2018

Challenges and Coping Strategies in the Soybean Market Chain in Uganda

A Case Study

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N2Africa
Putting nitrogen fixation to work for smallholder farmers in Africa

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Challenges and Coping Strategies in the Soybean Market Chain in Uganda

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September 2018

MSc Internship Report - International Development Studies

Economics of Development // Plant Production Systems

DEC-70424

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Abstract

This report studies linkages in the soybean market chain in Uganda in an attempt to grasp what kind of challenges occur in the market, what the consequences of these challenges are, and what kind of coping strategies were employed to counter the challenges and their consequences. Qualitative data analysis was done on 11 key informant interviews, six focus group discussions, and participant observations. A Market Map, showing linkages in the chain between relevant actors, was created and a theoretical framework of challenges, consequences and strategies was constructed. Results indicate that stakeholders are often simultaneously linked through multiple channels involving different actors. When market exchange is ineffective in one of the linkages the actor is relatively free to switch to another linkage, without any kind of repercussion due to a lack of fixed contracts and commitments. The main challenges faced in the soybean market are categorized into three categories, namely challenges with (1) market linkages, (2) access to resources, the enabling environment and ICT-based technologies, and (3) production. The consequences of these challenges were categorized as (1) inhibited adoption of soybean, associated technologies, or both, (2) low level of productivity, (3) distrust and conflict, and (4) price fluctuations and mismatches in supply and demand. Three well-grounded coping strategies to counter the challenges and consequences were (1) collective planning and marketing, (2) facilitating (multi-stakeholder) market linkages, and (3) ICT-based platforms and other ICT methods. I find qualitative evidence that certain recognized adoption determinants were associated with marketing decisions of farmers and other actors in the soybean market chain in Uganda. I argue that two cases of imperfect markets – a non-competitive market and a market operating at market-clearing prices – were noticeable in the soybean market in Uganda in 2018. Which of the two was relevant depended mainly on the extent of influence that middlemen and processors had in determining market prices for grain and inputs.

Key words - soybean, market chain, coping strategies, Uganda, Africa

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List of Abbreviations

ARD	Agricultural Research and Development
BDS	Business Development Services
GDP	Gross Domestic Product
IITA	International Institute for Tropical Agriculture
LGP	Length of Growing Period
LSB	Local Seed Business
NARO	National Agricultural Research Organisation
PMCA	Participatory Market Chain Approach
SME	Small and Medium-scale Enterprise
SSA	Sub-Saharan Africa
VA	Village Agent

1 Introduction

Agronomic studies show that significant increases in yield can be achieved when cultivating grain legumes in combination with the application of targeted packages of improved agricultural technologies[1] (Franke, van den Brand, & Giller, 2014; Mutuma, Okello, Karanja, & Woomer, 2014; Ronner et al., 2016; N2Africa, 2018). Since 2009, N2Africa, a project funded by the Bill and Melinda Gates Foundation, has disseminated agricultural knowledge- and technology packages to smallholder farmers in Sub-Saharan Africa (SSA) to improve agricultural productivity, raise farmers' incomes, and reduce the pressure of agriculture on the environment (Vanlauwe et al., 2010; Vanlauwe et al., 2014). One aspect of N2Africa's vision of success is the development of sustainable, long-term partnerships and the establishment of new value (market) chains that enable African smallholder farmers to access and apply the promoted agricultural technologies (Baijukya, 2014). Yet studies show that adoption of the promoted agricultural technologies by farmers in the years after project participation is often either low, or adapted to socio-economic circumstances (Ronner, Descheemaeker, Almekinders, Ebanyat, & Giller, 2017; Ronner, 2018), or believed to be too expensive (Hoppenbrouwers, 2018). Market failures resulting from high transaction costs or weak enforcement of contracts may have inhibited the optimal allocation of resources and technologies (Dillon & Barret, 2017). Nevertheless, there is no documented evidence on market failures within the N2Africa project in Uganda. An analysis of linkages in the legume market chain was needed to pinpoint potential market failures and their association with adoption behaviour.

A market chain analysis approach takes into account all actors who make their living from a market chain and all associated public and private service providers (Horton et al., 2010). In an agricultural setting, market chain analysis studies agro-food networks, which may be defined as "the transformation processes from inputs through primary production, processing and marketing to the final consumer" (Gereffi and Korzeniewitz, 1994 in Ruben et al., 2006; Ruben et al., 2006, p.5). In general, an agro-food network consists of three dimensions (Ruben et al., 2006): (a) organizational systems for the coordination amongst agents; (b) knowledge systems for combining information, skills and technologies; and (c) economic mechanisms for product and technology selection and for providing market access. Relevant market chains and agro-food networks exist within an enabling environment, which includes the policies and institutional structures that either facilitate or inhibit the linkages between relevant actors (Hellin & Meijer, 2006).

The established market chain linkages in an agro-food network are subject to forces that may inhibit their functioning, inducing market failures. A 'failing market' means that exchange (a) does not take place, (b) takes place at non-competitive prices, or (c) takes place at market-clearing prices but still results in a socially undesirable outcome. The second and third situation may result in adoption-inhibiting factors, such as mismatches in supply and demand due to uncertainty or high transaction costs (Dillon & Barret, 2017). With the following quote, Dillon & Barret (2017, p.64) give a specific example of how the market for an agricultural input may fail:

> Suppose that the market for the input is hampered by high transaction costs, weak enforcement of contracts, and significant output risk – features common to rural economies in SSA. These forces could induce market

[1] These technology options include combinations of improved legume varieties, mineral fertilizers, rhizobium inoculants, and improved farm management techniques, such as row spacing and weeding.

failure by causing mismatches in supply and demand or underpinning the formation of oligopolies by a small number of active suppliers.

To counter non-competitive elements in the market, Dillon and Barret (2017) argue in favour of policy interventions that target the market failure directly. In particular policies that allow for better contract enforcement or policies that control prices. Conversely, when the market operates at market-clearing prices but results in a socially undesirable outcome, the value of the primary endowments of the farmers must be raised above market prices. In the latter case, Dillon and Barret propose a strategy that focusses on training, education and temporary assistance of farmers and other actors in the market.

Models of diffusion and adoption of agricultural innovations also recognize high transaction costs, weak enforcement of contracts and output risk as constraints to the adoption of agricultural technologies. Wejnert (2002) considers, among other factors, costs of innovations as an important component in diffusion of innovation models. Other adoption determinants that are discussed in the literature may be ordered in the categories (a) farmer- and household characteristics, (b) resource endowments (human-, physical-, social- and financial capital), (c) (transaction) costs of adoption, (d) market structure, (e) technology type, (f) agro-ecological conditions, (g) uncertainty, and (h) risk- and time preferences (Feder & Umali, 1993; Makhura, 2001; Marra et al., 2003; Chirwa, 2005; Tittonell et al., 2005; Simtowe, 2006; Marenya & Barret, 2007; Mwaura, Muwanika, & Okoboi, 2010; DiFalco & Bulte, 2013; Wossen et al., 2015). These determinants may either inhibit or facilitate adoption of agricultural technologies. For instance, well-functioning contracts and agreements may reduce transaction costs because they decrease uncertainty (Makhura, 2001). Conversely, opportunistic behaviour – or *opportunism*, made possible by improperly functioning contracts, may increase transaction costs (Williamson, 1981)

As part of N2Africa, various stakeholders, such as seed producers, agro-dealers, and extension workers, have been trained with the purpose of creating a well-functioning, horizontally structured network that can sustain an independent and continuous improvement of legume production, and reach the majority of farmers in the participating countries (N2Africa, 2018). Various sources recognize such multi-stakeholder partnerships as key to improving innovation and diffusion processes. Hall (2006) argues that strengthening linkages and interaction among actors in an agricultural supply chain will improve the efficiency and effectiveness of Agricultural Research and Development (ARD) projects that are aimed at improving the functioning of rural economies through increased productivity (Hall, 2006 in Fungo et al., 2011). Ruben et al. (2006) recognize the importance of linking 'hardware' actors (production, processing, and logistics) with 'software' actors (organization, management) through "expertise development based on the exchange of experiences with chain and network partners" (p. 11). Devaux et al. (2009) and Horton et al. (2010) argue in favour of the use of collective action – in the form of a participatory market chain approach (PMCA) and stakeholder platforms – to foster innovation in supply chains. Overall, well-functioning market linkages reduce input costs, enable technology transfer, increase specialization and flexibility. Tackling these processes may increase the efficiency and effectiveness of the market, thereby countering failing linkages in the market (Clancy et al., 2014).

The purpose of this report is to understand the challenges that actors experienced in the soybean market chain in Uganda in 2018 and to explore the strategies that they employed (or intended to) to counter these challenges. I used

the concept of 'challenges' to probe for potential market failures. Second, N2Africa is in its final stage and the programme's exit strategy depends on the development of strategic partnerships and national stakeholder platforms of public and private partners (Baijukya, 2014). Hence I assess how multi-stakeholder partnerships and ICT-based platforms can facilitate and coordinate the soybean market chain after the N2Africa programme terminates. I chose a qualitative research strategy to address perspectives of multi-level stakeholders in the market chain and to explore associated processes (Hoshmand, 1989).

I give attention to (1) the actors in the market chain and their linkages, (2) the existing multi-stakeholder partnerships and ICT-based platforms and their role within the market chain, (3) the, by stakeholders perceived, challenges in the market chain, (4) the strategies being employed by the stakeholders to counter these challenges, and (5) the association of the latter points with usage of agricultural technologies for soybean in Uganda.

The Market Map and a Grounded Theory approach are the main methods of analysis in this report. I use the Market Map to present the relevant actors and their linkages within the market chain (Hellin & Meijer, 2006; Zimmermann & Maennling, 2007). I used a Grounded Theory approach to systematically collect and analyse qualitative data (Bernard, 2011). I gathered data through semi-structured interviews, focus group discussions, and participant observation. I analysed the transcriptions of these interviews, the focus group discussions, and my field notes on participant observations and informal conversations with stakeholders.

Results indicate that stakeholders are often simultaneously linked through multiple channels involving different actors. When market exchange is ineffective in one of the linkages the actor is relatively free to switch to another linkage, without any kind of repercussion due to a lack of fixed contracts and commitments. The main challenges in the soybean market were categorized into three categories, namely (1) market linkages, (2) access to resources, the enabling environment and ICT-based technologies, and (3) production constraints. The consequences of these challenges were categorized as (1) inhibited adoption of soybean, associated technologies, or both, (2) low level of productivity, (3) distrust and conflict, and (4) price fluctuations and mismatches in supply and demand. Three well-grounded strategies to counter the challenges and consequences were (1) collective planning and marketing, (2) facilitating (multi-stakeholder) market linkages, and (3) ICT-based platforms and other ICT methods. I find qualitative evidence that certain recognized adoption determinants were associated with marketing decisions of farmers and other actors in the soybean market chain in Uganda. I argue that two cases of imperfect markets – a non-competitive market and a market operating at market-clearing prices – were noticeable in the soybean market in Uganda in 2018. Which of the two was relevant depended mainly on the extent of influence that middlemen and processors had in determining market prices for grain and inputs.

2 Methodology

2.1 Research area.

The main area of focus in this report is northern Uganda. Overall, soybean (*glycine max)* is the second most important legume in Uganda - following common bean (*phaseolus vulgaris)* - and is marketed by most of its producers (FAOSTAT, 2011 in Ronner & Giller, 2013; Tukamuhabwa et al., 2016). Uganda has a population of over 44 million people, 80 percent of which live in rural areas (World Population Review, 2018). Around 25 percent of the country's gross domestic product (GDP) is generated in the agricultural sector. Agricultural productivity (in yield/ha^{-1}), the use of p-fertilizers remains low, and farmers have limited access to extension services (Ronner & Giller, 2013). I present several additional economic- and development indicators in table 1.

I collected data in Uganda's capital Kampala and in three districts in the Northern Moist Farmlands, namely Lira, Oyam, and Apac. The latter three regions are among N2Africa's target areas in Uganda. The Northern Moist Farmlands have two rainy seasons, a Length of Growing Period (LGP) between 255-365 days, and average temperatures between 22-23 degrees Celsius. N2Africa's best-bet grain legume in the target area is soybean (Farrow, 2014). Average farm size in 2013 was one hectare per capita on average. Population density in 2002 was between 116.4 and 121.2 people per km2. Figure 1 illustrates that access to markets in the area was generally good: Lira is an important soybean market hub and most of the target counties had good market access.

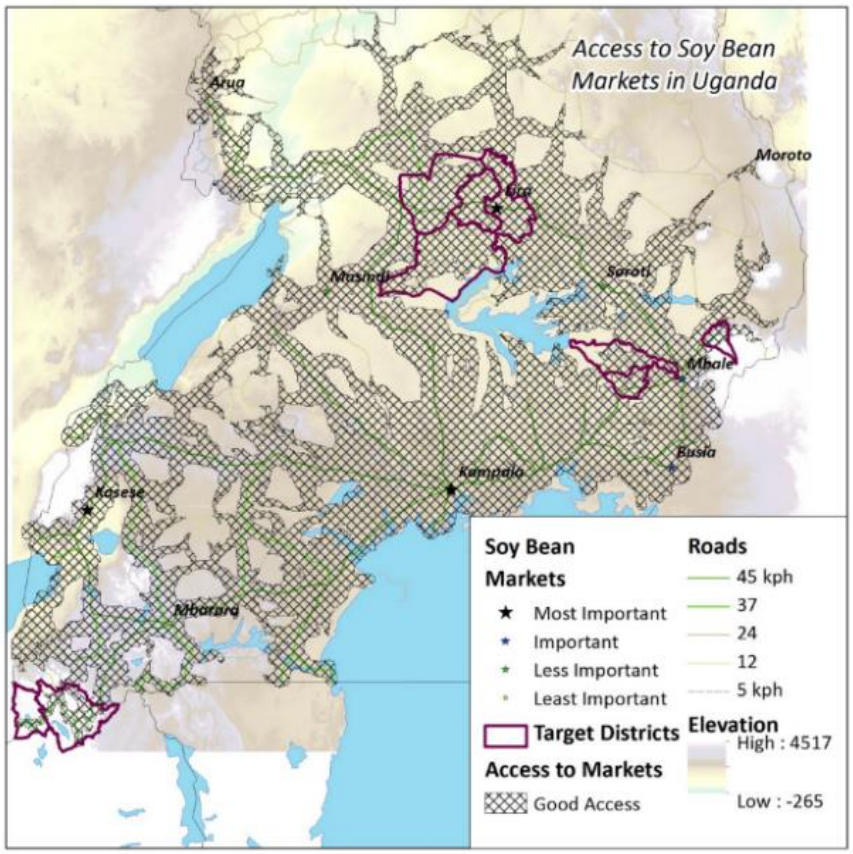

Figure 1 *Access to Soybean Markets in Uganda (Farrow, 2014).*

2.2 Participants and data sources.

Research participants for the 11 semi-structured key informant interviews were actors who partially made their living from the soybean market chain in 2018, who provided associated public or private services in that year, or who did both (Horton et al., 2010). Seven actors were active as public or private service providers. I categorized them as 'knowledge- and organizational actors.' Three actors partially made their living from the soybean market chain and I categorized them as 'economic mechanism actors.' Farmers made up the third category, but they may also be placed within the economic mechanism category. In several cases two categories overlapped. In that case, I chose the category most relevant to the role that the interviewee performed during the interview. For example, one village agent supervisor also traded in grain and agricultural inputs. Because I asked him to come as a village agent supervisor, he is categorized as a knowledge- and organizational actor. I interviewed one individual farmer as key informant. I present an overview of participants in table 2.

Each of the key informant interviews lasted approximately 60 minutes. I used a somewhat different questionnaire per category. Each questionnaire included the same themes, but the line-of-questioning and phrasing was slightly different. In the 'economic mechanism' questionnaire I specifically asked "Where do you buy inputs?" or "How do you transport the goods you buy" in the section about the soybean market chain. On the contrary, I kept the soybean market chain section open-ended in the organizational questionnaire. In the latter questionnaire I asked: "Could you describe and draw the soybean market chain from your perspective?" I included the same themes in each questionnaire to allow for comparison. These themes were (a) main activities actor, (b) general information on the soybean market chain (linkages), (c) communication and contracts, (d) market successes and failures, (e) power and influence, (f) Strengths, Weaknesses, Opportunities, and Threats, and (g) exit strategy N2Africa.

In addition to the semi-structured interviews, I hosted six focus group discussions with farmers. The participants of these discussions were all farmers between 18 and 65 years old who had produced soybean during the first season of 2018 and who had directly or indirectly been a beneficiary of the N2Africa project. I did three focus groups in Apac and three in Oyam. To capture potential gender differences in responses, I divided the focus groups equally into female-, male-, and mixed groups. Each group consisted of 6 to 9 participants. We discussed the same themes as described above, guided by the line-of-questioning from the 'farmer' questionnaire.

I purposively selected all informants through non-probability sampling, because I needed respondents with specific characteristics. Two local field officers helped develop a list of relevant stakeholders. Both officers contacted and mobilized the selected informants. In Lira, Apac, and Oyam one of the officers also served as a translator when needed. I informed each respondent on the purpose of the study and the confidentiality of their responses. A pseudonym is appointed to each participant (see table 2).

Table 1 *Selected development- and economic indicators*

Indicator	Uganda	Source
Population 2018 (thousands)	44.193	World Population Review (2018)
Young population under 14 years (% Population)	48.47	World Population Review (2018)
Gross net income 2016 (US$ per capita, PPP)	630	Worldbank (2018)
Population below poverty line 2012 (%)	19.7	Worldbank (2018)
GDP 2016 (billion US$)	24.079	Worldbank (2018)
Agriculture 2016 (% GDP)	25.782	Worldbank (2018)
Smallholder household income (US$)	2.897	FAO (2018)
Smallholder household income from on-farm activities (%)	59	FAO (2018
Value of crop production (const. 2009 US$)	898	FAO (2018)
Livestock (in TLU; pastoral households only)	3.6	FAO (2018)
% of households using fertilizer	4.4	FAO (2018)
% of households buying agricultural inputs through formal channels	94	FAO (2018)
% of households buying agricultural inputs in the local markets	53	FAO (2018)
% of households selling crops in the local markets	85	FAO (2018)
Stunting prevalence 2016 (% Population)	29	UNICEF Uganda Annual Report (2016)
Children under 5 mortality rate 2016 (per 1000)	64	UNICEF Uganda Annual Report (2016)

Table 2 *Overview of participants, their role, and their pseudonym*

Kind of actor	Role	Pseudonym
organizational- and knowledge	Research	KI 1
organizational; economic mechanism	Business development, produce dealer	KI 2
organizational- and knowledge	Research, extension service	KI 3
organizational- and knowledge	Village agent supervisor	KI 4
organizational; economic mechanism	Micro village agent, input dealer	KI 5
organizational; economic mechanism	Macro village agent, produce dealer	KI 6
organizational- and knowledge	Extension service	KI 7
organizational; economic mechanism	Micro village agent, produce dealer	KI 8
economic mechanism	Produce dealer	KI 9
economic mechanism	Farmer	KI 10
organizational- and knowledge	Research	KI 11
economic mechanism; focus group	Female LSB group	Group 1
economic mechanism; focus group	Male farmer group	Group 2
economic mechanism; focus group	Mixed farmer group	Group 3
economic mechanism; focus group	Male farmer cooperative	Group 4
economic mechanism; focus group	Female farmer cooperative	Group 5
economic mechanism; focus group	Mixed farmer group	Group 6

Data. My primary data consists of 16 hours of recorded interviews and focus group discussions. I personally transcribed these recordings. The total body of data consists of over 115 pages of transcripts and field notes. Due to theft in the field I lost three recordings, one transcript, and two field-notebooks. I managed to save most of the data and I had digitalised most of my field notes. I lost one notebook with personal reflections on my research. Normally, theoretical saturation – when you expect a new interview to reach no new themes - is reached after 10-12 *similar* interviews (Strauss & Corwin, 1990 in Breen, 2006). I recognize that theoretical saturation may therefore not have been reached because of the dissimilarity between some of the actors that were interviewed and the limited amount of data.

I recognize several threats to the validity of my data. First, the data from the interviews and focus groups may have been subject to the response effect. This effect suggests that there are differences in responses of interviewees that are predictable from the characteristics of the interviewer and the respondent (Bernard, 2011, p. 176). For example, agro-

input traders had certain interests and characteristics that possibly biased their answers to favour their own position. I triangulated data from different actors to cross-check whether and how issues are discussed in various cases. Second, when I involved my translator, I considered the possibility that he was on familiar terms with the respondent and therefore skipped certain parts of the translation or biased the answers. When I suspected he was on familiar terms, I asked the respondent to clarify the discussed topic in more detail. Third, groups in focus group discussions may have exerted pressure on participants to conform to socially accepted viewpoints. I did two things to minimize the potential effect of group pressure. First, I separated the groups based on gender. Second, I probed deeper into issues of which I expected the answers to be biased, to deliberately draw out different opinions within the group (Ritchie, 2003).

2.3 Analytical process

I used a Market Map and a Grounded Theory approach to analyse my primary data. I asked ten key informants to draw the soybean market chain from their perspective on a blank piece of paper. I digitalized these drawings with MindMaple and VUE software. These maps provided a perspective about specific sections in the market chain. I used these maps and related transcripts to construct the Market Map that represents all actors and linkages (Hellin & Meijer, 2006).

I used a Grounded Theory approach to (1) identify categories and concepts that emerge from the transcripts, and (2) to link these concepts into a theoretical framework (Bernard, 2011). I began the process with the production of transcripts, which I then read through and coded. Although I used "open" coding to identify categories, I also had a pre-conceived theory I intended to investigate – that market failures existed within the market chain and inhibited adoption of agricultural technologies for soybean. Consequently, my first phase of coding was a combination of inductive and deductive coding. I had an idea about a set of codes for variables but I lacked sufficient knowledge to know whether these codes completely addressed the problem. Hence, the first codes I created were *in vivo* – in the terminology of the respondent. My lack of knowledge on potential challenges was the reason why I have chosen to use a Grounded Theory approach instead of a Content Analysis approach. The latter is generally used to *test* hypotheses quantitatively (Bernard, 2011). The exploratory nature of the open coding process allowed me to underline or refigure preconceived assumptions about my research problem.

After the first phase of coding I began linking different groups of codes to create categories, a process named axial coding (Strauss & Corbin, 1990). I related and linked the categories, which allowed me to conceive new and merged code categories. I repeated this process a number of times until I felt the categories were saturated - that is, when no new categories emerged from the coding process. In the end, I categorized relevant challenges into three primary categories and ten secondary categories. For an overview of the complete codebook that emerged from this coding process, see Appendix 1. Finally, I linked the emerged themes and categories into a theoretical framework (Bernard, 2011), named the Challenges, Consequences, and Strategies Framework.

3 Results

3.1 The Market Map for soybean in Uganda

I present a simplified market chain in figure 2. This chain formed the basis for the more complex Market Map that I present in figure 3. In what follows I briefly discuss the stakeholders that were represented in the market chain in Uganda in 2018 and how they are linked in the Market Map.

Figure 2 *Simplified soybean market chain*

Research. Research actors provided new technologies and agricultural knowledge. The agricultural department of the Makerere University in Kampala was the main player. They were the sole producers of inoculant and foundation seed for soybean. Newly bred varieties from the seed breeding department were multiplied and distributed by the Seed System department as foundation seed. Most interaction was between research and (government) projects that disseminated products and knowledge through agents and extension officers. The International Institute for Tropical Agriculture (IITA) was a research actor, but also formed the link between research and extension. They disseminated new seed varieties and inoculant from Makerere and provided technical assistance. The IITA tested new varieties, provided field demonstrations and set up Local Seed Businesses (LSB's). Another important research actor that was mentioned is the National Agricultural Research Organisation (NARO).

Inputs and extension. Inputs reached farmers through several pathways. First, inputs were disseminated to farmers through projects from the government or from NGO's. The IITA was in partnership with AFSRT, which oversaw N2Africa's project implementation in northern Uganda. AFSRT hosted field demonstrations and linked farmers and LSB's with markets or other actors. Government projects had their own extension staff. Government officers provided the same services as NGO-project staff, depending on the project(s). One particular input-related project was the promotion of LSB's. LSB's are farmer groups that had been certified by the Integrated Seed Sector Development (ISSD) to multiply foundation seed, which was sold to other farmers in local or neighbouring communities.

The second pathway was more market-oriented. Inputs – mainly chemicals, such as p-fertilizers or pesticides - were distributed from large-scale input suppliers to small and medium scale enterprises (SME's). These SME's may have been owned by local input dealers or village agents who traded in inputs. The difference between 'regular' input dealers and agents was that agents often provided associated services to farmers, such as trainings on how to apply the inputs, and they often linked farmers to output markets (see *Marketing)*. Village agents were themselves linked to the umbrella projects or companies (see table 3a and 3b*)*.

Production. Foundation seed was multiplied and distributed by LSB's or private seed companies and was channelled to farmers through the previously mentioned pathways. Individual smallholder farmers were responsible for grain production on relatively small and often infertile tracts of land. Farmers produced multiple crops at the same time, sometimes on the same piece of land (intercropping).

Output marketing. Farmers were linked to output buyers – produce dealers and processors - through three marketing pathways. First, linkages were created through what is called the *Village Agent Model* (see table 1.b). AFSRT, N2Africa's partner in northern Uganda, linked farmers with processors through *Micro* or *Macro* Village Agents (VA's). These agents disseminated project information and supported farmers in bulking and marketing grain. VA's were supervised by project extension workers, called village agent supervisors. Some large-scale processors operated through a similar concept. Mukwano deployed 'site coordinators', which operated in the same way as VA's linked to NGO projects.

Second, farmers often bulked their grain and sold it directly to either county level middlemen, named produce dealers, or processors. Through this channel, farmers bypassed sub-county level middlemen. The third pathway was through these sub-county middlemen, who often came directly to *individual* farmers. These middlemen came directly to prevent farmers from bulking their product. In general, sub-county middlemen only bought grain and did not supply farmers with inputs. I discuss the difference middlemen and VA's in more detail in table 1.a.

Buying and processing. Before grain reached the consumer it was processed in factories in Lira, Kampala, or in other locations. Grain was often also exported to neighbouring countries, such as Kenya and Rwanda, for processing. Based on my text analysis, there were three categories of buyers and processors. I discuss the differences between buyers in table 1.c.

The enabling environment. Besides the stakeholders that were directly involved in the market chain, there were actors that made up the enabling environment. These were (a) government institutions in charge of policies and the facilitation of inspection, such as the Ministry of Agriculture, Animal Industries & Fisheries, (b) investment and tax authorities, such as the Uganda Revenue Authority, (c) local councils, and (d) the central bank of Uganda.

Business related services. Others were actors that provided business related services. Sometimes these actors overlapped with NGO's and government institutions. The main service providers were (a) financial institutions that provided loans and in some cases insurance, (b) business development services (BDS) that helped in the development of business plans, (c) transportation companies that transported grain and inputs, and (d) multi-stakeholder or ICT platforms that linked key stakeholders in the chain and that facilitated discussion and consultation between actors. One ICT platform that was specifically linked to the N2Africa project is AGINSBA. AGINSBA facilitates market linkages between farmers, input sellers, output buyers, and financial institutions. AGINSBA operates through a VA model. Its sister platform, M-Omulimisa - "Mobile-Trainer" – focusses on the facilitation of ICT-based linkages.

The Market Map shows that stakeholders were often linked through multiple channels simultaneously, involving different kinds of actors. When market exchange was ineffective in one of the linkages the actor was relatively free to switch to another linkage without any kind of repercussion due to a lack of fixed contracts and commitments (KI1, KI2, and KI5). If a farmer could not sell his or her crop through 'pathway 1', which involved a cooperative, the farmer was free to sell directly to a middleman. Though often at a lower price per kilogram (KI7). In the following chapter I will discuss the challenges that were associated with the linkages that are illustrated in figure 3.

Table 3 *(a) Difference between middlemen and village agents; (b) the Village Agent Model; (c) difference between buyers*

Middlemen	**Village Agents**
Independent entrepreneurs with their own capital, who often targeted *individual* farmers directly if they operated on *sub-county* level (KI6). They had their own transport and earned profit from buying and selling grain at a different price. Often named 'produce dealers' if they operated on *county-district level*. District-level middlemen operated on a larger scale than sub-county middlemen did and were not directly in contact with individual farmers. To illustrate, produce dealers may have had a storage location in either Apac, Oyam, or Lira town where grain was brought to by sub-county middlemen or cooperatives before it was sold to processors in Lira and other parts of Uganda or to buyers from Kenya or Rwanda.	VA's are "experienced entrepreneurs with an interest in buying and selling of both inputs and outputs" (KI1). May be '*macro'* or '*micro'*, depending on their level of operation. Micro VA's operated on sub-county level; macro VA's operated on county-district level and directed multiple Micro VA's. VA's earned money from commission or from trading inputs or outputs. They facilitated linkages between farmers and (1) input dealers, (2) output buyers, (3) projects, and sometimes (4) financial institutions. VA's also helped farmers aggregate, or bulk, and market their grain. VA's were linked to umbrella companies, such as Mukwano, or organizations, such as the IITA.

The Village Agent Model. A relatively new dissemination model was employed in Uganda in 2018. This model facilitated the dissemination of project information and technologies on the one hand and established and maintained linkages between farmers and input- and output dealers on the other. This facilitation happened through VA's who allowed for a direct link between farmer groups and cooperatives and input- or output markets. Within the model, VA's earned a commission for their dissemination and mobilization services and they earned a small profit if they were involved in trade within the market chain (not all agents were). A major difference between regular input- and output suppliers was that the VA's directly benefitted from a well-functioning soybean market chain on the side of the farmer. The VA's profited from training farmers and building farmers' capacity and they directly reaped the benefits of this training. To illustrate, a VA who also traded in grain benefitted from both higher quality grain as well as from higher productivity. Both higher quality and productivity gave the VA more certainty as a buyer to meet his own contracts. VA's had their own business model embedded within the linkages they facilitated. The Village Agent Model was employed within the N2Africa programme as a response to the limited access of farmers to web-type applications and platforms (KI1 and KI6).

Class A	**Class B**	**Class C**
Large scale buyers and processors. Class A buyers (1) employed middlemen who bought grain directly from farmers at individual level and who set farm-gate prices, (2) bought grain from farmer cooperatives directly, and (3) bought grain from other buyers. Class A buyers often employed their own agents, sometimes named 'site coordinators', based on the Village Agent Model. Were almost never, or only to some extent, involved in BDS for farmers and showed little interest in long-lasting relationships with farmers. Class A buyers sometimes engaged in contract farming, such as arrangements to supply inputs for grain. Overall, Class A buyers had a low level of commitment to farmers and were mostly involved in the final stages of the market chain. e.g. Mukwano, Nile Agro, and Mt. Meru	Small- to medium-scale buyers, or processors, or both. Bought grain through (1) formal contracts or (2) through VA's. They employed macro- and micro VA's to buy outputs, supply inputs and disseminate market information. Involved farmers in the determination of farm-gate prices prior to harvest and attempted to keep prices transparent. Provided (paid or commissioned) BDS services for farmers. Class B buyers had an interest in long-lasting relationships with farmer cooperatives. They may have sold grain to or bought grain or inputs from Class A actors. Overall, Class B buyers had a high level of commitment to farmers through group- and cooperative formation. They were involved in most stages of the market chain. e.g. AgriNet and Oasis	VA (supervisor) who was also an output buyer. Directly disseminated knowledge and BDS to other agents or directly to farmer cooperatives. Class C buyers were the linkage between Class B buyers and farmers, but they also linked farmers to financial institutions, research actors, or both. They often received knowledge and inputs from (1) Class B actors, (2) NGO projects, or (3) the government. Class C buyers sometimes engaged in contractual arrangements with farmers or Class B actors. Overall, Class C buyers had a high level of commitment to farmers because they were closest to them or were part of the farmer community themselves. They were involved in the middle stages of the market chain (production and service provision).

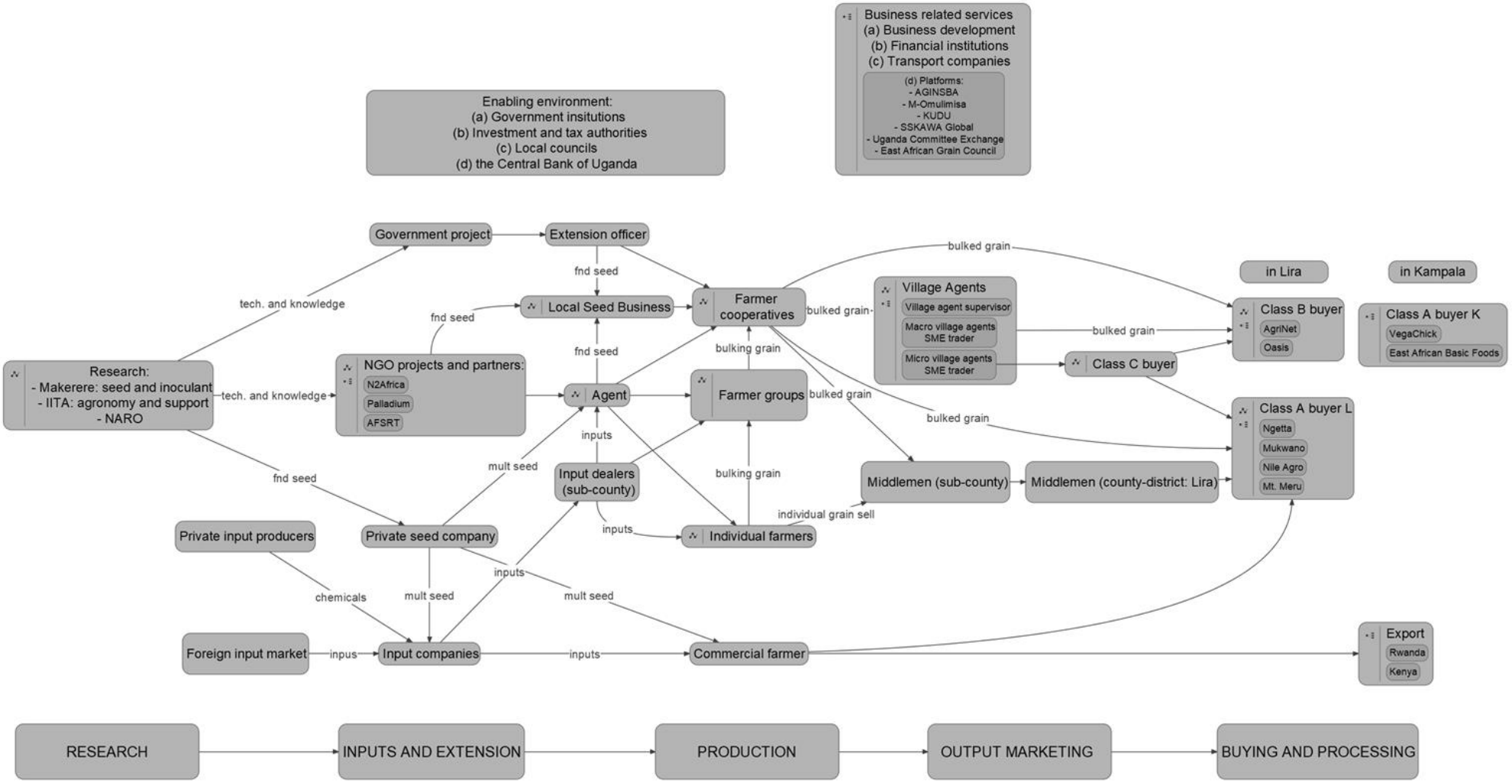

Figure 3 *The Market Map*

3.2 The Challenges, Consequences, and Strategies Framework

I present the Challenges, Consequences and Strategies Framework in figure 4. The structure of the framework is derived from Straus and Corbin (1990) and Morrow and Smith (1995). In this chapter, I discuss all the boxes in the framework.

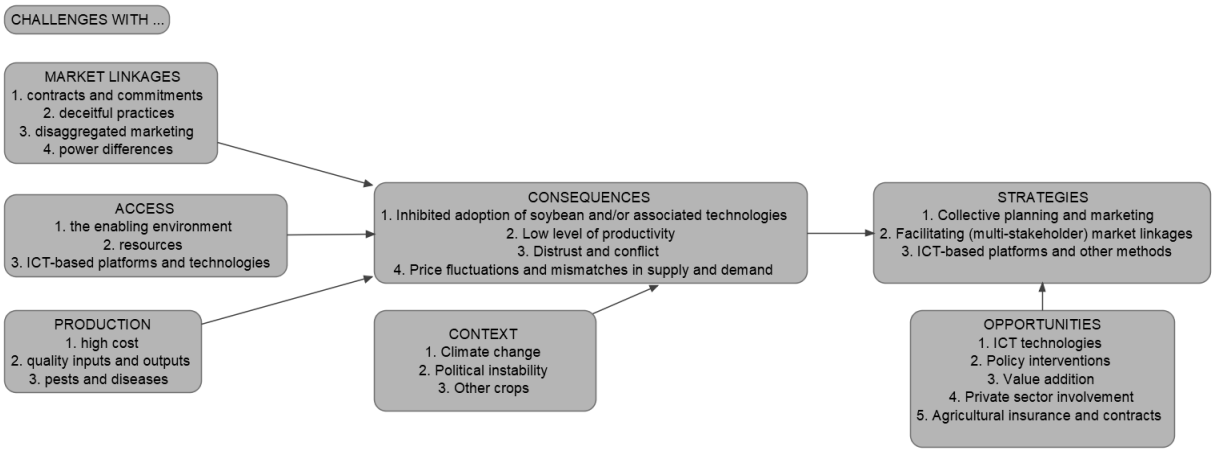

Figure 4 *Challenges, Consequences and Strategies Framework*

Challenges with market linkages

Four challenges related to existing market linkages emerged from the Grounded Theory approach. These are challenges with (1) contracts and commitments, (2) deceitful practices, (3) disaggregated marketing, and (4) power differences. First, six out of 11 informants and four out of six groups mentioned challenges with contracts and commitments as problematic within the soybean market. The enforcement of formal contracts and associated commitments became challenging at the level of the farmer. KI2 stated that "it is difficult to enforce them [contracts]" at this level. Farmers often sold crop on the side, which was an "immediate problem" according to three informants (KI1, KI2, and KI5). Other actors in the chain would also fail to meet their contracts. At the same time, contracts made by processors and buyers over prices were often neglected when buying started. KI7 explained that, when the time came, processors bought "at a lower price." Other delays, such as late payment for grain were mentioned in three groups (3, 4 and 6) as a problem related to contracts and commitments. Interestingly, none of the farmer groups mentioned side-selling as a challenge.

The second category in market linkage-related challenges was the employment of deceitful practices. Deceitful practices may be understood as actions taken by actors to purposively mislead other actors for their own benefit. Eight of the 11 informants and all the focus groups mentioned challenges with deceitful practices as problematic. I classified deceitful practices into four categories: (a) deliberate exploitation of desperation, (b) paid inspection ('bribery'), (c) sale of counterfeit product, and (d) withholding of (market) information. Deliberate exploitation of desperation implied that middlemen intentionally dropped prices when they were aware of the financial situation of farmers. That is, when "the farmer needs money to harvest or buy services" (KI 5). In group 4 it was said that middlemen "are deceitful" and "spread rumours about prices on the market and lower prices intentionally." According to group 2, farmers accepted

these prices because of "desperation"; because they were "in need of money." Businessmen, in this case middlemen, took these opportunities. The following quote by KI11 suggested this opportunistic behaviour was exploitation:

> Actually, a businessman would be taking the opportunity, call it *exploitation*. If he realises that the farmer is in a crisis, he exploits him or her.

Second, paid inspection, or 'bribery' was mentioned as an issue that occurred at the level of seed production. LSB's had to pay a government inspector twice to inspect their field to get the proper certification. Certification was obligated by the government to ensure that good quality seed was produced. For LSB's the payment for certification – 60.000 Ugandan shillings per inspection - raised costs and was considered a challenge (group 1). For other, private seed companies the payment of "bribes" was a way to bypass the certification process, according to KI3 and KI4. As a result, bad seed varieties ended up on the market.

Bad seed varieties on the market directly relates to the sale of counterfeit products. I understand counterfeit products as *all* products in the soybean market chain, from agro-chemicals to grain. There were three main cases of counterfeit products on the market: agro-chemicals were fake and ineffective (KI4), grain was sold as seed (KI4, KI7, KI8, group 2, and group 4), or sand was sold as grain by farmers (KI4).

Last, some actors were known to intentionally withhold (market) information. The use of faulty weighing scales by middlemen created distrust, according to KI4 and group 4 and 6. In group 4 it was mentioned that "they [middlemen] have two weighing scales: one they use to buy from farmers and the other to sell." "Price communication varies a lot," said KI6. VA's were in some cases also withholding information, communicating different prices to farmers than to buyers (KI5 and KI6).

Disaggregated marketing (in vivo) is the third category in market linkage-related challenges. I define disaggregated marketing as a form of marketing where actors operate independently and out of sync with others. Six of the 11 informants and two out of the six groups mentioned disaggregated marketing as a challenge. It was said that farmers often produced and sold grain individually or that they demanded inputs on an "as it happens" basis (KI3). KI5 said this happened because "farmers are always confused," because "the market is not stable" and "the price is not stable." Farmers therefore produced "on speculation" (KI7) and seed producers were dependent on fluctuations that happened at grassroots-level. Conversely, KI3 mentioned that processors were also part of the problem. They were "not forthcoming in what they want" and were "waiting, because they don't want price commitments." Disaggregated marketing relates directly to the first category (contracts and commitments) and, as I will discuss later, may have resulted in price fluctuations and mismatches in supply and demand.

The final category of challenges with market linkages concerns power differences between actors in the soybean market chain. Five out of 11 informants and four out of six groups mentioned power differences as an issue. One specific term used by informants to denote differences in power was "monopoly." The Makerere Seed System and Inoculant department were named monopolies because they had the only mandate in Uganda to produce inoculant and soybean seed (KI3 and KI11). Whether they truly were a monopoly or not, they had a big influence on the kind and quality of inputs that flowed into the soybean market in Uganda. Other power differences were noticeable at the level

of the buyers. Group 2 said that middlemen were in a position to "decide the price themselves." KI10 said that middlemen "own the market". Group 4 argued that middlemen "dictate the price" and that farmers had no power to counter this, unless they bulked their grain.

Challenges with access

I present three categories of access-related challenges in figure 5. These are challenges with access to (1) the enabling environment, (2) resources, and (3) ICT-based platforms and technologies. First, issues with access to the enabling environment were mentioned by seven informants and in one group. Lack of regulations, such as government control on seed quality, was argued as one challenge. KI3 said "it is not our work to see that these guys produce good seed, it is supposed to be done by the ministry." Second, taxes on grain and inputs were argued to be high and problematic (KI5, KI6, group 4). Other factors, such as a lack of extension workers in the field and bad roads were mentioned, but not well-grounded in the data.

Second, access to a broad range of resources were mentioned by nearly all informants and groups as challenging for the soybean market chain (16 out of 17). I categorized these resources as (a) agricultural technologies, (b) agronomic knowledge, (c) finance, (d) human capital, (e) land, (f) information, (g) storage facilities, and (h) transport. More than a hundred separate quotations could be given to substantiate resource endowment-related challenges. These quotations suggest that one or multiple of the mentioned resources were lacking on various levels in the market chain.

Third, I gave specific attention to challenges with ICT-based platforms and technologies during the interviews and focus group discussions. Mentioned issues were about (a) awareness, (b) cost of ICT platforms, (c) know-how (by farmers), (c) access to mobile phones (for farmers), (d) language of ICT platforms, (e) human capital needed to receive and act on data from an ICT platform, and (f) the stability of the network. Of these, know-how was mentioned most often. KI1 and KI4 said that texting was a challenge for farmers, but at the same time a requirement for individual access to current ICT-based platforms. Even if farmers had a phone, KI6 said, they "may not use the phone effectively." Overall, there was an ICT-related knowledge gap on farmer level (KI2, KI6, and KI7).

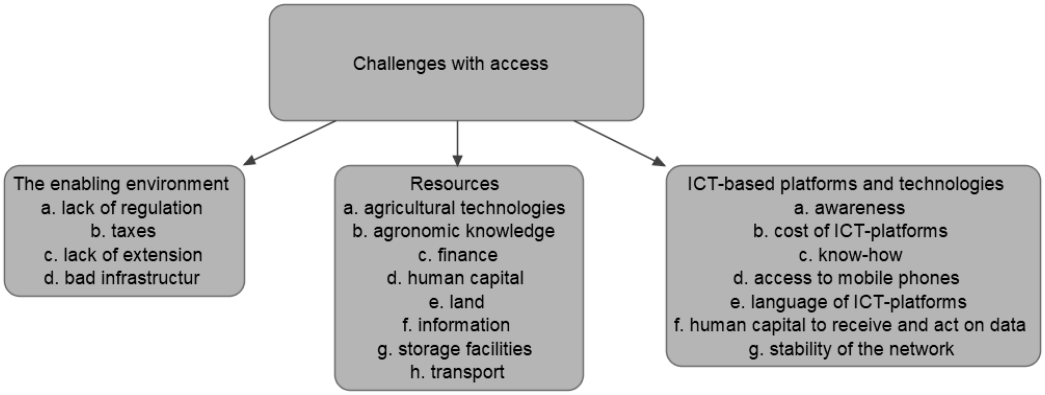

Figure 5 *Challenges with access*

Challenges with production

Three production-related constraints were mentioned by all respondents as challenges in the soybean market. These were (1) high cost of production, (2) quality of inputs and outputs, and (3) pests and diseases. High cost of production, mentioned by eight of the eleven informants and in all groups, resulted from the following sources: high tax on revenue (KI2, KI5, KI6, group 4, and group 5), high interest rates on loans (ranging from 10 to 36 percent per annum) (KI2, KI5, KI6, KI8, KI10, group 2 and group 4), high cost of transport (KI6 and group 1), and high prices of agricultural inputs (KI10, group 2, group 3, group 6). The previously mentioned deceitful practices were other factors that increased costs. For example, the use of faulty weighing scales lowered the profit on the side of the farmer, because they received less revenue for the kilograms of grain sold (KI4).

Six informants and five groups discussed issues with the quality of inputs and outputs. I mentioned the sale of counterfeit inputs and outputs under deceitful practices. Counterfeit product sales were likely a direct cause of low quality inputs and outputs on the market. The germination of seed during rainfall was mentioned as another quality-related problem (group 1, group 2, group 4, group 5, and group 6). KI3 argued that, "in the process of multiplying [seed] a lot goes wrong." The quality of grain for sale was also mentioned as a challenge. Grain quality deteriorated quickly during the rainy season and threshing, drying and storing grain after harvest was often not done properly (KI4, KI5, group 2, and group 5). Bad quality of grain resulted in lowered prices received by farmers or missed markets to supply to, explained buyer KI2: "Farmers are not yet were we want them to be, in terms of what we need."

Pests and diseases were mentioned by five informants and three groups as challenging in the soybean market. Only soybean rust and weevils were named, but otherwise pests and diseases were argued to be factors that affected farmers' crop during the season or during periods of storage. In the case of a nation-wide outbreak, informants expressed the need for a government intervention (KI2) and improved access to tolerant varieties (KI3 and group 1).

Context

Three contextual, or exogenous, factors were mentioned in addition to the challenges in the soybean market chain. These were (1) climate change, (2) political instability, and (3) other crops. These factors were seen by actors as threats in the market that were beyond their control. Five informants and four groups mentioned climate change as an exogenous threat to the soybean market. Seasonal planning was influenced by the climate (KI5, KI7, and KI8), because inconsistent rainfall patterns made it hard for a farmer to plan when he or she could begin planting seed. Other actors mentioned recurring droughts as a factor that negatively affected farmers' soil and crop (KI8, group 1, group 4, and group 5).

Political instability in neighbouring Kenya was mentioned as another threat to the market. Many buyers did not come to Uganda in 2017 because of elections that year in Kenya. Arguably, this allowed local processors to lower the price: there was a certain supply but a lower demand for soybean (group 2 and group 4). Other crops, such as sorghum (*sorghum bicolor)* and shea (*vitellaria paradoxa*), were mentioned as the third exogenous threat to the soybean market. Farmers often switch crops if others provide them with better (financial) prospects (KI8 and group 4).

Consequences

Four consequences emerged from the challenges and associated context. These were (1) the inhibited adoption of soybean, associated technologies, or both, (2) low levels of productivity, (3) distrust and conflict, and (4) price fluctuations and mismatches in supply and demand. Widespread adoption of improved agricultural technologies for soybean is one of the cornerstones of the N2Africa programme, but usage of these technologies often remains low (Ronner, 2018; Hoppenbrouwers, 2018). Strained adoption of soybean and associated technologies was mentioned by five informants as a consequence of the challenges in the soybean market. "Adoption is not uniform," said KI3, even though many trainings and demonstrations were given. KI8 claimed that "adoption is a challenge." In another case, non-uniform adoption was argued to be because of a disaggregated market (KI11). In table 4, I present data on usage of three agricultural technologies during the first season of 2018 by the focus group participants. 7 out of 49 participants used chemical fertilizer on soybean in the previous season. 8 out of 49 used inoculant. Usage of pesticides was slightly higher: 21 out of 49 farmers used it. Note that this sample is not representative for the soybean market in Uganda and should be interpreted with caution.

Second, "low use [adoption] of yield enhancers" was associated with the level of productivity, according to KI4. Even though there was demand for soybean, "the only problem is the level of production," said a respondent in group 2. Access to resources, such as human capital in the form of agronomic knowledge (KI3), or access to quality seed (KI7) were factors that were also associated with farmers' productivity. Note that low levels of productivity may have been caused by innumerable factors, which I am unable to determine with my text analysis alone. The quotes do show that actors in the chain linked levels of productivity directly to access to and use of inputs and resources.

Eight informants and five groups mentioned distrust between actors in the soybean market chain as a consequence of at least one of the mentioned challenged. The farmer, for one, had "a lot of trust issues," according to KI3. Seed did not germinate (KI4) or the farmer was deceived by middlemen who used faulty weighing scales (group 6) or who did "not tell the truth" (KI10). Contrarily, buyers did not always trust farmers, because some had "put sand in their bag to get more kilograms," said KI4, which spoiled the (international) market for soybean. The acceptance of bribes on the side of government officials who are in charge of certification was another source for distrust, said KI4. KI4 went as far to say that there was "distrust at every linkage" in the market chain.

Last, nine informants and five groups mentioned price fluctuations and mismatches in supply and demand as a consequence of an unsteady, disaggregated market where middlemen and processors determined prices (KI1, KI3, KI5, KI7, KI8, KI11 group 2, group 4, and group 6). The market was disaggregated, said KI3, because "everyone is a player and the highest bidder takes it all. […] Today soybean [grain] is at 1500 (UGx per kilogram), tomorrow it has dropped to 1400, the next day it rises to 1600." The same was said about inputs such as pesticide and seed (KI4 and KI8). If prices had risen too much, buyers could not purchase enough grain to meet their own contracts or production targets. Price fluctuations trickled down to multiple levels in the chain (KI2 and group 5) and arguably resulted in mismatches in supply and demand (KI1).

Table 4 *Dichotomous usage choices of three technology options by participants of the focus group discussions*

Technology	**Apac**		**Oyam**		**Total**	
	%	N	%	N	%	N
Mineral fertilizer (type unspecified)	8	25	21	24	14	49
Inoculant	0	25	33	24	16	49
Pesticides and herbicides (type unspecified)	60	25	25	24	43	49

Opportunities to cope with the consequences of challenges in the market

In general, nine informants and five groups recognized that soybean offered a good market in the near future. Five other opportunities were mentioned as factors that influenced (future) coping strategies. These opportunities were (1) ICT technologies, (2) (price) policy interventions, (3), value addition, (4) private sector involvement, and (5) agricultural insurance and contracts. ICT technologies were recognized as an opportunity because they can (a) improve and accelerate communication between actors, (b) allow for efficient gathering of farm-level data, (c) permit farmers and other actors to access up-to-date market-, weather-, and agronomic information, (d) help to address various issues, and (e) make communication cheaper (KI2, KI3, KI4, KI5, KI6, KI7, KI8, KI10, KI11, and group 4).

Second, several actors mentioned the need for price policy interventions that may counter price fluctuations by setting a harmonized grain price, secured by a government-fund (KI3, KI11, group 4). Third, value addition may allow farmers to access a broader market, where profits are potentially higher. “The one who is taking the biggest value [in the market] is someone who is adding value,” said a participant in group 4. While it may be that adding value may increase profits, it would require additional training of the farmer, said KI11. Fourth, private sector involvement could allow for a bigger supply of seed and inoculant. In 2018, the seed and inoculant supply could often not meet demand (KI3 and KI11).

Several informants stressed the need for insurance and contracts (KI7, KI8, and group 4). Agricultural insurance and contracts may reduce uncertainty and increase commitment. Insurance can serve as a safety net for farmers, should pests and diseases or droughts destroy their crop. AGINSBA tried to introduce insurance through their platform, but only a small amount of farmers had access to it in 2018. Contracts, if formalized and binding, are a way to counter trust issues and price fluctuations. Contract farming, when inputs are supplied in return for grain, was mentioned as a potential opportunity if combined with bulk-marketing (KI8).

Coping strategies

To counter the challenges and consequences in the market chain, informants mentioned several strategies that were employed or that were being booted in 2018. These strategies were (1) collective planning and marketing, (2) facilitating (multi-stakeholder) market linkages, and (3) ICT-based platforms and other methods. I illustrate these strategies in figure 6.

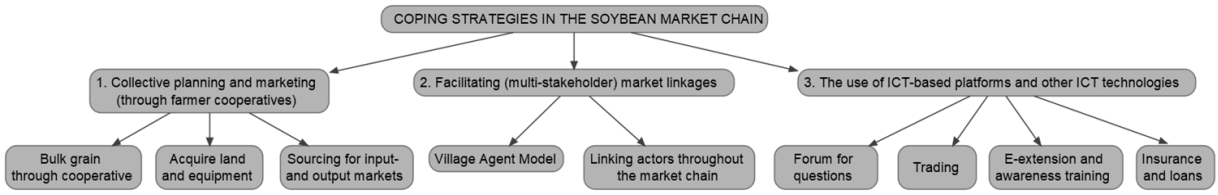

Figure 6 *Coping strategies in the soybean market chain*

Collective planning and marketing. The first coping strategy was a collective planning and marketing model. According to the informants, this strategy was a mainly reaction to several challenges, namely price fluctuations, exploitation by middlemen, disaggregated marketing, power differences, and lack of access to resources. The formation of farmer cooperatives was key in this model, because such cooperatives were not yet well-established (KI1). Farmer cooperatives helped farmers (a) bulk produce and market it collectively, (b) acquire land and equipment, and (c) source for input- and output markets (KI4, KI8, KI5 group 4). This form of "harmonized- or bulk marketing" resulted in higher bargaining power for farmers (KI4, KI5, KI7, and group 4). KI7 suggested that, "if they [farmers] bulk tonnes, they can talk to [buyers] and bargain for better prices" (KI7). A participant in group 4 added that, "as farmers are brought together, we negotiate for [a] good market" (group 4). Collective marketing also allowed farmers to attract international markets (KI4). The model is community-based (KI6): it worked in a local setting, as opposed to strategies devised and implemented top-down (KI5). "Being closer to the farmers; being in touch and to communicate with the farmers," said KI7, "this facilitates a lot of adoption" (KI7). Financial security in the form of a cooperative fund was another (potential) strength of the model, though this fund was still in its infancy. A fund may be used to counter middlemen who threaten to come to farmers directly and offer them a price lower than the market price (group 4). A quote by KI11 explained how collective marketing with a buffer fund may work in practice. I illustrate the reasoning behind this quote in figure 7.

> […] you keep [stay] within the group and solve the problem there. They need a buffer fund, so that they do not need to sell when a farmer has an emergency. For example, a farmer has a sick child and the buyer comes and knows the farmer is in a crisis. Instead of buying at 1200 he buys it [at] 800 and the farmer has no choice. So, when the buyer says, 'I already bought at 800', the price now starts to fall. Do you see how that can becomes a problem? Maybe if they had a group the farmer could run to the buffer fund, saying, 'give me 1000, I have about a 100kg of soybean at home.'

Group 4 said they are able to set up this fund themselves, in due time. Conversely, KI11 said that a buffer fund can only be established with the support of the government.

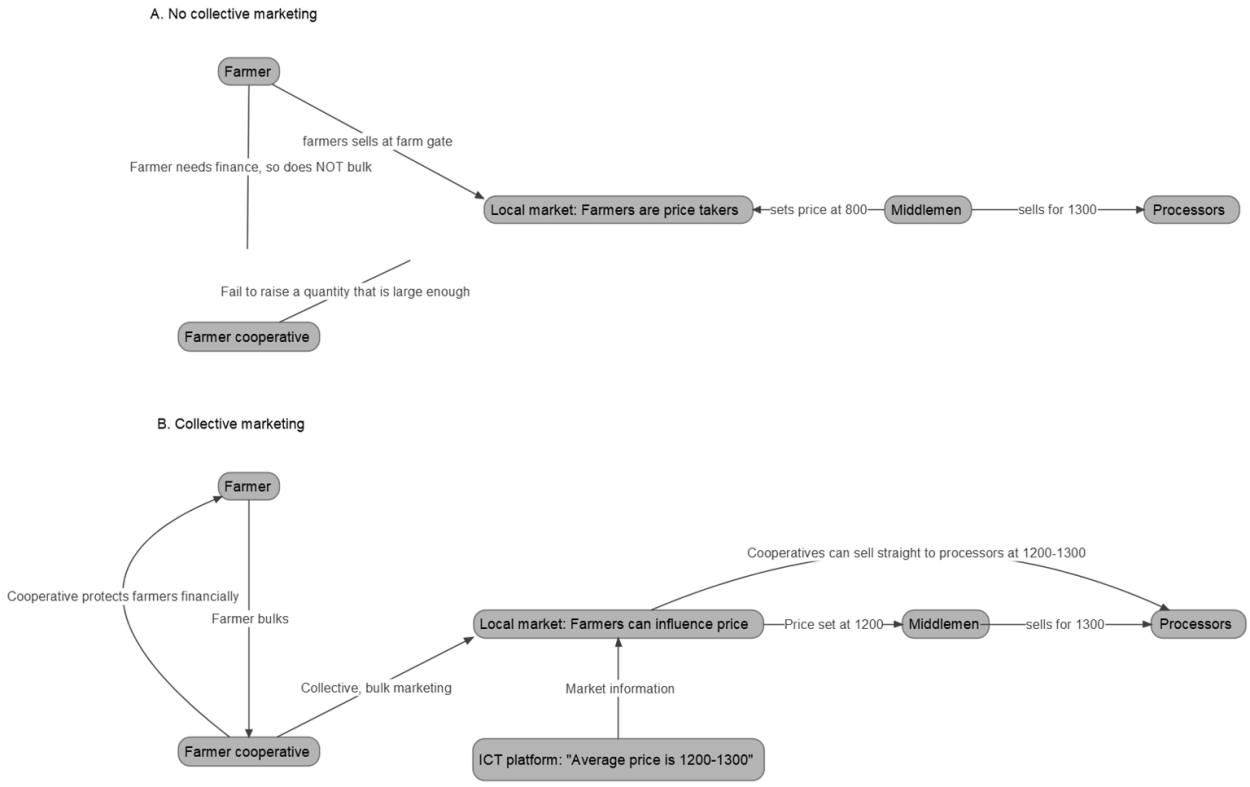

Figure 7 *Non-collective vs. collective marketing illustrated*

Facilitating (multi-stakeholder) market linkages. The collective planning and marketing model discussed in the previous section depended on a well-functioning Village Agent Model. Through VA's farmer groups were brought together and farmer cooperatives were formed. VA's were also key in the facilitation of market linkages between various stakeholders in the soybean market chain (KI8). VA's profiled input dealers and output buyers to link them to farmers (KI4). Other linkages were established between farmers and financial institutions or between VA's and financial institutions. VA's were often also trained as input dealers themselves (KI4). The importance of the VA's was clear, said KI8, because they were "close to farmers and have knowledge to link them to different companies. To link farmers to governments. Linking farmers and networking." The facilitation of these linkages "smoothens the process" (KI3).

ICT-based platforms and other methods. The last two quotes in the previous paragraph were not solely directed towards the facilitation of market linkages through VA's. They also discussed the coping strategy that employed ICT-platforms and other ICT technologies. AGINSBA, sister platform M-Omulimisa, and AgriNet's 'KUDU' are platforms that were in the making or that were already being used or tested in the field in 2018. AGINSBA focusses on the facilitation of linkages between farmers and various actors, ranging from experts to input dealers. Farmers may ask questions on the platform and receive a response by any other person on it. Actors may also trade inputs or outputs on the platform. M-Omulimisa facilitates and provides e-extension services, agriculture insurance, agricultural loans and input distribution. KUDU is a trading platform. Again, these platforms depended (and still do) on VA's to

empower farmers on the ground and to educate community-based trainers on how to use smartphones for collecting market information and disseminating project or platform information (KI7).

The main challenge related to ICT-based platforms, discussed in the section 'challenges withaccess,' was farmers' access to them. KI8 went as far by saying that, "in my personal experience, those platforms don't work" (KI3). But strategies were being devised to counter access-related issues. First, there will be an increase "awareness training and training on ICT" (KI8). Second, communication is to go through either one or more educated farmer group members or through VA's. These actors can pass information down to individual farmers (KI2, KI7, KI11 and group 4) or upload farmers' questions on the platform and connect them to various actors, such as experts, who can answer these questions (personal communication, AGINSBA, 27th of June, 2018). Third, user-friendly platforms that include various local languages and that use standardized codes are to be created. Language and standardized codes were argued to be a requirement for relevant platforms to work (personal communication, AGINSBA, 27th of June, 2018; KI11). Bigger organizations and companies would also need to hire additional staff that is always ready to receive and respond to information received and disseminated through the platform (KI11).

Besides facilitating active links to web-based platforms, ICT technologies were already widely employed to do surveys and profile actors in the chain in 2018 (KI7). Radio also remained an important tool for the dissemination of information. Still, said KI2, "once in a while you need to meet physically." ICT-based platforms were therefore always employed as a complement to regular business and market linkages.

4 Discussion

The purpose of this report is to better understand the linkages in the soybean market chain in Uganda and to grasp what kind of challenges were associated with these linkages in 2018. I explored what kind of coping strategies were being employed or devised by the relevant actors to counter challenges and consequences in the market chain. I also investigated what the role was, and could be, for multi-stakeholder partnerships and ICT-based platforms. I did qualitative data analysis of 11 key informant interviews, six focus group discussions, and participant observations. First, I constructed a Market Map that illustrates which actors were involved in the soybean market chain and how they were linked in 2018. Second, I created a theoretical framework on the challenges, consequences, and coping strategies in the soybean market. My results indicate that stakeholders were often simultaneously linked through multiple channels involving different actors. When market exchange was ineffective in one of the linkages an actor was relatively free to switch to another linkage, without any kind of repercussions due to a lack of fixed contracts and commitments. The main challenges experienced by actors in the soybean market were with (1) market linkages, (2) access to resources, the enabling environment and ICT-based technologies, and (3) production. The perceived consequences of these challenges were (1) inhibited adoption of soybean, associated technologies, or both, (2) low levels of productivity, (3) distrust and conflict, and (4) price fluctuations and mismatches in supply and demand. Actors in the chain employed, or intended to employ, three strategies to counter the challenges and consequences, namely (1) collective planning and marketing, (2) facilitating (multi-stakeholder) market linkages, and (3) the use of ICT-based platforms and other ICT technologies. I find qualitative evidence that certain recognized adoption determinants were associated with marketing decisions of farmers and other actors in the soybean market chain in Uganda. I also argue that two cases of imperfect markets – a non-competitive market and a market operating at market-clearing prices but resulting in a socially undesirable outcome– were noticeable in the soybean market. Which of the two was relevant depended mainly on the extent of influence that middlemen and processors had in determining market prices for grain and inputs.

Many of the presented challenges, consequences, and strategies correspond with the literature on diffusion and adoption of innovations. In several cases the results are congruent with the occurrence of market failures, as discussed by Dillon and Barret (2017). In the following paragraphs, I will address the relationship between my results and (a) the literature on diffusion and adoption of innovations and (b) the concept of market failures.

The literature on diffusion and adoption of innovations recognizes a wide range of factors that may influence adoption behaviour. Two of these - mismatches in supply and demand due to uncertainty and high transaction costs – are of particular importance for this study, because they are indicators of market failures (Dillon & Barret, 2017). Several of the presented challenges correspond with these two factors. A lack of (formal) contracts and commitments and a lack of government regulation and control are factors that are recognized to increase transaction costs (Makhura, 2001). Disaggregated marketing, which may partially be a consequence of improperly functioning contracts, also increase costs due to higher levels of uncertainty and risk. According to several informants, disaggregated marketing resulted in price fluctuations and mismatches in supply and demand (KI2, KI11, and group 5). Several deceitful practices, such as paid inspection (bribery), the withholding of market information, and the intentional reduction in prices to exploit

desperation may also have increased (transaction) costs for the farmer. Intentionally reducing prices to exploit desperation is a form of opportunistic behaviour – or *opportunism*, which is recognized to increase transaction costs (Williamson, 1981). Other recognized determinants relate to the challenges associated with resource endowments (Feder & Umali, 1993; Marenya & Barret, 2007). Access to (a) agricultural technologies, (b) agronomic knowledge, (c) finance, (d) human capital, (e) land, (f) information, (g) storage facilities, and (h) transport were mentioned as challenges in the market chain. Increased costs and a lack of resource endowments reduce farmers' incentives to invest in agricultural technologies (Feder & Umali, 1993; Suri, 2011; Marenya & Barret, 2007).

What can I infer from these findings? I find evidence that certain recognized adoption determinants were associated with marketing decisions of farmers and other actors in the soybean market chain in Uganda. Worth mentioning is that, due to the qualitative nature of this study, I cannot prove causality. Additional quantitative research on this topic may be interesting. A question that may be asked in a future, quantitative study is: "What is the effect of formalized contracts for the purchase of soybean grain on adoption of agricultural technologies for soybean by smallholder farmers in Uganda?"

The results in this study also concur with theory on market failures by Dillon and Barret (2017). Based on the challenges that I discussed in the previous chapter, I argue that two cases of failing markets – a non-competitive market and a market operating at market-clearing prices but resulting in socially undesirable outcomes – were noticeable in the soybean market in Uganda in 2018. Which of the two was relevant arguably depended, though not only, on the extent of influence that middlemen and processors had in determining market prices for grain and agricultural inputs. First, power differences, monopolized price decisions, and unequal access to information (often because information was deliberately withheld) have been mentioned and can be considered as non-competitive elements in the market. These factors become problematic when an actor was the sole supplier of an input or the sole buyer of an output. According to Dillon & Barret (2017), monopolies or oligopolies are underpinned by high transaction costs, weak enforcements of contracts and output risk. Consequently, these non-competitive elements can induce market failures. To illustrate, when a farmer was not a member of a farmer cooperative, middlemen where often the sole buyers of the farmer's grain. In such a situation, middlemen had the power to determine the price, because the farmer had no other place to sell his or her grain. Because there were no fixed contracts between farmers and middlemen, the market remained non-competitive and 'failed'. Second, mismatches in supply and demand emerged in my analysis as a consequence of several challenges in the market. Disaggregated marketing, a lack of contracts, deceitful practices, and the quality of inputs and outputs may have induced price fluctuations, which disturbed the supply of grain and demand for inputs. Even when a market did operate at market-clearing prices, for example when farmers managed to bulk and market their grain collectively, socially desired outcomes – i.e. high yielding, good quality, and profitable soybean production – were often not achieved because of several other challenges in the market, such as a lack of resources, pests and diseases, and the quality of inputs and outputs.

Two questions still stand. Do the strategies that are employed effectively counter the market failures? And, which of my results are specific for the soybean market chain in Uganda? Additional quantitative research is needed to investigate the first question, but theoretically I can argue the following. Collective planning and marketing is the first

coping strategy in the framework. It can be argued that this strategy counters non-competitiveness by increasing the bargaining power of those that have it least – the farmers. Bulking grain provides farmers with a certain leverage, because processors and middlemen require large amounts of grain to meet their own targets. In theory, farmers are thereafter able to *compete* with middlemen in price determination, which improves the competitiveness of the market (Courtois & Subervie, 2014; Wossen et al., 2015). Likewise, the facilitation of (multi-stakeholder) market linkages and the associated increase in social capital may decrease (transaction) costs (Clancy et al., 2014; Wossen et al. 2015). The linkages that were being created with the Village Agent Model are all examples of the enactment of the facilitation strategy. Linkages were created between farmers and input- or output dealers; between VA's and financial institutions; between research institutions and farmers; or between many other actors. Each well-functioning linkage may improve the efficiency, effectiveness and overall functioning of the soybean market chain (Hall, 2006; Ruben 2006).

Another important aspect that is associated with the first and second coping strategy is the usage of ICT-based platforms and technologies. An *accessible* platform facilitates equal access to market information within the market chain and could directly counter non-competitive elements (Courtois & Subervie, 2014). Accordingly, middlemen would be unable, to a larger extent, to determine prices, which may decrease power differences and price fluctuations. ICT-based platforms may also improve the functioning of multi-stakeholder partnerships. An accessible and effective platform may reduce the time and cost of communication, making it easier and cheaper to establish long-lasting relationships between various actors in the chain. Nevertheless, ICT could not (yet) take over the role of facilitator completely, because ICT technologies and associated platforms were not accessible to most farmers. If the goal is to reach and include as many farmers as possible into a properly functioning market chain, improving the accessibility of ICT-based platforms is of primary importance.

There was one important strategy missing, although it was recognized as an opportunity. To counter non-competitive elements in the market, Dillon and Barret (2017) argue in favour of policy interventions that target the market failure directly. Since monopolized price determination and exogenous price fluctuations were mentioned as causes of mismatches in supply and demand, price policy interventions by the Ugandan government are needed. Such policies were not in place in 2018.

To answer the second question - which of my results are specific for the soybean market chain in Uganda? – I argue that many of the presented results are applicable to agricultural markets in Uganda in general. However, this statement is based on speculation, not fact. Many of the farmers, agents, buyers, and processors also produce and trade in other (cash) crops, such as sunflower. Farmers also produce staple crops such as maize, cassava and sorghum. For the latter crops the market chain analysis in this study is less relevant, because these crops are mainly produced for subsistence consumption. Yet for sunflower there are some potential similarities. Many of the channels that were used for soybean were also used for the production and trade of sunflower; and many of the same actors were involved. Several informants mentioned sunflower and in some focus group discussions farmers discussed problems that were both applicable to the soybean and sunflower market chain.

Based on my text analysis, I can argue that the following aspects may also be applicable to the sunflower market. First, high cost of production, for instance due to expensive seed, was a challenge for both the soybean and sunflower

market. Second, access to good quality sunflower seed is another similarity, because the supply of sunflower seed was controlled by a sole supplier, Mukwano (KI4). Power differences between middlemen and agents or farmers were similar in the sunflower market (KI6). Third, paid seed certification was also problematic for other crops, because the same actors were responsible for it. Fourth, there was a lack of properly functioning contracts in the sunflower market. Mukwano tried contract farming – an agreement to supply inputs for grain - with sunflower farmers, but it did not work according to KI3. Overall, it can be said that the challenges with market linkages and access were not limited to the soybean market.

Challenges with production, for instance with the quality of inputs and outputs or with pests and diseases, are distinct for the soybean market. To illustrate, inputs may be 'asset specific' - they are only applicable to certain crops. Challenges with seed, such as problems with germination after periods of heavy rainfall, are in this case soybean specific. The same can be said for 'soybean rust', which is a disease specifically affecting soybean. Soybean rust was still a problem in 2018 and it requires continual development of new seed varieties (field note, 4th of July, 2018). Besides evidence that Mukwano was the sole supplier of sunflower seed, I have no further information on mismatches in supply and demand for sunflower. From a market perspective, each crop has its own supply and demand, both in terms of associated inputs and grain output. It can therefore be argued that the challenges with mismatches in supply and demand were distinct for soybean. Nevertheless, I cannot go beyond speculation on this point.

Several limitations regarding the internal- and external validity of this study must be mentioned. First, the internal validity of this report is limited because of my research design. My first intention was to do an impact assessment. Due to a lack of knowledge on potential challenges, however, I did not chose to *test* hypotheses but to *explore* them. This paper can therefore be used to derive hypotheses for future impact assessments. Sample selection was another factor that influenced the internal validity of this report. I selected my target sample non-randomly and the sample size was limited. A non-random sample is less problematic in qualitative research as compared to quantitative research, because one deals with subjective information and data, which is different for every person. Nevertheless, a representative sample is important. I tried to cover as much different actors as possible to get a representative view on the topic. The sample size, however, may not have been sufficient. As a rule of thumb, 10 to 12 similar interviews may be enough to reach theoretical saturation (Strauss & Corwin, 1990 in Breen, 2006). Even though all the respondents were in one way or another connected to the soybean market, not all the respondents were the same kind of actor. Some respondents were farmers, others were buyers, and others still had another role. Based on my text analysis, however, I suspect that the most important topics have been covered. I was unable to interview representatives of large scale processors, so their perspective is missing. It is important to note that there is a possibility that the results in this report give a somewhat one-sided account of the market situation, where large scale buyers and processors are often presented as a source of some of the challenges. I made an attempt to include different sides of the story as much as I could, but the results must be interpreted with caution.

Second, the external validity of this study is limited. It is a qualitative case study and the results may only be relevant to one particular setting – that of the soybean market chain in Uganda. What was challenging in the soybean market chain in Uganda in 2018 may not be so in the years to come or in other parts of SSA. .

To conclude, it is worth mentioning that even the data collection process was useful for the participants themselves. During the process, participants thought about their linkages with other actors, where in these linkages things became challenging, and what strategies were used (or could be used) to counter the challenges. During the focus group discussions, many farmers wrote down what was written on the flip-over charts and what we discussed. The findings of this report may give relevant actors additional insight on the views and opinions of other actors in the chain; not only on their own.

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Appendix I

Column	*First-Order Category*	*Variable Description and Variable Values*
	PERSON	Number of respondent
	NAME	Name of respondent
	PSEUDONYM	Pseudonym of respondent
	#ACTOR	Kind of actors (18 categories)
	#FARMER	If farmer: commercial, cooperative, group, or individual
	#GOVERNMENT	If government: extension, local council, ministry of agriculture, UDP, URA
	#VILLAGE AGENT	If village agent: CAT, macro, micro, or supervisor
	CHALLENGE_1	ACCES to … is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_1_1	Access to the enabling environment is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_1_2	Access to a resource is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_1_3	Access to ICT-based platforms or technologies is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2	Issues with market linkages are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_1	Issues with contracts and commitments are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_1_1	Conflicts of interest between actors are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_1_2	Price commitments by actors are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_1_3	Side-selling of grain is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_1_4	Delay in payments or deliveries are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_2	Deceitful practices by actors are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_3	Mismatches in supply and demand are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_2_4	Power differences are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_3	Issues with production are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_3_1	High cost of production is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_3_2	Issues to do with inputs and outputs are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_3_3	Climate and weather is mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	CHALLENGE_3_4	Pests and diseases are mentioned by respondent as a challenge in the market: 1 = yes, 0 = no
	THREAT_1	Climate change is mentioned by respondent as an exogenous threat to the market: 1 = yes, 0 = no
	THREAT_2	Political instability is mentioned by respondent as an exogenous threat to the market: 1 = yes, 0 = no
	THREAT_3	Other crops are mentioned by respondent as an exogenous threat to the market: 1 = yes, 0 = no

Appendix I (*Continued)*

CONSEQUENCE_1	Inhibited adoption of soybean and/or associated technologies is mentioned by respondent as a consequence of one or multiple of the given challenges: 1 = yes, 0 = no
CONSEQUENCE_2	Low level of productivity is mentioned by respondent as a consequence of one or multiple of the given challenges: 1 = yes, 0 = no
CONSEQUENCE_3	Distrust between participant and another actor is mentioned by respondent as a consequence of one or multiple of the given challenges: 1 = yes, 0 = no
CONSEQUENCE_4	Price fluctuations and mismatches in supply and demand are mentioned by respondent as a consequence of one or multiple of the given challenges: 1 = yes, 0 = no
OPPORTUNITY_1	A good, future market is mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
OPPORTUNITY_2	ICT technologies are mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
OPPORTUNITY_3	Policy interventions are mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
OPPORTUNITY_4	Value addition is mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
OPPORTUNITY_5	Private sector involvement is mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
OPPORTUNITY_6	Agricultural insurance is mentioned by respondent as an opportunity for the soybean market: 1 = yes, 0 = no
STRATEGY_1	ICT-based methods are mentioned by respondent as a strategy to address challenges in the market chain: 1 = yes, 0 = no
STRATEGY_2	Collective planning and marketing between actors on different levels in the market chain is mentioned by respondent as a strategy to address challenges in the market chain: 1 = yes, 0 = no
STRATEGY_3	Facilitation of market linkages between actors on different levels in the market chain is mentioned by respondent as a strategy to address challenges in the market chain: 1 = yes, 0 = no
STRATEGY_4	The Village Agent Model is mentioned by respondent as a strategy to address challenges in the market chain: 1 = yes, 0 = no