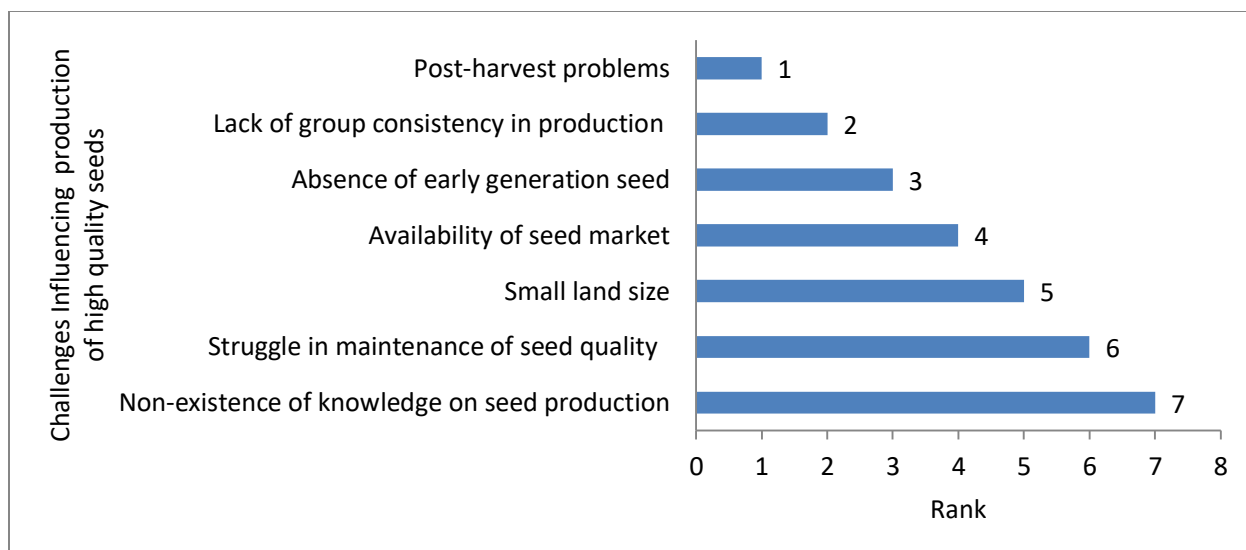


Figure 20: Major challenges influencing seed production of high quality seeds

5.1.4 Seed varietal suitability and seed resilience

Smallholder farmers in south western agro-ecological zone grow both local and improved varieties. In this region improved varieties of common beans became popular in early 2001 and they were introduced by National Agricultural Advisory Services (NAADS) which is a Ugandan government agency created in 2001 to improve rural livelihoods by increasing agricultural productivity and profitability.

In figure 21, 55% of farmers classified the performance of seeds to be fair, 28% of farmers indicated that the performance of seeds are good while 17% of farmers indicated that the performance of seeds is poor from all sources. Generally 72% of farmers are not satisfied with the performance of the seeds available in the agro ecological zone.

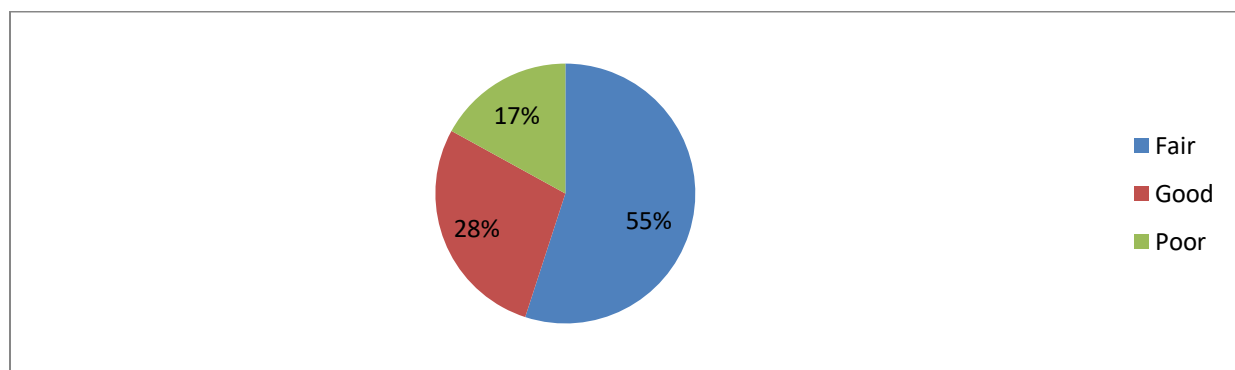


Figure 21: Performance of seeds

Regarding on seed resilience, farmers use a diversity of seed varieties more than 79 seed varieties are grown in the region. Every farming household grows more than one variety per season from multiple sources both improved and local varieties as shown in figure 7 and 11. Also farmers said that improved varieties are more resistant to prolonged droughts, pests and diseases. Agro-inputs dealers and seed producers have limited knowledge on the performance of the seed sold to farmers in the region.

5.2 Common bean varieties

Farmers mentioned 79 varieties of common beans are widely grown in the districts of Sheema, Mbarara, Isingiro. 72 varieties were identified by farmers as their own traditional common bean varieties. Every common bean variety has a local name recognized and maintained by farmers as a unit of diversity and only seven (7) varieties were known to have been officially released by the government breeding producers through NARO. However, out of the 79 varieties only 14 common bean varieties were ranked by farmers to be the most cultivated and consumed in the south western agro-ecological zone as shown in figure 22.

The number of common bean varieties planted per farming household defer from season to season. In most farming households on average more than two varieties of common bean are planted every season. Farmers reported that the reasons for ranking the 14 common bean varieties to be the most preferred in the region are associated with ready market and high prices of the variety and good taste (highly nutritious). Besides these varieties perform well in all soil types, tolerate harsh environment, have high yielding, are resistant to pests and diseases, grow very fast / mature early and these varieties are being promoted by MAAIF and NGOs. Seed producers specified NARO bean 2, NARO bean 3 as the most demanded and profitable to farmers. Agro-input dealers reported NABE 19, NABE 16 and Kabanyardwanda are local varieties that are most demanded common bean seed varieties by farmers.

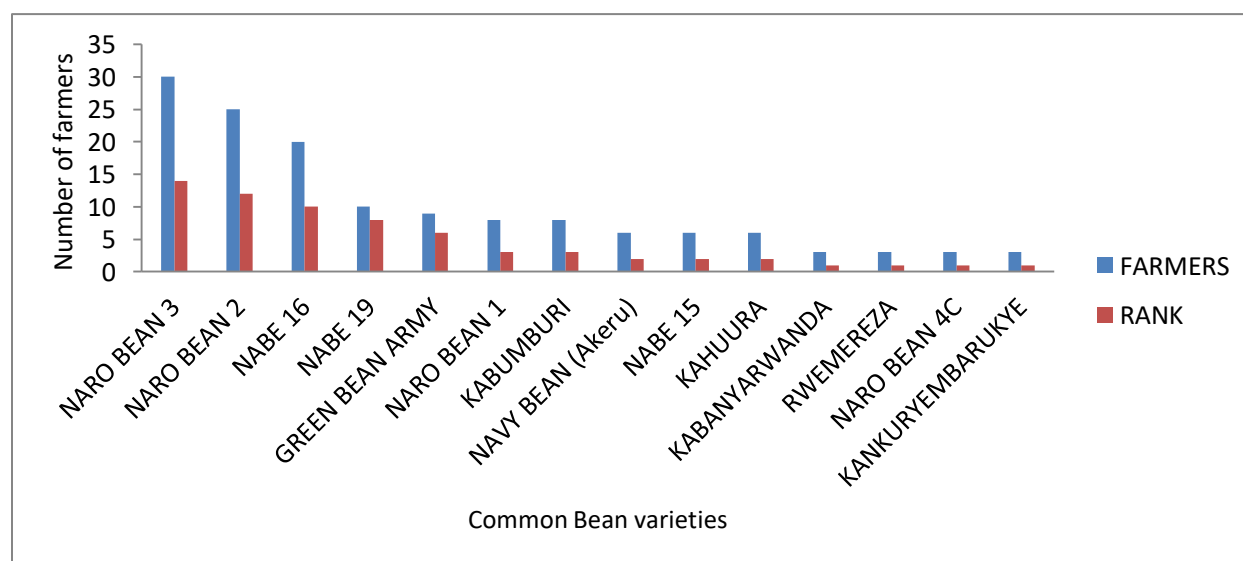


Figure 22: Most preferred common bean varieties

The interviews with the twelve common bean seed producers showed that NARO bean 3 & NARO bean 2 are most produced varieties by 6 seed producers, NABE 16 is produced by 4 seed producers, NABE 19 & NABE short are produced by 2 seed producers and NABE 1, NABE 14 & NARO bean 5c are the least produced varieties by only 1 seed producer respectively in the south western agro ecological zone see figure 23. Seed producers do produce these common bean varieties because they are high yielding compared to other varieties and quick maturing. Furthermore, varieties are iron rich with a ready

market, high tolerant to harsh environment and also they are resistant to pests and diseases. Experts from NARO, ISSD and agricultural extension workers classified that common beans are considered to be a female crop because its production requires little resources and is mainly grown for home consumption with surplus for sale.

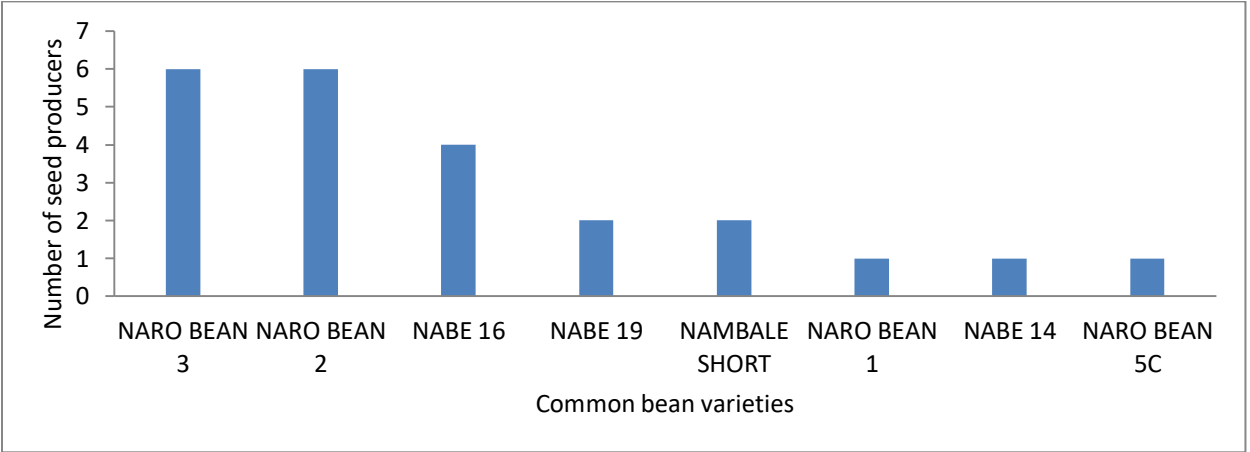


Figure 23: Common Bean Varieties produced by seed producers

5.2.1 Main purpose for cultivating common beans

During the farming household survey, farmers were requested to mention a least two main purposes for cultivating common beans. Almost all farmers (97%) in Mbarara, Sheema and Isingiro districts cultivate common beans for domestic and surplus for commercial, 38 % of farmers grow common bean for seeds while 7% grow common beans for domestic/ food purposes an shown the figure 24.Seed producers grow common beans specifically for seed production and surplus common beans that cannot meet the requirements of seeds are sold as grain for food.

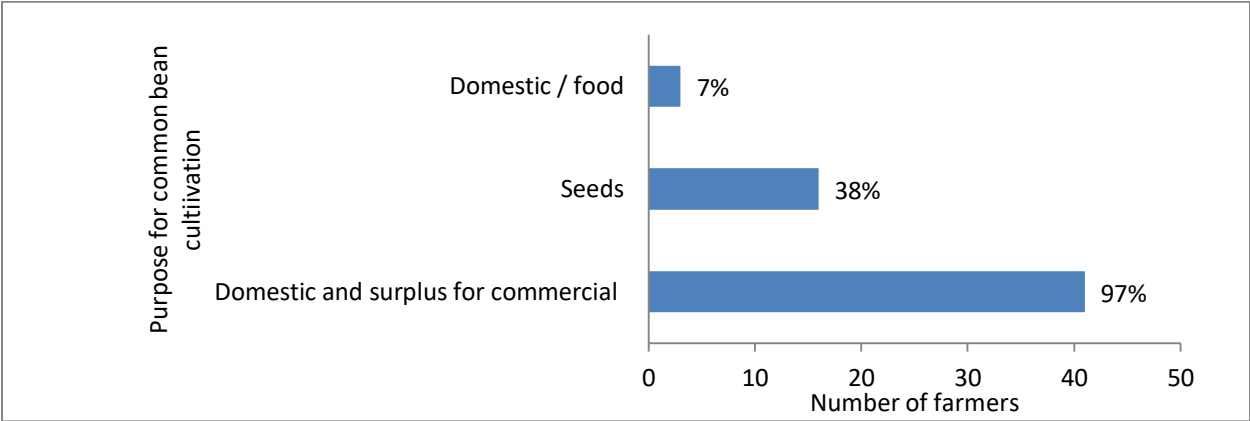


Figure 24: Purpose for cultivating common beans

Reasons for change in main variety of common bean

In the same farming household survey 42 % of farmers showed interest to change the main common bean varieties to be planted during the upcoming season while 58% will maintain their varieties as planted the previous season. The 42% of farmers who showed interest to change the main varieties were further asked to clarify the reasons for change in main variety of common bean in the upcoming season. Farmers gave multiple responses as shown in figure 25. Farmers (47%) will change the variety due lack of seed, 42% free seed from NAADS and NGOs, 36% due to better access to seeds of another variety, 42% free seed from NAADS and NGOs, 26% seed price increase, 36% because of guaranteed selling price of produce, 26% due to secure market, 21% seed price decrease and 21% produce price decrease.

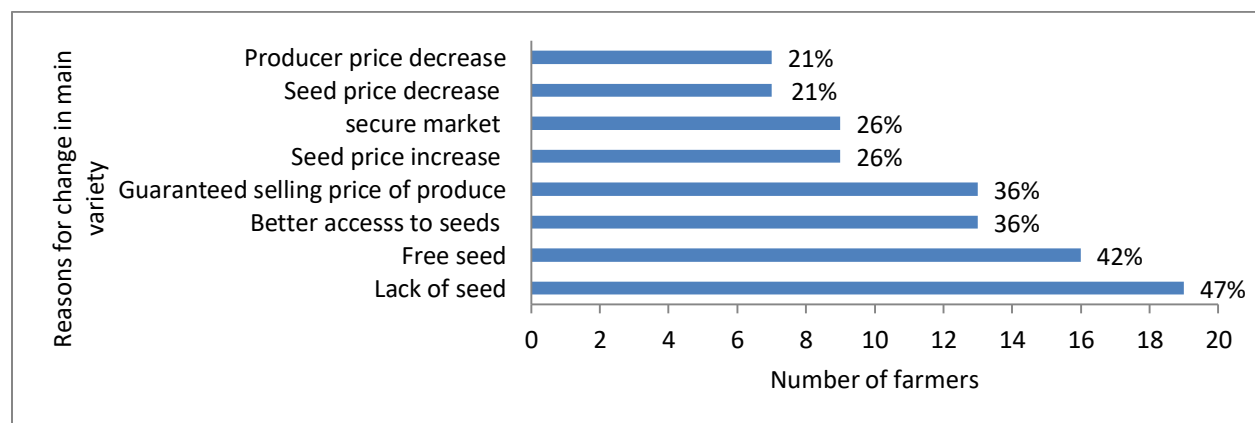


Figure 25: Reasons for change in main variety of common bean in the upcoming season

5.3 Quantity and area planted

Average acreage planted under common beans, in the season of March-June 2020, most farmers grew their common beans on a small piece of land: 50% on 1-2 acres and 43% on < 1 acre. Only 4% grew beans on a bigger land size of > 3 acres and 3% on 2-3 acres. However, in the next season of August-November 2020, many farmers plan to cultivate their beans on the same size of land while 17% on bigger size of land 2-3 acres and 7% on >3 acres see figure 26. Farmers grew common bean mainly as a sole crop (88%) and 12% grew common bean mixed with other crops such as banana, coffee, maize and cassava.

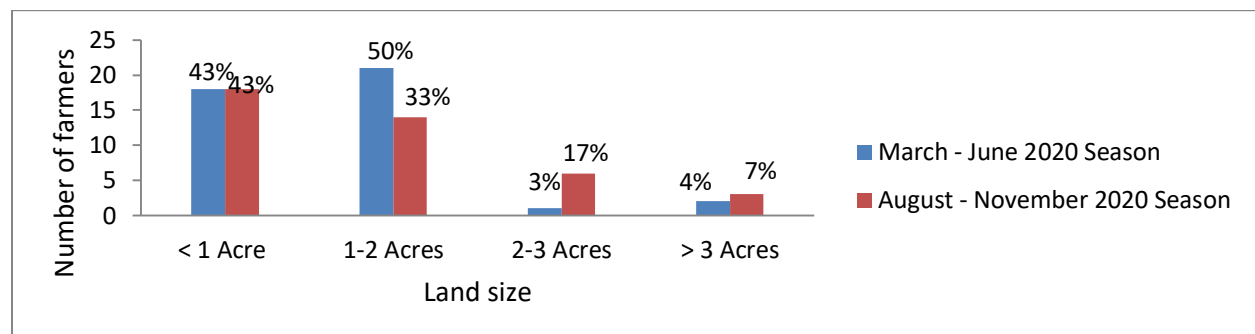


Figure 26: Average acreage planted under common beans

Average quantity (kg) of common bean seed

The march-June 2020 season, most farmers (31%) planted 11-20 Kg of seeds and more than 30kgs. Also few farmers (21%) planted 1-10 Kg and 17% planted only 21-30kgs of seed. However in the next season of August-November 2020, most farmers (38%) are planning to plant 21-30 Kg of seed and 28% farmers will plant 11-20kgs. Farmers planning to plant more than 30 Kg are 22% and 1-10 Kg are 12% as shown in figure 27.

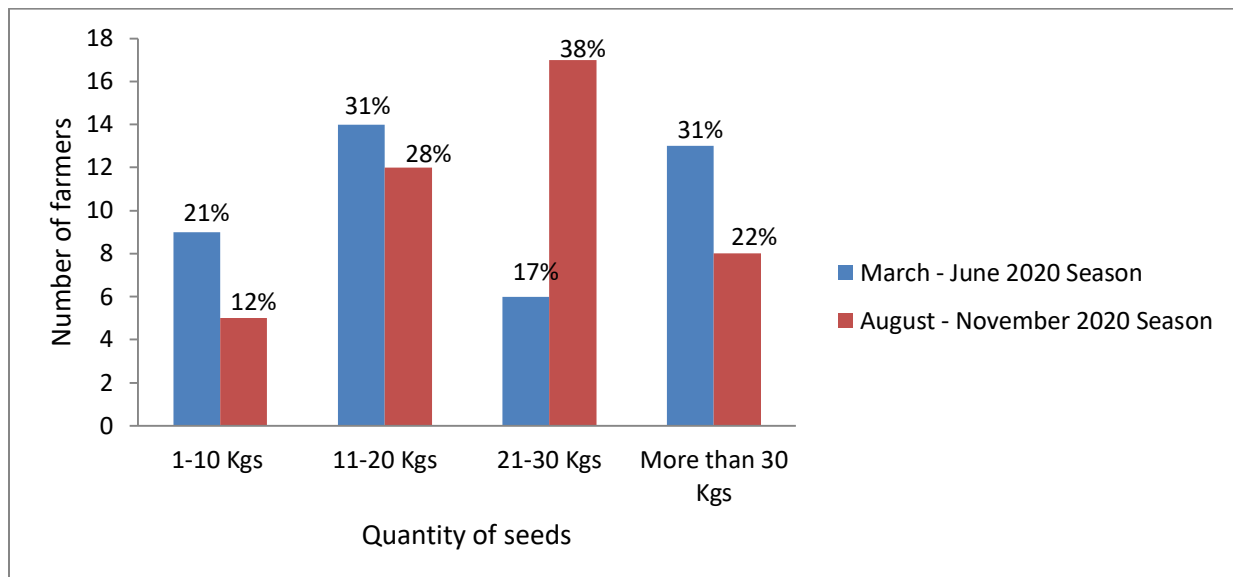


Figure 27: Average quantity of seed

CHAPTER SIX: RESULTS FOR APPROPRIATE MARKETING CHANNEL OF COMMON BEAN SEEDS

In the south western agro-ecological zone of Uganda, appropriate marketing channels of common bean seeds have been classified as available market channels for common bean seeds, the most common beans selling channels, most preferred common beans selling channels and how do seed producers build a successful strategic seed quality trust with farmers.

6.1 Available market channels for common bean seeds

The farming household survey showed farmers obtain seed from 7 different market channels which were developed by actors in the seed market based on these actors' interests of selling seeds to farmers and getting the grain from farmers at the end of the season. Farmers obtain seed from multiple market channels in the region. Most farmers ranked the most preferred market channel to get common bean seeds as: local trader 69%, individual farmers 55%, and local bean seed business groups 40%. However the least ranked marketing channel by farmers included: Schools 31%, farmers' cooperative (society) 19%, agro-input dealers 14% and seed companies 12% as shown in table 3.

Table 3: Most preferred common beans seed marketing channels by farmers

Rank	Preferred common bean marketing channels	Number of farmers. N=42	Percentage of farmers
1	Local traders	29	69%
2	Individual farmers	23	55%
3	Local bean seed business groups	17	40%
4	Schools	13	31%
5	Farmers' cooperative society	8	19%
6	Agro-input dealers	6	14%
7	Seed companies	5	12%

However, as shown in the figure 28, most common bean seed producers (50%) prefer to sell their seed to individual farmers, 45% agro-input dealers and only 5% through seed companies. Meanwhile agro-input dealers prefer to sell to individual farmers as their marketing channel. Also seeds from all sources are sold on wholesale or retail for cash and sometime exchange with common bean grains.

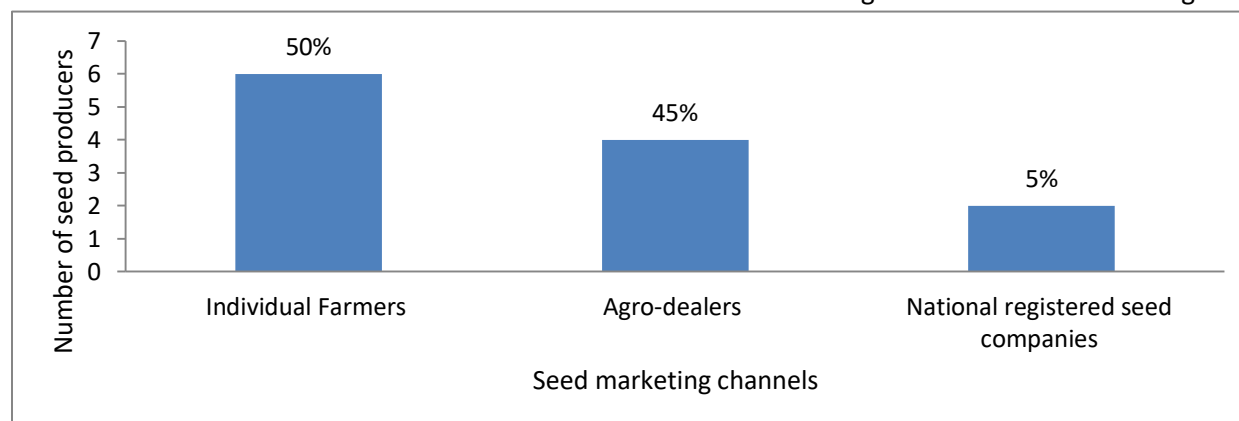


Figure 28: Preferred Common bean seed marketing channels by seed producers

The interviewed experts said that farmers grow seed on contract for seed companies, agro-input dealers and local bean seed business groups. In order to bypass middle men in the common bean chains, schools and farmer's cooperatives contract farmers to grow common beans and buy directly from farmers at the end of the season. This cluster of seed market channel obtains their preferred common bean seed variety and give them to farmers for planting in return to buy common bean grains at the end of the season. Schools are the largest consumers of common bean grains in the region. Farmer's cooperatives (society) organise farmers to produce together and sell producers together.

Farmers were also asked why they prefer seed from this market channels. In the response farmers said seed from seed companies and farmers' cooperatives are always of high quality and seed is always available on time. Schools make agreement to deduct school fees and schools provide a ready market of the beans produced and their prices are higher compared to other channels. Local traders and individual farmers give out loans, ready market of beans produced, advance payments and pay cash but prices are very low. Local bean seed business groups and agro-input dealers give commission when farmers grow their varieties, they are easy accessible and pay promptly. However the yield performance of seed from agro-input dealers channel is very low.

6.2 Building a successful strategic seed quality trust

Common bean seed producers ensure farmers to trust in the quality of seed produced through multiple strategies see figure 29. Most seed producers (92%) carry out household field visits before planting to get feedback of the previous season, field inspection visits (83%) to verify the performance of the seeds planted, farmers training (83%) on the importance of growing improved quality seeds and only 75% of seed producers ensure seed quality trust through verification by seed testing laboratory.

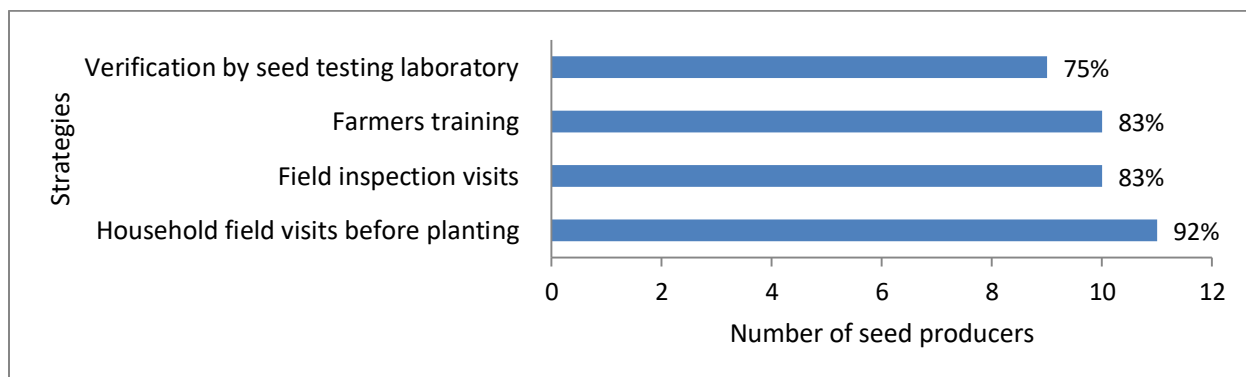


Figure 29: Precautions taken to ensure farmers trust in the quality of seed produced

CHAPTER SEVEN: DISCUSSION

The discussion follows the elements of Farming household characteristics, Features of common bean seed value chain, Constraints in the common bean seed value chain, Critical loss stages, Common bean seed security, Common bean varieties, Quantity and area planted, appropriate marketing channels of common bean seeds and Building a successful strategic seed quality trust.

7.1 Farming household characteristics

This study shows that the participation of men and women in common bean production is dominated by female farmers in the region. Experts from NARO, ISSD and agricultural extension workers said that, common bean is considered to be a female crop because its production requires little resources, is mainly grown for home consumption and surplus for sale.

Also a study in Uganda by Mastenbroek et al, (2016) indicated that in farming households focusing on seed production for income generation, men have a tendency to dominate common beans production whereas women produce grains principally for home consumption.

In a study by Birachi (2012), resource poor small-scale farmers are more expected to grow common beans in Tanzania, particularly in the southern highlands of Kagera, Kigoma and Lushoto regions. However according to Birachi (2012) in Malawi, NGOs are promoting common beans production among the poor farmers who can temporarily access land, that cannot afford the inputs required in tobacco production but can afford some resources to plant beans. Also up to 75% of the farming households around Malawi grow common beans for home consumption while farmers merely sell beans because of financial distress instead of having surpluses and will usually buy back from market for consumption when their financial situation improves. It has been witnessed, in Malawi, farmers selling the better quality of beans and leave inferior quality for home consumption.

The study showed the age of farmers is quite high with only 17% below 36 years old. The aging farming population could threaten the ability to produce needed quantities of bean if left unchecked in the region. Age is one of the essential characteristics of a productive community and is associated with health situation (WHO, 2015). In the tropics and Sub-Saharan Africa, aged people are more prone to diseases and become less productive in agriculture (FAO, 2016).

Loren (2017) said that farmers in the USA above 55 years are less productive compared to farmers under age of 25 years. The productive age group of farmers is generally greatest between 25 to 34, or 35 to 45, but then decreases by increase in age. Younger farmers are not experienced and begin with less investment in farming compared to older farmers. Nevertheless farmers by the age of 25 to 34 would have gained experience and begun to acquire more new technologies while aging farmer may fail to adopt the new technologies in agriculture.

The farming household survey indicates that at least 90.5% of the farmers attained formal education and therefore farmers are in the position to apply the basic concepts and principles of commercial agricultural production and organized farming practices. A study In Tanzania by Birachi (2012) showed

that education level of household heads influences the way of doing farming as business and decision making. New technology adoption decision such as use of improved seeds is positively influenced by the level of education among the household farmers.

7.2 Features of common bean seed value chain

The study began with the identification and mapping of stakeholders to develop a visual depiction of the structure of the value chain. This helps to analyse the processes of seed multiplication, multi-stakeholder discussion and reveal bottlenecks to be solved in following phases of seed production cycle. Kaplinsky et al, (2000) confirmed that value chain maps help to identify information gaps and bottlenecks need to be solved for proper mainstreaming the value chain.

Section 4.1.1 of this study illustrates a diversity of stakeholders who play different roles to bring the end product (seed) on market. A similar study in Nigeria by NASC & SEEDAN (2020) indicated that stakeholders in the seed sector of Nigeria also include a diversity of government bodies, knowledge institutions such as research organizations and universities, regulatory bodies, NGOs, farmer organizations registered seed companies and agro-dealers in the formal seed system. Whereas also in Nigeria individual farmers, disorganized seed producers, community-based seed production groups and various types of seed businesses dominate the informal seed traders and informal seed systems.

Wheelen et al (2008) describe the value chain as a linkage of set of values making activities to begin with supply of raw materials to production, distribution and selling of end product to the final consumer. All this is attained as full and seamless collaboration among stakeholders to create a win-win situation for all. The current study reveals NaCRRI of NARO as the sole suppliers of EGS, seed companies and LSBs perform the role of seed multiplication, agro-input dealers do the distribution and selling of common bean seeds while farmers are the end consumers of seed. USTA, MAAIF and NGOs support the seed value chain and they have registered key successes in the development of the common bean seed value chain in Uganda.

These actors have been also confirmed in the study by ASARECA/KIT (2014). This study states formal seed production system is generally comprised of public agricultural variety development and early generation seed production, certified seed multiplication by both LSBs and private seed companies and marketing of seeds is done by registered agro-dealers and agricultural offices.

A study by ISSD Uganda (2014) confirmed that NARO institutes are the main source of EGS of maize and common beans. Also seed companies and other seed producers obtain crop varieties from international research centres that have to be verified by NaCRRI and approved by the National Variety Release Committee (NVRC) of MAAIF for large scale seed production and commercialisation. Local Seed Businesses (farmer groups) producing QDS usually rely on ZARDI for foundation seed to produce certified and QDS seed. In Tanzania, QDS production is done by registered trained small-scale farmer/groups for selling to neighbouring farmers and therefore every producing group must be registered by the Tanzanian Official Seed Certification Institute (ASARECA/KIT, 2014). However, in this study Ezra stated that, in south western Uganda, QDS producers are not registered and controlled by a

seed regulatory body. QDS producers even don't know their customers. This is likely to cause conflicts in the market place in case of fake seeds.

Thijssen (2019) explains that high quality seed varieties cultivated by research institutes now often remain on the shelf. Also the government in Uganda should start permitting licenses to seed producers to propagate and sell EGS of specific varieties such as maize and beans.

This study showed the potential participation of seed companies in the seed value chain. A study by Edward (2018) confirmed that in 2017, Uganda had registered 34 private seed companies of which 17 produce and market common bean seeds. Ojiewo et al (2018) confirmed the roles of NGOs with the study results that NGOs operate in remote areas and work closely with poor smallholder farmers. To help farmers to access seeds, produce quality improved legume seeds and provide farm inputs, agricultural technologies and markets.

7.2.1 Constraints in the common bean seed value chain

Main actors on EGS production experience main constraints of low funding for variety development and promotion, lack of appropriate information on EGS demand and weak policies for quality control. Research by Ojiewo et al (2018) showed that agricultural research and development in East Africa has main focus on cereal crops and little attention goes to legumes despite of nutritional, ecological and economic values globally. Ezra agricultural extension worker confirmed that cereal crops are referred as food security crops whereas legume crops such as common beans are seen as non-staple food crops. In other words legumes (common bean) are often wrongly grouped, yet are most consumed on every meal in the Uganda and receive little funding from the government of Uganda. This has been caused by the little attention given to common bean seed research and development in the past.

This study showed seed multipliers experience key challenges such as lack of knowledge on seed multiplication, unavailability and poor quality of EGS. This has great implication on the quality of seed produced and planted by farmers which may result in reduced yields and poor performance of the crop. Such challenges have also been seen in the research by Todd et al (2019) where the research says in Sub-Saharan Africa timely availability of EGS remains a challenge in the seed sector. This current study shows contracted farmers produce poor quality seeds due to low adoption of post-harvest technologies. This means appropriate technologies must be adopted to enable seed contracted farmers to produce quality seeds.

Seed producers reported shortage of land to grow seeds on isolated fields. Seed producers also reported that seed production requires several rounds of bulking without sales that is not profitable. Generally common bean seed multiplication rate is very low which requires extra land, skilled labour as well as more than three generations to produce certified or quality declared seeds. This is in confirmation with the study by Mastenbroek et al (2016), to ensure uninterrupted seed production each year four rounds of bulking is needed which makes the seed production business not profitable. The same study showed that 138 kg of EGS on 1.73 ha on first round of bulking led to 2.08MT yield of foundation seed, the 2nd round of bulking plants 2.08MT on 26 ha with end 31.2 MT yields of foundation seeds, the 3rd round of bulking plants 31.2 MT on 380 ha led to 468 MT yields. Therefore 408 ha are needed to produce enough

quantities of foundation seeds and common bean production is very fragile and less attractive to seed companies in Uganda.

Seed marketing and distribution is challenged by low farmer's adoption of improved varieties of beans. Seed companies reported that it could be due to negative publicity by some of the NGOs about the use of improved seeds in the region. Most NGOs mistake improved seeds to be genetically modified seeds. In practice, low agricultural technology adoption is the main cause of low farm productivity, poverty and food insecurity. Improving agricultural production yield through adoption of improved crop varieties is a pathway to increase food security and household income. A study by Faminow (2014) shows that in Sub-Saharan Africa, the adoption of improved varieties remains low due to poor extension agricultural linkages with research. However in this current study area, adoption of improved varieties is currently linked to seed producers failing to meet constant supply of quality seeds demanded by farmers.

This study shows that lack of coherent and effective seed policies to key stakeholders to improve accessibility and availability of quality improved common bean varieties is the main challenge in the seed value chain. A study by issdafrica.org (2020) shows the key problem experienced by seed stakeholders is lack of effective and coherent policy design in Sub-Saharan Africa. However research by Niels et al (2008) shows that a conducive seed policy is the guide to facilitate quality seed accessibility and availability in Egypt. The government role is to initiate components of the seed chain with conducive environments, through legislation in particular, integration and privatization. Government can investment in the seed policy creation of public organizations for scientific plant breeding, public seed production and seed certification regulation framework.

7.2.2 Critical loss stages

In section 4.1.4 seed producers identified the most critical loss stage to occur as the planting and growing stage (74%). This is in contrast with the study of Deepak et al (2017) that showed in African countries the post-harvest stage accounts for the most critical loss stage (80%) in seed production while only 20% in growing stage. Kimani et al (2001) showed similar results to this current research. In that study stated post-harvest losses are associated by bruchids damages due to poor storage facility that forces farmers to sell immediately after harvest, shortage of labour, incomplete harvest, scattering, shattering and breakages of the seed. In reality high crop yields depend on suitable temperature, rainfall and soil fertility. A study by Kameswara (2017) showed that to attain high quality seed production in general, enough moisture is required in early stage of plant development, low rains at flowering, & maturity stage. Seeds harvested during dry period always have high quality.

ISSD (2012) states that abiotic stress resulting from prolonged droughts and water stress reduces seed yield and quality. In rain-fed areas, irrigation can possibly reduce water stress and losses. Andrade et al (2016) argues that breeding varieties for drought survival is a very complex process. Drought can occur at any stage of crop development cycle which results to total loss at growing stage. Thijssen (2019) says African farmers lose 82% at growing stage of the crop due to fake EGS that has poor or no germination capacity making the crop easily affected by the diseases. Therefore special attention should be given in early stages of seed production. CIAT (1989) detailed that in East Africa pests and diseases are the main cause of loss at growing stage and farmers have registered low yields in common bean production. Kilimo Trust (2012) results confirm the cause of losses at marketing stage in this current study.

7.3 Common bean seed security

The common bean seed security is discussed based on the key elements of seed availability, seed accessibility, seed quality, seed varietal suitability and seed resilience

- **Seed availability**

This study shows that seed is available to most farmers at the start and mid-season (76%) and 67% of farmers collected seed within their villages. Seed producers sold 67% of seed above 15 km and all seed producers were not satisfied with the required amount of EGS available at sources. In improving seed security, timely availability of affordable improved seed is critical. Timely planting is a result of timely availability of seeds that makes the crop high yielding and resistant to pest and diseases. A sufficient seed quantity available to farmers with required quality standards improves food security and livelihoods for smallholder farmers.

The results of this study are in contrast with the study by Edward et al (2018) in East Africa and Zimbabwe. Edward's study specified on average availability of basic seed to seed producers for four crops as good 62%. Seed producers were satisfied with basic seed availability for maize 72%, beans 59%, millet 50% and sorghum 55%. This was accelerated by heavy investments in maize breeding and research programs in Africa.

However, findings in West Nile sub-region Uganda by ISSD Uganda (2015) comply with results about the availability of adequate quantity of seeds in this current study. In the West Nile sub-region 65% of farmers planted common beans indicated enough seed availability with similar 75% of the respondents in 2015. However, 85% of the farmers obtained their seed before or at the start of the planting season in Arua. Therefore seed timing and proximity to farming household was not a big problem at the time of planting.

- **Seed accessibility**

Farmers accessed seed from multiple main sources, including own saved seed 62% and local market 19%. ISSD Uganda (2015) stated that in 2014, the local market was considered to be the main source of seed (43% of farmers), but also own saved seed (34%), seed from social network (12%), seed aid (5%), and agro-input dealers (4%). Also in the same study 89% of farmers sourced seed from informal sources which had implications for the quality of seeds. This could be attributed to lack of enough improved varieties on time. These two studies are supported by Birach (2012) who stated that only 10-20% of farmers use improved seeds. Most farmers begun by using improved seeds and end up recycling the seed over many years from farmer saved seeds and seed aid. Daniel (2006) concluded that 71% of maize farmers in north-west Nigeria found farm-saved seeds to be the cheapest and most easily accessible at time of planting. Tripp (2001) discovered that farm-saved seed is given as gift or seed exchange in social networks. In this current study it should be noted that farmers' in south western agro-ecological zone

describe improved varieties as seeds not locally or traditionally known to farmers even if the same seeds are grown or replicated over time and again.

Many farmers (83%) showed interest to change the main sources of seeds for season of August-November 2020. Major reasons to change seed sources were seeds lack resistance to pests and diseases (56% of farmers) and bad performance of seeds (44% of farmers). This poor performance of seeds could be caused by the use of recycled seed from farm-saved seed and accessing seed from local market. This challenge was also reported by CIAT (1989) that says East African farmers are confronted by pests and diseases as the most limiting factors to common bean production. The pests and diseases prevalence varies reliant on the area, crop variety and seasonality. Continued planting of recycled seed by farmers lowers the performance of crop (Amaza et al., 2010). Seeds infected with seed-borne pathogens result into poor germination, crop stunted growth, new diseases, and crop can easily be affected by pests and diseases (Maddox, 1998).

The current study discovered that a large part of the farmers (48%) found seed affordable and fewer farmers (4%) found seed very expensive. Therefore only 7% farmers access seed from local market and 33% of farmers from agro-input dealers. This is in contrast by the ISSD Uganda (2015) research results that show seed prices a major concern (80%) of farmers. In the ISSD research, farmers considered prices by the agro-input dealers as very expensive compared to the prices of uncertified seed varieties acquired from the local market. Lipper et al (2009) clarified that local markets sell grains of low quality and farmers don't consider genetic purity of the seed. However, when traders in Somalia invested in high quality seed, most farmers preferred accessing seeds in local markets (Longley et al., 2001). Sperling (2003) discovered that emergency seeds are accessed from local markets especially when farmers run out of farm-saved seed at planting time and all of the poorest farmers use this source. .

- **Seed quality**

Most farmers (81%) considered seed from all sources as good (no impurities and no damage). This was confirmed by 79% of farmers reporting that the general germination of the common bean seeds from all sources were good. The good quality seeds could have been achieved by the fact almost all seed producers (92%) classify quality seeds as seeds with high germination percentage and uniform variety free from impurities. Also it can be caused by farmers planting quality seed that increases the potential yield of crop per unit area and it has been found out that quality seeds have high ability to efficient inputs utilization. Nicholas et al (2017) suggested that dimensions of seed quality are genetic content and variety purity that determines germination rate, high yields, resistance of pests and diseases. However in absence of such information farmers in sub-Saharan Africa tend to consider physical impurities to know the genetic potential and germination rate before buying or planting the seeds. Bruchid damages are the main cause of seed physical damage in developing countries therefore seed selection and sorting is most important step in producing quality seeds (Christiaan, 2013). Christiaan further concluded that 78 out of 81 sampled seed varieties available to farmers in Nigeria failed to meet the quality standards requirements of certified seed. However this study results are in support with Christiaan's (2013) argument that seed producers considers uniform variety, germination percentage and source of seed as maximum measurement of high quality seed. Similar results of ISSD Uganda

(2015) showed that farmers in West Nile region Uganda found seed physical cleanliness (95%) clean from the agro-input dealers and 85% from own saved seed mean while 90% farmers considered good seed germination from all sources.

Most seed producers (55%) produce different common bean seed varieties on separate farms and 46% are produced on the same field with isolation standard distance of 3-4 meters. At least 100% of the fields are inspected once per season. That makes 83% of seed producers produce certified seed and 17% not certified seeds. Partly this is due to the 8% of seed producers are not aware of seed certification. This is in contrast with Tripp (2003) who argues that unfortunately, some African countries see seed certification as magic bullet. A study by Birachi (2012) found out only 43% of seed producers fields are inspected and certified in Uganda. NSCS provides seed inspection services with only four seed inspectors on 25 seed companies with over 900 seed out growers. However, the performance of seed inspection is excellent in Zimbabwe with an average score of 83% and 90% seed company's fields inspected on time whilst in Kenya 64% of seed company's fields are inspected. In Uganda seed inspection is mandatory with only seven seed inspectors in 2014 therefore seed inspection services are fair with 59% of fields inspected (Naluwairo, 2014). Only formal seed inspectors in Uganda do final germination and purity tests that involves laboratory test but not visiting the field (Edward, 2018).

- **Seed varietal suitability and seed resilience**

In the south western agro-ecological zone, the majority of farmers (72%) are not satisfied with the performance of the seeds available. However agro-inputs dealers and seed producers have limited knowledge on the performance of the seeds sold to farmers in the region. Farmers reported more than 79 seed varieties are grown in the region. This big diversity could be as result of farmer saving seed, and poor seed inspection services available (as discussed in previous sections). This is in contrast the study by ISSD Uganda (2015) that states, in West Nile sub-region farmers are satisfied with the performance of the seed in their region and all common bean varieties coped with the prolonged drought, had short maturity varieties period in the field, were pests and disease tolerant, high yielding, had a good taste, and high market value. This could be because the ISSD study was about the new common bean varieties released by NARO and being promoted by NAADS.

7.4 Common bean varieties

Farmers reported the most grown varieties as NARO bean 3, NARO bean 2, NABE 16 and NABE 19. Seed producers specified NARO bean 2, NARO bean 3 as the most produced varieties, highly demanded and profitable to farmers. However this is in contrast with what agro-input dealers ranked as the top demanded and sold varieties to farmer such as NABE 19, NABE 16 and local variety kabanyardwanda. This could be caused by poor seed inspection and fake seeds on the market as earlier mentioned by farmers. FAO (2017) results shows that NABE, 4, 15 and 17 are the most grown improved bean varieties in communities visited in Uganda.

Research in Uganda by Edward (2018) concluded that in 2017, the most sold popular bean varieties were NABE 15 and NABE 17 which were recent released, NABE 4 was already released in 1999. However

seed companies reported 59% of bean varieties were dropping in production and degenerating which included Nambale, NABE 2 released in 1995, NABE 4, NABE 5, NABE 11, NABE 17, K131 released in 1994, and K132 also released in 1994. Dr Stanley of NaCRRI of NARO (2017) confirmed widespread adoption of new bean varieties NAROBAN 1, NAROBAN 2, NAROBAN 3 NAROBAN 4 and NAROBAN 5 that are excellent source of iron and high yielding despite of drought. This justifies the main purpose for growing common beans in the south western agro-ecological zone Uganda.

Thijssen (2019) explained that in many African countries such as Uganda the seed market is dominated by fake seed mixed grain and repackaged with copies of real certification logos. Edward (2018) reported that fake seed sold by agro-input dealers is a threat to formal seed sector in South Africa. The fake seed sales are encouraged by Uganda government unpredicted seed distribution program (Operation Wealth Creation) with insufficient seed quality procurement checks. This is in confirmation with this current study where 42% of farmers indicated the main reason for change in the seed variety is free seed from NAADS and NGOs. In 2017, seed companies reported 14 cases of fake seeds sold by agro-input dealers and governments efforts to eliminate fake seed on market is rated at 53% by seed companies in Uganda (Edward, 2018).

7.5 Quantity and area planted

Most farmers (93%) in south western agro-ecological Uganda grow common beans on less than two acres with seed rate of less than 30Kg per acre 69% of farmers. In this current study seed usage depends on the availability of land size and amount of seed available at planting time. Munyaka et al (2015) suggested that most smallholder farmers in sub-Saharan Africa are challenged by small land size and unavailability of high quality seed. A market baseline study by USAID (2014) also indicated that bean production in Uganda takes place on small farming ranging from 0.4 to 4 ha. Research by Mafele (1973) showed pressure on land is considerable, land is not increasing and it's fixed. However land allocated to various crops can change if the planted crop is not profitable. Tiftonell et al (2013) concluded that farmers can continue to cultivate and increase land allocated to crops as farming business become more profitable.

7.6 Appropriate marketing channels of common bean seeds

Farmers ranked local traders as the most preferred market channel of common bean seeds, followed by individual farmers, local bean seed business groups, schools, farmers' cooperatives, agro-input dealers and seed companies. However common bean seed producers mostly prefer to market seed direct is to individual farmers (55%), agro-input dealers (45%) and seed companies (5%) while agro-input dealers prefer individual farmers. This demonstrates that all seed producers and farmers produce seeds before identifying buyers. A transaction with trader (brokers) provides reliable information and ready cash. Reliable marketing channels such as seed companies and farmers' cooperative are difficult to find with entry barriers. Other study by FAO (1994) on seed marketing suggested that seed marketing channels can be through government agencies, farmers' cooperative and private sector such as commission agents, Grain merchants, Crop buyers, Retail store dealers and schools.

7.7 Building a successful strategic seed quality trust

Most seed producers (83%) have made farmers' to trust on produced seed quality through training farmers the importance of growing improved quality seeds. FAO (2018) stated that training of farmers can increase trust. In 2003 Bioversity International introduced community seed bank in Nepal. Through training, farmers increased awareness on the importance of planting quality seed. Farmers' increases trust on the usage of quality seeds as the seed were produced within the community. FAO (2018) said that a similar project was introduced in Sheema district Uganda in 2010. Every farmer that acquired seed from the seed bank was trained proper agronomic practices to produce quality seeds which led to increased yields. As a result farmers started to trust in seed produced by community seed bank. In this study experts from ISSD and NARO reported that seed production in Uganda as business is only about making money and little attention have been given to farmer's opinion on the performance of the seed as the only main seed consumers in the country. Ever since the giant seed companies started to gain monopoly control of the seed market in Uganda based on property rights, farmers lost trust on the quality of seed on market. Subsistence farmers have resorted to obtain seed from informal sector within farmers' seed system such as local grain.

7.8 Reflection on the research process

This thesis research employed different methodologies that included desk study, household survey and interviews. A total sample size of 74 respondents were selected to represent the entire study population which consisted of 45 farming households, 12 seed producers, 11 Key informants (experts), 3 Agro-input dealers and 3 local common bean traders. Triangulation was done to test the validity of the collected data. Data was analysed using with Value chain approach, SWOT approaches, SPSS and Microsoft Excel (programme).

Due to COVID-19 pandemic situation and lock down of international borders, the author decided to use 3 enumerators to collect data. For reliability and validity, the enumerators were agricultural extension officers resident in the targeted districts. Prior to the survey, the enumerators were online trained on the accurate understanding of questions in the survey questionnaire and interviews for them to collect perfect replies from respondents in their respective districts. Also validity laws et al (2013) suggested that it's vital to pilot the questionnaires and interviews. Therefore, after enumerators training the questionnaire and interview were piloted in the area of study. Changes were made in the questionnaire to become clearer after completing the first batch of pilot interviews.

During this study I did not encounter many limitations apart from slow internet connection that increased research financial costs to more than what I had budgeted. The smooth process was because of the mini thesis research I participated in. During the mini thesis research titled 'Assessing the sustainability of Arnhem-Nijmegen regional food systems amidst COVID-19 pandemic'. I was fully trained by Marco Verschuur to use the value chain approach and whatever limitation encountered during the min thesis I was guided by Marco on how i should approach such challenges in future. Furthermore Grevenhof Ilse van gave me extra online classes on data analysis and more clarifications on research design and planning was done by the help of Pleun Van Arensbergen. Albertien Kijne my thesis

supervisor gave me extra ordinary guidance on the adjustment and further understanding of the research methodology.

So by the time I started the field work I was very well equipped. However, during field work the random sampled respondents were very far from each other in the remote areas where the network connections are very slow. Also in the farming household survey, three randomly selected respondents didn't answer the questionnaires because they were sick of COVID 19. Furthermore I lost my father in-law which affected me during data analysis.

Also I learnt that I was not alone experiencing slow internet connections during data collection. A similar challenge was reported by Indendent.co.ug showing that Ugandans are facing slow internet as lockdown increases traffic. Other studies by Michigan State University (<https://msutoday.msu.edu>) shows that slow Internet connections or limited access have a negative impact on the academic performance of the students from rural areas. There is high performance of students with high-speed internet compared to students with low internet that causes late submission. According to www.brookings.edu, slow internet speeds have been an issue in American schools. In 2012, most schools and students (70%) lacked internet connections fast enough to support basic administrative and instructional needs overseas.

Basing from the above studies I gained hope and courage to find a way of solving the slow internet connections. Slow internet connection challenges were overcome by using hardcopies of questionnaires during household survey. After the data collection, the enumerators would travel to urban centres to access high speed internet and fill in the online questionnaires. Also key informants were transported to nearby universities where the internet connections were very fast and I interviewed them.

Also my supervisor advised me to make sure that all the research questions are answered even if the three respondents didn't respond to the question. Laws et al (2013) stated that plan to follow up on people who have not been contacted should be done as this will increase response rate or think about anything else you can do to improve the response rate.

During this study, the part I enjoyed most was writing results because all my research questions were easily fully answered. Answering the research questions in my Research Report were directly related to the quality of primary data, secondary data, and the choice of methodology. Therefore, these issues were approached effectively by critically assessing the validity of the sources of secondary data and assessing alternative choices of methodology.

As a result of comprehensive analysis the most reliable sources of secondary data in order to be used in Research Report were found to include published research reports, textbooks and various journals.

The choice of methods for conducting the study, on the other hand, was guided by the reliability of the data analysis methods and their relevance to the research issues. After spending additional amount of time for the choice of appropriate methodology and taking into account advises of my supervisor, analytic tools were chosen to be employed in my Research Report.

To summarise this part, it is fair to state that all of the research questions in my Research Report have been effectively addressed, because the data have been obtained from reliable sources, relevant methodology has been used to conduct the study, and the research findings have been critically discussed.

Finally, I have learnt that well prepared research methodology eases the research processes especially data collection and analysis. In future research I plan to selected more respondents than the targeted sample when using random sampling. In case some respondents do not respond to questionnaires for some reason. I would be having some respondents to answer the questionnaire instead of repeating the whole process.

In conclusion, my thesis helps me to gain experience and confidence concerning the importance of being able to work well in a team and come up with common goal. I have had beneficial conversation with respondents online and group members. This helped me to conducting thesis research with ease. Also I adopted the procedures and experience of conducting online interview in my final thesis. The online filling questionnaire survey and interview were most suitable for data collection amidst COVID-19.

CHAPTER EIGHT: CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS ON FEATURES THAT INFLUENCE COMMON BEAN SEED VALUE CHAIN

8.1.1 Stakeholders and their functions

Conclusions on common bean seed value chain are focusing on the actors and their functions in the chain as follows:

- **Actors:** Actors in the common bean seed value chain comprises of input providers, producers, traders, and seed consumers (farmers). Supporters include government agencies (NARO, MAAIF) and non-governmental organizations (ISSD, AVSI and VEDCO).
- **EGS Bean breeding:** The common bean breeding programme in Uganda dominated by government agencies (NARO) main focus is on developing bean varieties that are disease resistant, good taste, high yielding and early maturity. Since 2015, more than eight bean varieties have been released and NARO is the sole producer of EGS in Uganda.
- **Production of foundation and quality declared seed:**
Common bean seed commercial business is dominated by LSBs and only 7 registered seed companies. In general common bean seed production is unattractive and seed companies have invested less leaving farmers to continue recycling of the seeds.
- **Seed distribution and marketing:**
The seed distributions system is un-regulated with fake, un-certified seeds on the market and inadequate capacity of seed producers to multiply and disseminate seed to enhance farmers' seed uptake. Seed distribution and marketing is done through farmer groups, agro-input dealers and seed companies with support from NGOs.

8.1.2 Constraints and opportunities

In general the common bean seed value chain is poorly coordinated with various challenges. The main constraints in the common bean seed value chain include lack of adequate EGS and foundation seed, low funding of common bean variety development, fake seed on market and low adoption of improved varieties by farmers, lack of appropriate technical knowledge on seed multiplication is the challenge to seed producers. However main opportunities include high demand of quality seed, presence of national and zonal agricultural research institutions to do research on bean variety development and presence of NGOs that fully support LSBs.

8.1.3 Acute loss stages

The most critical losses occur at planting and growing stage this could be due to fake seeds on market, recycled seeds, prolonged droughts and improper agronomic practices.

8.2 CONCLUSIONS ON CURRENT BEAN SEED SECURITY SITUATION

8.2.1 Factors influencing common bean seed security

Factors influencing common bean seed security in south western Uganda are focused on the elements of seed accessibility, seed availability, seed quality, variety suitability and resilience

- **Seed accessibility:** In south western agro-ecological zone Uganda, farmers' access seed from multiple sources with two co-existing seed supply systems (formal and informal seed system). The formal seed supply system (80%) is un-regulated by government dominates the systems and farmers depend on farm-saved seed and seed from local market while the formal seed system contributes to only 20% and seed is accessed through seed aid. Farmers and seed producers are concerned about the prices of the improved seed to be generally expensive and late seed delivery.
- **Seed availability:** Seed from informal is always available at planting time. However improved seeds are available in inadequate quantities from far way markets. Seed producers' shows concerns on unavailability of EGS of some common bean varieties at the time of planting.
- **Seed quality:** Farmers were satisfied with the physical cleanliness of seeds while seed producers were concerned on the germination rate of the EGS. However key informants cited poor quality, fake seed being sold on market and seed producers lack appropriate knowledge to produce quality.
- **Variety suitability and resilience:** Generally 72% are not satisfied with the performance of the seed. Farmers are concerned with low yields, easily affected by pests and disease. Nevertheless key informants classified farmers recycle seeds and concluded that all varieties are suitable for the region bean production with high resilience to prolonged droughts, high yielding.

8.2.2 Most consumed common bean varieties

Out of 79 varieties only 14 common bean varieties were ranked by farmers to be the most cultivated and consumed in the south western agro-ecological zone. These varieties consumed most by farmers are NARO BEAN 3, NARO bean 2, NABE 16 and NABE 19.

8.2.3 Quantity of common seed and acreage planted

Most farmers (93%) in south western agro-ecological Uganda grow common beans on less than two acres with seed rate of less than 30Kg per acre (69%).

8.3 CONCLUSIONS ON APPROPRIATE MARKETING CHANNELS

8.3.1 Available market channels

The available market channels for common bean seeds in the region include local traders, individual farmers, local bean seed business groups, schools, Farmers cooperatives, agro-input dealers and seed companies. These various seed marketing channels in the region are dominated by seed brokers. The seed market system is very weak and LBS are stronger in seed marketing than seed companies.

8.3.2 Strategies to ensure farmers trust seed quality

Most seed producers ensure farmers to trust in the seed quality through household field visits before planting, field inspection visits, training farmers and verification by laboratory seed testing.

8.4 RECOMMENDATIONS

The recommendations emphasizes on requisites increasing timely availability and accessibility of quality seeds, adequate quantities of seed and building strong chain linkages among key actors to improve seed security in the south western agro-ecological zone.

- To increase adequate quality seed availability and access, Government (MAAIF and NARO) should reformulate well-structured seed policies focusing on seed intellectual property rights, establishing seed production enterprises at ZARDIs to increase the availability of high quality EGS and decentralization of EGS through capacity strengthening of public-private partnership. Empower communities on seed production with proper seed inspection and certification. This can solve the shortage of foundation seeds.
- MAAIF can address the poor seed quality through increasing seed inspection services, training and skilling seed producers the basics of seed production management. Stimulating adoption of improved varieties by farmers to reduce usage of farm-saved seed. This can be done through training agricultural extension workers on seed quality to train farmers. Training farmers on seed production can increase the capacity of farmers to grow improved seed.
- NARO needs to develop appropriate methodology for seed demand assessment at different levels of the seed value chain to determine the appropriate quantities of seed required per season at all levels.

Table 4 summarises how the recommendation will lead to sustainable solutions for constraints found in this study.

Table 4: sustainability consequences

	Recommendation	Outcome	Impact
People	<ul style="list-style-type: none">• Training and skilling seed producers the basics of seed production management.	Reduced loses in the chain	Stimulating sustainable common bean seed security in the region through:
	<ul style="list-style-type: none">• Training farmers on seed production can increase the capacity of farmers to grow improved seed.	Adaption of improved seeds	
	<ul style="list-style-type: none">• Training agricultural extension workers on seed quality to train farmers		
Profit	<ul style="list-style-type: none">• Decentralization of EGS through capacity strengthening of public-private partnership.	Reduced monopoly of EGS production.	Increasing adequate quality seed availability and accessibility. Improved seed quality.
	<ul style="list-style-type: none">• Reformulate well-structured seed policies focusing on seed intellectual property rights.	Controlling fake seeds on market	
	<ul style="list-style-type: none">• Establishing seed production enterprises at ZARDIs	Income to facilitate research on development of new varieties.	
	<ul style="list-style-type: none">• Develop appropriate methodology for seed demand assessment	Knowing appropriate quantities of seed required per season at all levels.	
Planet	<ul style="list-style-type: none">• Empower communities on seed production with proper seed inspection and certification	Increasing farmers trust on seed quality	
	<ul style="list-style-type: none">• Stimulating adoption of improved varieties by farmers to reduce usage of farm-saved seed	Seed resilient to climate change, pests and diseases	

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Appendix 1: Research method/tool to address research question

	Research questions	Data collection	Data analyses
Main question 1	What are the features that influence the common bean seed value chain in south western Uganda?		
Sub-Questions	Who are the key stakeholders in the bean seeds value chain?	Key Informative Interviews (KII), Desk study	Value chain analyses approaches (VCA)
	What are the roles and functions of common bean seed stakeholders in facilitating farmers' purchase of quality seeds in the value chain?	Key Informative Interviews (KII), Desk study	Value chain analyses approaches (VCA)
	What are the constraints and opportunities in the common bean seed value chain?	Agro-input dealer's interviews, Seed producer's interviews, Farming Household Survey,	SWOT analyses approaches (SWOT of the value chain), Rapid Chain Appraisal. SWOT analyses approaches (SWOT of the farmers)
	What are the acute loss stages in the common bean value chain, at which stage do loss take place and why they take place?	Seed producer's interviews, Farming Household Survey, Literature review	Rapid Chain Appraisal, Questionnaires content analysis procedures
Main question 2	What is the current bean seed security situation regarding to availability, access, quality, variety suitability and resilience		

	among small-holder farmers?		
Sub-Questions	What are most common bean varieties liked and consumed in south-western Uganda?	Local common bean market survey, Agro-input dealer's interviews, Seed producer's interviews, Farming Household Survey, Key Informative Interviews (KII)	Excel spread sheet, SPSS,
	What is the difference in number of seed varieties obtained from both informal and formal common bean seed subsector?	Farming Household Survey, Key Informative Interviews (KII)	Excel spread sheet, SPSS,
	What are the effective marketing channels and linkages of common bean seeds to small holder farmers?		
Main question 3	What are the available market channels for common bean seeds?	Local common bean market survey, Agro-input dealer's interviews, Seed producer's interviews, Farming	SPSS, Excel spread sheet, Rapid Chain Appraisal

		Household Survey,	
Sub-Questions	What kind of strategies can common bean seed producers and suppliers use to ensure farmers trust in the seed quality?	Seed producer's interviews, Farming Household Survey	Rapid Chain Appraisal, Questionnaires content analysis procedures
	What are the possibilities to bring actors from the worlds of common bean seed development closer together with farmers' access to quality seeds?	Key Informative Interviews (KII), Desk study	Rapid Chain Appraisal, Questionnaires content analysis procedures

Appendix 2: Key Informative Interviews (KII)

Respondent Information

Questionnaire number _____ Date of Interview: _____

Name of respondent. _____

District _____ Sub-county _____ Village _____

Part I: Common bean production /Seed value chain Overview

1. Which are the main common bean varieties grown in this area?
2. Are there any common bean 'value chain' projects and/or any common bean seed projects supporting farmers in this area?
- 2a If yes, who runs the project, where?

Part II: Common bean seed Operation

3. Are there agro-input dealers in the area/ district?
- 3a. Are they registered with the ministry responsible for agro-input dealers?
- 3b. If yes, how many and what common bean seed varieties do they sell?

Part III: Common bean seed multiplication

4. Are there common bean seed-producing groups (Local seed business groups) in this area/district?
- 4a. If yes, how many are they and name them?
5. Are there common bean seed companies in this area/district?
- 5a. If yes, how many are they and name them?
6. Who ensures the quality of the common bean seed produced by seed-producing groups or companies?
7. What are the origins of the most widely multiplied common bean varieties by:
 - (I) Seed production groups in this area?
 - (II) Seed companies in this area?
8. Are there stakeholders that support common bean seed multiplication in this area/ district?
- 8a. If yes, name them and their roles in common bean seed value chain in this area?
9. Are there seed policies in place guiding seed production in this area/ district?

- 9a. If yes, do you have access to any seed policy or any seed reports in this area or district?
- 9b. What would you consider as the strong point and weaknesses of the seed policy?
- 10. Are the agricultural extension services in your area aware of the seed regulations
- 10a. If yes do they make an effort to promote the use of certified common bean seed in this area?
- 11. What are varieties of common bean seed commonly liked by farmers in this area/district?
- 11a. Do farmers have access to adequate quantity of preferred common bean seed at right time?
- 12. Are there concerns around the quality of the common bean seed planted by farmers in this area/ district?
- 12a. what are the concerns?
- 13. Are there some varieties of common bean seeds considered unsuitable by farmers but being promoted in the areas and why? Which varieties are these?

Part IV: Value chain of common bean seeds

- 14. Who are the stakeholders in common bean seed chain in this area/ district?
- 15. What are the challenges encountered by common bean seed chain actors in this area/district?
- 16. What are the major causes of the challenges in the common bean seed value chain?
- 17. Are these challenges in the common bean seed value chain differ according to the gender of the actor? If yes, please explain how.
- 18. How can these challenges in the common bean seed value chain be addressed?
- 19. Do you think there is “fake common bean seed” being sold in this area or country?
- 19a. If so, what measures are being taken, or could be taken, to stop this dangerous practice?

Appendix 3: Farming House hold Survey

Respondent Information

Questionnaire number _____ Date of Interview: _____

Name of respondent. _____

District _____ Sub-county _____ Village _____

1. **Age:** (a) 18-35 years (b) 36-45 years (c) 46-50 years (d) over 50 years
2. **Gender (Sex):** (a) Male (b) Female (C) both male and Female
3. **Education level** (a) No formal education (b) Primary level (c) Secondary level (d) Tertiary

Part I: Common bean production

4. What common bean varieties did you always plant?

- 4a. Of the above common bean varieties, which were the three most important you cultivated last season?

- 4b. Why did you grow the above common bean varieties last season?

5. What Main purpose do you cultivate common beans varieties?
(a) Domestic / food (b) Commercial/ income (b) Domestic and surplus for Commercial

- 5a. If commercial, who decides to sell and on how the money is used?
(a) Men (b) Women (c) Both men and women

6. What area (acre) did you plant common beans during the last season?
(a) < 1 acre (b) 1-2 acres (c) 2-3 acres (d) >3 acres

7. What was the quantity of common bean seed used (kg) last season?
(a) 1-10kgs (b) 11-20kgs (c) 21-30kgs (d) more than 30kgs

8. What was the cropping practice last season?
(a) mixed crop (b) sole crop
9. How do you rate the harvest of common beans last season?
(a) Excellent (b) Good (c) Fair (d) Poor
10. Of the above (mentioned) common bean varieties, which ones will you plant during this upcoming season? (At least three varieties)
-
-
-
- 10a. Why would you choose these varieties last season?
-
-
-
- 10b. Will you change in main common bean varieties next season?
(a) Yes (b) No
- 10c. What are reasons for change in main variety of common beans? *Note farmer can choose more than one.*
- (a) Lack of seed
 - (b) Better access to seeds
 - (c) Free seed
 - (d) Seed price increase
 - (e) Seed prices decrease in
 - (f) Produce price decrease
 - (g) Guaranteed selling price of produce
 - (h) Secure market
 - (i) Others, specify
11. Name of the most maintained common bean varieties as planted previous seasons?
-
-
-
12. What is the area (acre) expected to be planted with common bean next season?
(a) < 1 acre (b) 1-2 acres (c) 2-3 acres (d) >3 acres
13. If there is difference acreage planted last season, why?
-
-
-
14. What quantity of common seed expected to be planted (kg) next season?
(a) 1-10kgs (b) 11-20kgs (c) 21-30kgs (d) more than 30kgs

Seed Sources

15. What was/were your source(s) of common bean seed varieties grown in the lasts season? *Note multiple responses possible*

(a) Own saved seed (b) Local Market (c) Friends/Neighbours (d) Agro-input- Dealer (e) Seed aid

16. Where did you collect the common bean seed from?

(a) In this village (b) Neighbouring villages (c) far away district. (d) outside the country

16a. What common bean variety type obtained from the sources?

(a) Local varieties (b) Improved varieties

17. Was there enough common bean seed from this source last season?

(a) Yes (b) No

18. When was the common bean seed available?

(a) Before the planting season (b) At start of the season (c) Mid-season (d) towards the end of season

19. How did you acquire the common bean seed?

(a) self-saved

(b) Purchase

(c) Exchange

(d) Loan

(e) Others, specify -----

19a. If purchase, where did you purchase it and why there?

19b. How was the price of the common bean seed acquired? (*Ask only those who acquired by purchase, on credit or Exchange only*)

(a) Affordable (b) Expensive (c) very expensive

19c. If it's too expensive, what price would be okay for you in relation to what it is now?

20. Was the common bean seed sourced in good physical condition? *Note: Damage refers to physical, pest infestation or both*

(a) Good (no impurities, no damage)

(b) Fairly clean (some impurities, no damage)

(c) Not clean (Some impurities & damage)

21. How was the germination of the common bean seed?

(a) Good (b) Fair (c) Poor

NEXT SEASON

22. In the **UPCOMING (NEXT) OR THIS SEASON**, where will (have) you source of common bean seed from? *Note: Multiple responses possible*

(a) Own saved seed (b) Local Market (c) Friends/Neighbours (d) Agro-input- Dealer (e) Seed aid

22. Are the common bean varieties to be planted next planting season the same as last season?
 (a) Yes (b) No
- 22a. If No, Main reason for change of common bean variety? *Note: Multiple responses possible*
 (a) Lack of seed from same source
 (b) Lack of resistance to pest and diseases
 (c) Bad performance of seeds
 (d) Increase in seed prices
 (e) Lost seeds during storage
 (f) Others (specify)-----

23. What are main challenges you face in terms of common bean seed quality, availability and accessibility?

Identification of Beans loss points at farm level

24. Anticipate amount of common beans that will be produced (kg).

25. Amount of common beans actually harvested (kg).

26. What are the acute loss stages in the common bean at farmer's level, the key stages at which losses happen? Rank (5 highest rank, 4,3,2,1 lowest)

- (a) Planting and growing stage
 (b) Harvesting and drying stage
 (c) Threshing and winnowing stage
 (d) Storage stage
 (e) Marketing stage

26a. What are courses of the loss and quantify the loss at each stage in common bean production?

Loss stage	Causes of loss	Quantifying the loss	Select causes of loss
Planting and growing stage			<ul style="list-style-type: none"> • Poor seed germination • Prolonged droughts • Harvey rains and hailstones • Pests • Diseases • Not ready to harvest • Incomplete harvest
Harvesting and drying stage			
Threshing and winnowing stage			
Storage stage			

Marketing stage			<ul style="list-style-type: none"> • Scattering • Discolouration • Breakages • Low recovery • Incomplete threshing • Contamination • Rotting • Thieves • Damage by Bruchids and rodents • Lack of markets • Low prices

Marketing beans at household level

27. What varieties of common beans do you grow for market? Rank from the most grown.

28. On average, what amount of entire common bean harvest is sold against what is eaten by the household?

29. Mention common bean varieties preferred by the market/consumers?

30. What are the most common beans selling channels?

31. Which of the above selling channels do you prefer most?

31a. Why do you prefer the above mentioned channel?

32b. What constraints do you face to marketing common beans?

Appendix 4: Seed producer's interviews

Respondent Information

Questionnaire number _____ Date of Interview: _____

Name of respondent. _____

District _____ Sub-county _____ Village _____

1. When was this common bean seed multiplication group/company started?

1a. Is your group/company still active?

(a) Yes (b) No

1b. How many members are in this seed production group/company?

2. Do you get supports for common bean seed multiplication for Government or private institutions / NGOs?

(a) Yes (b) No

2a. Name the institutions

2b. What kinds of support do you receive from supporters?

(a) Seed (b) other agro-inputs (c) Extension services (d) financial (e) others-----

3. What are the major seed crops multiplied by the group/seed company?

(a) Maize seeds (b) common bean seeds (c) Pasture seeds (d) other seeds-----

3a. What are most preferred varieties of common bean seeds by farmers? Rank (5 highest rank, 4,3,2,1 lowest)

3b. Why are these varieties preferred by farmers?

4. What kind of common bean parent's starter seed did you use for common bean seed multiplication?

(a) Early generation (b) Breeder seeds (c) Foundation seeds

4a. Where did you get the common bean 'starter' seed to multiply from?

(a) Research institutions (b) Seed company (c) Farmers (d) Agro-dealers (e) other (specify) -----

5. How common bean seed multiplication is organized and managed?

(a) Individuals with their own field

(b) Individuals producing on a block farm

(c) Group field

(d) Contracted by Seed Company as out grower

(e) Seed company block farm

(f) Others (specify) -----

6. What are the major challenges influencing your seed production group ability to produce quality declared seed? Rank (5 highest rank, 4,3,2,1 lowest)
- () Absence of foundation seed/ early generation seed
- () Non-existence of knowledge on seed production
- () postharvest problems
- () Small land size
- () Availability of seed market
- () Struggle in maintenance of seed quality
- () Lack of group consistency
- () Others specify-----
7. What is the main common bean seed storage facility used by the group/company?
- (a) seed store (b) Granary mixed with other producers (c) Kitchen (d) main house (e) Others-----
8. What is the most storage problem faced by the seed production group/company?
- (a) Pest damage (b) high moisture affecting seed (c) space available (d) others

Identification Loss points

9. Do you experience bean losses at any stage across the common bean seed chain activities?
- (a) Yes (b) No
10. What are the most acute loss stages and what are the causes of the loss in common bean seed chain activities?
11. What are the key stages does the loss happen and why they happen in common bean seed chain activities?

Common bean Seed availability

12. What varieties of common bean seeds are always available?
13. How much is per kg of common bean seeds?

Seed accessibility/marketing

14. Could you please describe how you organize marketing of your seed? How is seed accessed by farmers or how do you market the seed?
-
-

15. What are the most common bean seed selling channels? *(Note multiple responses possible)*
- (a) Individual Farmers (b) national registered seed companies (c) Agro-dealers (d) others-----

15a. Of the above mentioned marketing channels which one do you prefer?

16. How do you sell common bean seeds?

(a) Wholesale (b) Retail (c) Exchange (d) others -----

17. What is the distance from the common bean seed is produced to where you sell your seed?

(a) 1-5km (b) 6-10km (c) 11-15km (d) above 15km

18. Is there fixed price or measure of your seed produced?

(a) Yes (b) No

19. Are you able to sell all the seeds meant to be sold each production season?

(a) Yes (b) No

19a. If No state the reason -----

20. How many Kg of common bean seed sold last season?

21. When is this variety required by farmers?

22. What common bean variety is there the greatest farmer demand?

23. Which common bean variety do you think is the most profitable?

24. What is your price for each of the common bean seed variety?

Seed quality

25. How do you determine seed quality of common bean?

- (a) Seed with uniform variety
- (b) Seed from inert material
- (c) Seed with high germination percentage
- (d) Seed that is disease and pest free
- (e) Others -----

26. What precautions have been adopted by your seed production group/company to ensure the production of quality common bean seed?

- (a) Farmers training -----
- (b) Verification by seed testing laboratory-----
- (c) Household field visits before planting -----
- (d) Field inspection visits-----
- (e) Others, specify-----

27. Do you produce different common bean seed varieties on separate farm?

(a) Yes (b) No

27a. If no what is the isolation distance used?

(a) 0m (b) 1-2m (c) 3-4m (d) above 5m

28. Do common bean seed field inspectors visit your farm?

(a) Yes (b) No

28a If yes how often do they visit your farm during production season?

(a) Once per season (b) twice per season (c) thrice per season (d) Four times per season

29. Which feedback do you get on the quality of your common bean seed from the inspectors and/or customers?

30. Are you aware of any common bean seed certifying agency in the country?

(a) Yes (b) No

30a. What are the common bean seed certifying agencies in the area?

30b. Are the common bean seed you produce certified by a seed certifying agency?

(a) Yes (b) No

30c. If no state the reasons -----

CONSTRAINTS

31. What are the challenges that you are currently experiencing in your common bean seed activities?

Appendix 5: Local common bean market survey

Questionnaire number _____ Date of Interview: _____

Name of respondent. _____

District _____ Sub-county _____ Village _____

Name of the market _____

Part II: Seed Business Seed Supply and Demand Information

1. Do farmers buy some of your common bean grains for planting?

(a) Yes (b) No

1a. For how many years have you been in the common bean grain business?

2. Do you sometimes sell common bean grains as seeds outside this market?

(a) Yes (b) No

2b. If Yes, to which locality(s) and how far is this locality from here? *(Note: Multiple responses possible)*

(a) Within the sub-county (b) within this District (c) Neighbouring Districts (d) Others
(specify).....

3. What common bean variety type do you sell to farmers for planting?

(a) Local varieties (b) Improved varieties

4. Do these common bean varieties grow well in this area?

(a) Yes (b) No

5. Who supplied you with this common bean variety? *(Note: multiple responses possible)*

(a) Individual farmers

(b) Farmers group

(c) Seed growers group

(d) Seed Company

(e) Others (specify) _____

6. What is the current price of these common bean varieties per Kg?

7. What was the price of these common bean varieties at planting time per Kg?

8. What was the price of these common bean varieties one month before planting time per Kg?

9. What quantity of these common bean varieties do you have now in stock?

10. What quantity of common beans do you normally sell during the planting season as seed?

11. Which month(s) do you sell more of these common bean variety as seed?

12. What is physical cleanliness of the current common beans in stock?

(a) Clean (b) Fairly clean (c) Not clean (3) Can't tell as there is no stock

Grain/seed conditioning

13. What are the most important activities you undertake to improve the commercial value of your common bean seed? (*Observation: True, False, can't confirm (Note: the observation is to be made on what is seen on display; multiple responses possible)*)

Observation

- (a) Clean out impurities – dust, debris and stones
- (b) Sort out broken, shriveled and discoloured grains/seed.....
- (c) Packing according to varieties
- (d) Graded according to grain/seed size
- (e) Package according to popular demand
- (f) Others (specify).....

Appendix 6: Agro-input dealer's interviews

Questionnaire number _____ Date of Interview: _____

Agro-inputs dealer's Information

Name of respondent. _____

District _____ Sub-county _____ Village _____

Name of the market _____

1. For how many years have you been dealing agro-input? _____
2. Do you have another agro-input branch elsewhere?
(a) Yes (b) No
- 2a. If Yes, to which location(s) and how far is this location from this branch?

3. Which agro inputs are you dealing in? (*Note: Multiple responses*)

- (a) Crop Seed
- (b) Vegetable Seed
- (c) Pasture seed
- (d) Agro-chemicals
- (e) Fertilizers
- (f) Hand tools
- (g) Animal ploughs
- (h) Sprayers
- (i) Other Equipment
- (j) Animal drugs
- (k) Animal feeds
- (l) Others (specify) _____

- 3a. Do you sell common bean seeds?
(a) Yes (b) No

- 3b. Which are the top most demanded varieties of common bean seed by your customers?

4. Who are your suppliers of common bean seeds you're marketing?
(a) Seed companies (b) individual Farmers (c) Farmers seed producing groups (d) Others specify ----
5. What common bean variety type do you sell to farmers for planting?
(b) Local varieties (b) Improved varieties (c) both local and improved varieties

6. Do these common bean varieties grow well in this area?
(b) Yes (b) No
7. Who is your main common bean seed customer (*Note: Please select only one*)
(a) Individual farmers
(b) Farmer groups
(c) NGOs/UN
(d) Government
(e) Other Agro-Input dealers
(f) Others (specify)
8. Is the seed availability enough for each desired common bean variety
(a) Yes (b) No
- 8a. At what time is the common bean seed available?
(a) Before the rainy season (b) At start of the rainy season (c) Mid Rainy season (d) towards the end of rainy season
9. What is the current price of these common bean seeds per Kg?

- 9a. What was the price of these common bean seed at planting time per Kg?

- 9b. What was the price of these common bean seeds one month before planting time per Kg?

10. What quantity of these common bean seeds do you have now in stock?

11. Which month(s) do you sell more of these common bean seed?

12. How do you handle unexpected over demand of common bean seed?

After sale services and feedback

13. What kind of after sales services do you normally offer your customers in relation to common bean seed?

14. Do you normally get positive and negative feedback from your regular common bean customers?
(a) Yes (b) No
15. What are some of the common feedback you receive from your regular common bean seed customers?

Challenges and Way forwards

16. What are the top challenges in your common seed business?

17. Do you have any suggestions to improve farmers' access – particularly poorer farmers - to common bean seed?

Appendix 7: Research activity plan

Activity	Month 2020					
	April	May	June	July	August	September
Desk study						
Proposal writing						
Data collection						
Data processing						
Data analysis						
Report writing						

Key

 Activity time

Appendix 8: Consent Form

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Date: 9th September 2020

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