

## **Role of informal institutions in Ready-to-Use-Food (RUF) supply chains in Ethiopia**

A Thesis Submitted to the College of Graduate and Postdoctoral Studies  
In Partial Fulfillment of the Requirements for the Degree of Master of Science  
In the Department of Agricultural and Resource Economics  
University of Saskatchewan

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## Abstract

Ready-to-Use food (RUF) products are nutrient dense foods given to individuals that are suffering from acute malnutrition. Currently 5.8 million children suffer from malnutrition in Ethiopia and the timely and efficient delivery of ready-to-use food products has a significant impact on the lives of these children. However, challenges exist in both the local and international production and delivery of RUF products. One of the challenges is the high transaction costs that exist in the supply chains. Transaction costs are the costs associated with searching for information regarding a product or its market, negotiating a deal and enforcing the terms of the deal. In situations where transaction costs are high due to missing or weak markets and institutions, people have relied on different mechanisms including social capital (trust and information sharing) to deal with these costs and carry out business and transactions. The purpose of the study is to examine the role of institutions, in particular informal institutions, in addressing these challenges and improving the supply chain for Ready-to-use food products and chickpea marketing (which is a potential ingredient in new RUF formulations). The institutions examined in this study are mainly the non-market institutions like trust and information sharing that build social capital. Data was collected through surveys and interviews from RUF supply chain actors in Ethiopia. These include chickpea producers, RUF producers, major demanders (humanitarian organizations and governments), transporters, beneficiaries (feeding centers and hospitals). These agents' use of informal institutions and trust level during transactions with each other is assessed. Interviews with key informants in the value chain in Ethiopia were conducted to further inform the analysis of institutions in supply chain organization and identify areas of high transaction cost. The transaction costs that are present in the supply chains were further identified through focus group discussions with farmers and a farmer survey. Both qualitative and quantitative methods were used to analyze these data. The structure equation model (SEM) was used to quantitatively analyze the data obtained from the farmer survey. The study also found that trust between trading partners reduces the time farmers spent negotiating price with buyers. Trust between trading partners also increased the marketed surplus of farmers. Information sharing among trade partners positively affects trust between partners. The study finds that institutions facilitate chickpea marketing through improving trust and information sharing among trading partners. The results indicate that membership in informal institutions strengthens the trust and information sharing between trading partners and this in turn reduces the transaction

costs associated with chickpea trade. In addition, the current performance of the RUF supply chain in Ethiopia is found to be relatively efficient with some issues in the availability of local and imported inputs and the failure to comply with quality standards. These results imply that existing, informal institutions in developing countries can be as effective as formal institutions so effort should be put towards their development and improvement. The RUF supply chain can also be further improved by increasing the capacity of local manufacturers to increase production and their capacity to adhere to quality standards. Stabilizing input markets to make inputs to RUF production more consistently available will also improve the production capacity and improve the price and accessibility of RUF products.

## **Acknowledgements**

I greatly appreciate the guidance, useful feedback and support I received from my supervisor Dr. Jill E. Hobbs during the course of this thesis work. I also appreciate the comments and guidance from my committee members, Dr. Eric Micheels and Dr. Lisa Clark as well as the valuable feedback from my external Dr. Richard Barichello.

The funding provided for my graduate studies and data collection in Ethiopia through the project: Development of Innovative Therapeutic Food Products for Treating Malnutrition and Responding to Emergencies within High Risk Communities funded by the Global Institute for Food Security (GIFS), University of Saskatchewan has made this research possible.

I am also grateful for the staff and Research Assistants at Mekelle University for facilitating the field data collection in northern Ethiopia. I particularly like to thank Dr. Afework Mulugeta, Dr. Addis Abraha and Omer Seid Adem.

Finally, I thank God for blessing me with health and a sound mind. I am grateful for my parents, my siblings, my husband Getahun Ersino, my children Caleb and Abigail for the motivation to start and finish this thesis. I am also indebted to the people of Ethiopia who were the greatest source of motivation.

## Table of Contents

Abstract .....	ii
Acknowledgements .....	iv
List of Figures .....	vii
List of tables .....	viii
List of Abbreviations and Acronyms .....	ix
Chapter 1 Introduction .....	1
1.1 Background .....	1
1.2 Problem Statement .....	2
1.3 Objective of the study .....	4
1.4 Methodology .....	5
1.4.1 Research Design .....	5
1.5 Outline of the structure of the thesis .....	6
Chapter 2 Literature review .....	8
2.1 Ethiopia country overview .....	8
2.2 Overview of ready to use therapeutic foods.....	9
2.3 The Supply chain for RUTF.....	11
2.3.1 Product flow .....	12
2.3.2 Information flow.....	13
2.3.3 Funding flows in the Plumpy’Nut supply chain.....	13
2.4 Issues in the local and global supply chain of RUTF.....	13
2.5 Social capital in supply chains .....	16
2.6 Institutions and transaction costs.....	19
2.7 Market Institutions and Government Policy in Ethiopia.....	21
2.7.1 Ethiopia Commodity Exchange (ECX) .....	23
2.7.2 The Ethiopia Grain Trading Enterprise (EGTE) .....	24
2.7.3 Agricultural Growth program (AGP) .....	24
2.7.4 Financial Institutions and Cooperatives .....	25
2.8 Market Structure and supply chain of chickpea .....	26
2.8.1 Transaction costs in chickpea supply chains .....	31
2.9 Performance measures in agri-food and humanitarian supply chains.....	32

2.10 Conceptual framework .....	35
2.11 Conclusion.....	39
Chapter 3 : Empirical Methods and Results .....	40
3.1 Hypothesis of the study .....	40
3.2 Survey design and Implementation .....	43
3.2.1 Study area .....	43
3.3 Descriptive statistics.....	45
3.3.1 Background and socioeconomic characteristics .....	45
3.3.2 Agricultural and chickpea production statistics.....	48
3.4 Research methodology and the structural equation model (SEM).....	51
3.5 Assessment of the measurement model .....	55
3.6 Hypothesis testing and model results .....	59
3.7 Conclusion.....	63
Chapter 4 Insights from the interviews .....	65
4.1 Insight from the health facilities .....	66
4.2 Insights from RUF buyers .....	68
4.3 Insights from food processing companies .....	75
Chapter 5. Summary and Conclusion .....	80
5.1 Summary of major research findings .....	80
5.2 Implications.....	81
5.3 Limitation of the study and areas for further research .....	83
References.....	86
Appendix.....	96
Appendix A: Results from the logistic regression .....	96
Appendix B: The OLS regression results.....	97
Appendix C Survey Instruments .....	101

## List of Figures

Figure 2.1 Product flow of Plumpy’Nut in UNICEF’s supply chain. ....	12
Figure 2.2 Information flow of Plumpy’Nut in UNICEF’s supply chain.....	13
Figure 2.3 Primary chickpea growing regions in Ethiopia .....	26
Figure 2.4 Trend in chickpea production, yield and area harvested in Ethiopia .....	27
Figure 2.5 Marketing Channels and value chains of Chickpea .....	30
Figure 2.6 The conceptual framework .....	38
Figure 3.1 Map showing the location of Aksum.....	45
Figure 3.2 Household income level per month (n= 142).....	46
Figure 3.3 Farmer survey participant ownership of equipment (n=147).....	47
Figure 3.4 Farmer survey participant area cultivated (n=147) .....	48
Figure 3.5. Marketing channel used for chickpea.....	51
Figure 3.6 The section of the conceptual framework examined by the SEM.....	52
Figure 3.7 The proposed full structural equation model.....	55
Figure 3.8. The measurement model.....	58
Figure 4.1 The section of the conceptual framework examined by the interviews .....	65
Figure 4.2 Product flow of RUF in Ethiopia.....	67
Figure 4.3 Funding flow of RUF in Ethiopia.....	69
Figure 4.4 Information flow in the RUF product supply chain in Ethiopia.....	73



## **List of Tables**

Table 2.1 Key success factors for humanitarian supply chains .....	34
Table 3.1. Background characteristics of farmer survey sample .....	47
Table 3.2 Household land ownership and chickpea production .....	49
Table 3.3 Description of the variables used in the model.....	53
Table 3.4 Trust, Information sharing and satisfaction survey questions .....	56
Table 3.5. Results of the measurement model .....	59
Table 3.6 Results from the structural equation model .....	61
Table 3.7 Support for hypotheses from the SEM .....	63
Table 3.8 Model fit indices for the SEM .....	63

## **List of Abbreviations and Acronyms**

AGP	Agricultural Growth Program
CSB	Corn Soya Blend
EATA	Ethiopian Agricultural Transformation Agency
ECX	Ethiopia Commodity Exchange
EGTE	Ethiopia Grain Trade Enterprise
EIAR	Ethiopian Institute of Agricultural Research
EPOSPEA	Ethiopian Pulses, Oilseeds and Spices Processors-Exporters Association
FYGTP	Five Year Growth and Transformation Plan
GDP	Gross Domestic Product
LTA	Long term Agreement
MANR	Ministry of Agriculture and Natural Resources
MOA	Ministry of Agriculture
MOFED	Ministry of Finance and Economic Development
MOH	Ministry of Health
NGO	Non-Governmental Organization
PFSA	Pharmaceuticals Fund and Supply Agency
RUF	Ready to Use Food
RUTF	Ready to Use Therapeutic Food
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization

## Chapter 1 Introduction

### 1.1 Background

Undernutrition is the underlying cause of 53% of infant and child deaths and 44% of children suffer from chronic undernutrition in Ethiopia (USAID, 2017). Ready to use foods (RUF) are high energy foods given to individuals, usually children who are malnourished. RUF can be in the form of either ready to use therapeutic food (RUTF) or ready to use supplementary food (RUSF). RUTF is given to individuals with severe acute malnutrition<sup>1</sup> while RUSF is given to individuals with moderate malnutrition. These food products are usually a paste made of peanuts, milk powder, oil, sugar, and are fortified with vitamins and minerals.

Several challenges exist in the production and delivery of RUF products from offshore and local sources. The major challenges in the global supply of RUFs include variability in lead time (time between order and delivery), lack of information sharing among supply chain agents, high cost of logistics, lengthy delivery times and delays in delivery (UNICEF, 2009). This has led to increased interest in local procurement. The benefits of local procurement include increased attention by regional governments, less time in custom clearance processes, and growth in local agriculture and food production. However, local production has challenges. Challenges in local production and supply chains for RUTF in Ethiopia include the high cost of local production due to high import taxes on imported ingredients and lack of grading facilities to assure quality. High transaction costs, lack of foreign exchange to import ingredients, and financial limitations to increase production as the facilities are not producing to their maximum capacity are further challenges in the RUF supply chain. The lack of sufficient information flow between donors, UNICEF, Ministry of Health and lack of correct forecast/ assessment of need and demand for RUF have been identified as issues that affect the performance of the supply chain both locally and globally (Komrska, Kopczak, & Swaminathan, 2013; Swaminathan, 2009).

Institutions have been shown to play a major role in supply chain organization and management, especially in developing countries (Alemu, Maertens, Deckers, Bauer, & Mathijs, 2016).

Institutions are “the rules of the game in a society or, more formally, are the humanly devised

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<sup>1</sup> Severe Acute malnutrition is defined by a very low weight for height (below-3z scores of the median WHO growth standards), by visible severe wasting, or by the presence of nutritional oedema (WHO, 2017).

constraints that shape human interaction” (North, 1990, p. 3). Institutions (formal and informal) are the rules and procedures that shape social interaction. One of the main roles institutions play is lowering transaction costs. The existence of properly functioning institutions like law enforcement agencies, courts, quality grading agencies, and market information services can lower transaction costs. Transaction costs are often categorized as search costs (cost of searching for information regarding a product and its market), negotiation costs (cost of negotiating the transaction including price of the product), monitoring and enforcement costs (costs of ensuring terms of the transaction are met and agents do not deviate from agreed behavior). The Transaction Cost Economics approach is one of the different theories that explain economic agent’s behavior. It postulates that economic agents choose different marketing channels to lower transaction costs.

Contractual agreement is one marketing channel that reduces opportunism and information asymmetry. Contract agreements that can be enforced improve trust and reduce opportunistic behavior that lead to transaction costs (Zhang & Hu, 2011). However, in the absence of formal contracts or institutions that can enforce them, mutual interest and informal institutions can effectively reduce opportunistic behavior. This paper uses the transaction cost approach to study the role of informal institutions and social capital (trust and information sharing) in the supply chain organization of ready to use foods in Ethiopia.

## **1.2 Problem Statement**

Agricultural markets in developing countries are characterized by high transaction costs, poor infrastructure and imperfect information (Gebremedhin, Jaleta, & Hoekstra, 2009; van Dijk & Trienekens, 2011). Supply chains in Ethiopia are characterized by high transaction costs due to weak institutions that make contract enforcement difficult, do not provide information on price or quality and due to poor infrastructure (USAID, 2015) and there is limited participation of the private sector ( Gebremedhin et al., 2009). Contracts are not commonly used in transactions and traders mostly use the spot market and occasionally cooperatives to get agricultural supplies (Abebaw & Haile, 2013).

Institutions play a role in reducing transaction costs and thus in the development and effectiveness of supply chains in Ethiopia (Gebremedhin et al., 2009). Though there have been improvements in the increased involvement of economic institutions in the agricultural sector in Ethiopia over the last few years, there is still great potential in terms of improving efficiency and access of smallholder farmers to institutions. Most smallholder farmers still lack access to markets, modern inputs and financial services. To address these challenges the government has implemented different policies and strategies and has increased expenditure on the agriculture sector. Since 1991, Ethiopia has been following a policy of Agricultural Development-Led Industrialization (ADLI) that recognizes agriculture as the engine of growth. The main purpose of this strategy has been to improve market access, rural infrastructure, and access to financial services and promote proper use of land. In line with this strategy, both the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and the Five-Year Growth and Transformation Plan (FYGTP) established in 2005-2010 and 2010/11-2016 respectively had specific agricultural development strategies of establishing effective agricultural marketing systems and specialization, diversification and commercialization of agricultural production (Chipeta, Emanu, and Chanyalew, 2015). Some of the specific programs launched and institutions established which aim to address smallholder farmers and agricultural markets are the Ethiopian Commodity Exchange and the Agricultural growth programs. These programs and institutions have been effective in addressing some commodity grains like coffee but they have still not addressed all commodities and many smallholder farmers are still outside these programs. Most transactions in rural Ethiopia, where 80% of the population live, still happen in the spot market without any formal institutions.

The institutional environment can further affect the supply chain through the development of trust (Cai, Jun, & Yang, 2010) and by providing motivations and influencing values (Bowles, 1998; Dong, Ju, & Fang, 2016). Buyers and sellers are less likely to engage in supply relations with each other when the level of trust between them is low. Trusting a partner and the perception of being trusted by a partner has led to increased participation of small scale farmers in supermarket value chains (Blandon, Henson, & Cranfield, 2009). The development of trust becomes particularly important when formal institutions are not there to enforce contracts or perform the function of formal institutions like banking/credit provision, property rights

protection, etc. Trust in exchange relationships also improves information sharing and coordination leading to better efficiency/minimizing inefficiencies (Dyer & Chu, 2003). When the level of institutional efficiency is different between organizations in the supply chain, i.e. when one organization is more coordinated or is better staffed than the other, continuous information sharing enhances coordination along the supply chain (Dong et al., 2016). For instance, UNICEF and local feeding centers/storage facilities in Ethiopia have different levels of institutional efficiency (with UNICEF being better coordinated and staffed) and continuous information sharing between the two organizations can improve the coordination in the whole supply chain.

Even where formal institutions exist they are often inaccessible, corrupt and inefficient. Informal institutions can make up for lack of efficiency and might work better until the formal ones are well developed, for example, a modification of Ikkub(discussed in chapter two) can substitute for formal Credit Unions. Informal institutions have even been found to complement formal institutions like enforceable contractual agreements and improve supply chain performance(Cai et al., 2010; Zhang & Hu, 2011). Therefore, in countries like Ethiopia where resources to invest in infrastructure and economic institutions are constrained, informal institutions can be utilized to lower transaction costs and facilitate trade.

This study aims to examine the effectiveness of informal institutions in building trust, information sharing and lowering transaction costs. It proposes that informal institutions can play a significant role in reducing opportunism and enhance information sharing in situations where it is hard to have formal institutions or where they are slow to develop, if ways are devised to utilize them tactfully. The main research question of the study is therefore how informal institutions affect the level of trust and information sharing in the RUF supply chain in Ethiopia?

### **1.3 Objective of the study**

The study analyzes the supply chain structure of local RUF production starting from farmers that produce chickpea (which is a potential ingredient to newly developed RUF formulations) to retailers, wholesalers, distributors, food processors, RUF distributors and users. The objective of this study is to outline the supply chain structure of a locally produced RUF and to identify the areas of inefficiencies and where transaction costs are high and to explore how institutions (formal and informal) could reduce these high transaction costs.

The main objectives of the study are

- To identify the main actors and their interaction in the RUF product supply chain
- Identify the major constraints/sources of high transaction cost in the RUF supply chain
- Identify the role institutions (formal and informal) have in the supply chain of RUF in Ethiopia in terms of reducing transaction costs and improving performance.

#### **1.4 Methodology**

Trust between supply chain agents is a complex phenomenon and it is not easily measured. The conceptual framework to measure trust is adopted from the literature which include the agent's judgment of the reliability, credibility, goodwill, ability and integrity of trading partners and satisfaction with trading partners (Blandon et al., 2009). Buyers do not build relationships with sellers whom they do not trust with regards to product quality and delivery; sellers are also less likely to supply to buyers who they think are too risky in terms of suppliers not trusting them enough to demand these products continuously. Trust between exchange partners will improve information sharing and thus lower transaction costs (Dyer & Chu, 2003). In addition, in the literature trust is measured from the risk perspective (Laequddin, Sahay, Sahay, & Abdul Waheed, 2010). The level of trust is measured based on the agent's perception of the riskiness of the relationship/partnership. Based on this theoretical background a conceptual model is developed (Figure 2.6 in chapter two) and both qualitative and quantitative analysis is used to examine the conceptual framework. The trust variable along with information sharing variable is obtained from a principal factor analysis and further refined by the confirmatory factor analysis in structural equation model using survey data as discussed in section 1.4.1. The relationship between trust, information sharing and transaction costs as outlined in the conceptual framework are examined using structural equation modeling. Key success factors obtained from the literature are also used to examine the effectiveness of the RUF supply chain.

##### **1.4.1 Research Design**

A survey research design was used to collect data from RUTF supply chain actors in Ethiopia. These include chickpea producers, RUTF producers, major demanders (humanitarian organizations and governments), transporters, quality and standard agencies and beneficiaries (feeding centers and hospitals). These agents' use of informal institutions and trust level during transactions with each other is assessed. The questionnaire is developed based on the literature

review and conceptual framework. Semi-structured interviews were used with most of the firms at each stage and a focus group discussion and survey was conducted with a sample of chickpea farmers in Lailay Maychew woreda in Tigray, Ethiopia. Interviews with key informants in the value chain in Ethiopia (Guts Agro, Hilina foods and local distributors) were conducted to further inform the analysis of institutions in supply chain organization and identify areas of high transaction costs. The transaction costs that are present in the supply chains were further identified through focus group discussions with farmers and a farmer survey. Interviews with key informants in hospitals which have feeding centers that administer ready to use therapeutic foods and in agencies (NGOs) that distribute RUTF were also conducted to measure the key performance indicators for RUTF supply chains. The key performance indicators adapted from the literature are flexibility, responsiveness and timely delivery (Aramyan, Oude Lansink, van der Vorst, & van Kooten, 2007; Beamon, 1998). Trust has been found to improve key performance indicators, particularly responsiveness (Handfield and Bechtel, 2002). Enforceable contracts or trust among supply chain actors is found to improve logistic performance and improve confidence of agents regarding prices and quality (Cai et al., 2010). Therefore, these key performance indicators along with trust are used to assess the level of effectiveness of the RUTF supply chain.

### **1.5 Outline of the structure of the thesis**

The thesis is structured as follows: the next section (chapter two) is the literature review which gives an overview of the country Ethiopia and moves on to discuss issues in the supply chain for RUFs and the role of social capital in agriculture supply chains. The literature review also discusses institutions and transaction costs as well as the relevant market institutions and government policy in Ethiopia. The market structure of chickpea as well as the performance measures of supply chains are discussed. Building on the literature review the conceptual framework is laid out and discussed. Chapter three discusses the empirical method and results. It starts by developing the hypotheses to be examined followed by the discussion of the survey design and implementation. Then the descriptive statistics are presented which includes survey participants' socio-economic characteristics and their chickpea production and marketing. Following the descriptive statistics, the main method of analysis, the Structural Equation Model (SEM), and the results from the model are discussed. Then chapter four discusses the insights



from the interviews. Chapter five summarizes the major findings and implication of the study and lays out the limitations of the study.

## **Chapter 2 Literature review**

The purpose of this chapter is to provide a review of available literature on ready-to-use therapeutic food products, their supply chain organization, challenges in this supply chain in Ethiopia, the role trust and informal institutions play in supply chains and to give an overview of the Ethiopian economy and some of the institutions in Ethiopia. The supply chains of the agriculture commodities used as an input in RUF (chickpea) as well as performance measures used in supply chains and possible ways to adopt them to a developing country's agriculture sector and the RUTF context are discussed.

The first section gives an overview of Ethiopia; the second section gives an overview of RUTF; the third section outlines the supply chain for global RUF and the fourth section discusses the challenges faced in producing and distributing ready-to-use food products. The fifth section discusses social capital and its role in agricultural supply chains. The sixth section discusses relevant market institutions and government policy in Ethiopia while the seventh section discusses the chickpea supply chain and the transaction costs in this supply chains. Performance measures in agriculture supply chains are discussed in the last section.

### **2.1 Ethiopia country overview**

Ethiopia, located in the East of Africa, is the second most populous country in Africa after Nigeria. It has a population of 105 million with an annual population growth rate of 2.43 which makes it the 12th largest population in the world (United Nations, 2017). In Ethiopia, undernutrition is the underlying cause of 53% of infant and child death (USAID, 2017). Though the country has recently experienced high rates of economic growth at 7.6 % annual GDP growth rate, it is still one of the poorest countries in the world, ranking 173 out of 187 in the UNDP Human Development Index (United Nations Development Programme, 2014). Ethiopia's economic performance is to a great degree influenced by the performance of the agriculture sector. Agriculture accounts for 43 percent of GDP and 90 percent of exports; it employs 80 percent of the population and about 11.7 million smallholder households account for 95 percent of Agricultural GDP (USAID, 2012). Agriculture in Ethiopia is characterized by heavy reliance on rain, subsistence (low output), low use of inputs (like technology, fertilizer, improved seed etc.) and poor land management practices (Gabre-Madhin, 2001). Poverty rates differ among the

regions in Ethiopia and Tigray has the 4<sup>th</sup> highest poverty headcount index next to Afar, Somalia and Gambella.

## **2.2 Overview of ready to use therapeutic foods**

Ready to use therapeutic food products are high energy food products fortified with vitamins and minerals which are given to severely malnourished children. RUTF is either in the form of paste or a biscuit that is easy to swallow. To prevent and minimize contamination between feedings, the products are packed individually in aluminum foil sachets for one time consumption only (~100g). They are ready to consume and do not require cooking, adding water or refrigeration. RUTF is generally made with oil seeds, pulses, cereals, sugar, milk powder, vegetable oils, vitamins and minerals. Peanut-based RUTF is the most common format and it typically consists of milk powder (30%), sugar (28%), peanut butter or paste (25%), vegetable oil (15%) and vitamin and mineral premix (1.6%) (Manary, 2006). Other alternative RUTF products include a product with cereal as the main ingredient, legumes or beans as the source of protein, animal source food (egg, meat, fish or milk) and another sesame based product (Wagh & Deore, 2015). There are also other proposed formulations that include barley and chickpea as possible ingredients.

The first peanut paste RUTF named Plumpy'Nut was developed by Nutriset and the French Institute of Research for Development in 1996 (Komrska, 2012). Currently, Nutriset is the largest producer of the product and it has a number of franchises around the world including Hilina Enriched foods in Ethiopia. The 2007 endorsement of the United Nations of RUTF use to treat severe acute malnutrition has increased its demand (Komrska et al., 2013). The shift from hospital-based treatment of severely malnourished children to home-based treatment in community-based programs has further increased the demand for the product (Swaminathan, 2009). Community based programs are programs where trained community health workers or volunteers use a plastic strip/armband to measure the arm circumference of children and screen out/ identify severely malnourished children. These children are given RUTF to take home and periodic check-ups are done at the health facility as RUTF does not require medical supervision and can be given at home by any individual unless there are complications in which case they are treated in hospitals (WHO, WFP, & UNICEF, 2007).

Though RUF is distributed worldwide to 57 countries, it is mostly needed/used in Ethiopia, Kenya, Somalia, Niger, Pakistan, Nigeria, the Democratic Republic of Congo, Yemen, Sudan and Chad (Komrska, Kopcak, & Swaminathan, 2013). Ethiopia is one of the largest demanders of the product with 2.7 million acutely food insecure people, 28% of children younger than 5 dying from malnourishment every year and 303,000 children currently expected to require therapeutic food products (UNICEF, 2017)

Ready to use therapeutic food products are supplied to those who need it by humanitarian agencies. United Nations International Children's Emergency Fund (UNICEF), established in 1946 after the second World War to advocate for the protection of children's rights, meet their basic needs and expand their opportunities to reach their full potential, is the largest demander of RUTF. Other demanders include the Clinton foundation, Medecins Sans Frontieres (Doctors without borders) and other smaller NGOs and UNICEF partners (UNICEF, 2009). UNICEF procures these products from international and local (in countries which have a demand for RUTF) producers. UNICEF procures RUTF for many organizations including the World Health Organization (WHO); the WHO transports and delivers these products to affected areas (UNICEF, 2013). UNICEF operates in 190 countries and distributes food and medical supplies to children in emergency situations. The supply division is responsible for the procurement of RUTF products from global and local suppliers. Currently there are 23 different suppliers, of which 18 are local producers found in countries that require a large amount of RUTF (UNICEF, 2017).

The price of RUTF varies based on the country of production and the company that produces it. Based on 2016 data, the weighted average price of 1 carton of RUTF containing 150 sachets of 92g each ranges between US \$45- \$55 for local RUTF and \$41-\$52 for offshore RUTF (UNICEF, 2017). The powdered milk and the packaging aluminum foil are the most expensive components. Locally produced RUTF is more expensive due to the need to import the milk powder and mineral mix. Over the years, the number of producers and volume of procurement have increased which has reduced the price of RUTF. However, prices have not decreased as much due to high start-up costs and producing below capacity (Komrska et al., 2013) and there are challenges to efficiently incorporate programs that utilize RUTF into a country's health services. Ethiopia has launched the national nutrition strategy in 2008 which included the

community management of acute malnutrition that uses RUTF. A case study of five countries including Ethiopia found that the challenges of integrating such programs along with other health services are the limited capacity of health services, lack of clear definition and indicator of integration, difficulty in the transfer of skills and resources to the governance of the program and, treating programs that require RUTF as emergency only thus prioritizing other programs that have regular funding (UNICEF, 2013).

UNICEF's quality standards for suppliers of these products are stricter than normal foods as they are given to individuals with an already compromised health status. The quality standards required for RUTF include no aflatoxin contamination, no bacterial contamination and prevention of oxidation (Manary, 2006). Aflatoxin is produced by a fungus, which contaminates peanuts after harvest but it can be prevented by keeping the peanuts in a cool dry place or using fungicides. Therefore, buyers want to buy from producers who can ensure delivery of peanuts that are not contaminated. Bacterial contamination can occur due to the presence of water in the product, which facilitates the growth of bacteria and mold. Complete drying of preparation materials is thus necessary. Oxidation shortens the shelf life of the product and thus air tight containers and packaging under nitrogen must be used as UNICEF requires a two-year shelf life for globally sourced RUTF (Caron, 2013). These quality standards are in accordance with international food production standards and local government's food safety standards. Most local producers send samples to developed countries to test for contaminants and aflatoxin, which increases cost and limits production. Hilina Enriched foods, which is the local producer of Plumpy'Nut in Ethiopia, has partnered with others to establish Bless, a laboratory to locally analyze quality and address this challenge (Segre, Liu, & Komrska, 2016). Bless Agri Food Laboratory Services, established in 2013 in Addis Ababa, Ethiopia, is the first accredited private food laboratory in the country (Precise, 2014).

### **2.3 The Supply chain for RUTF**

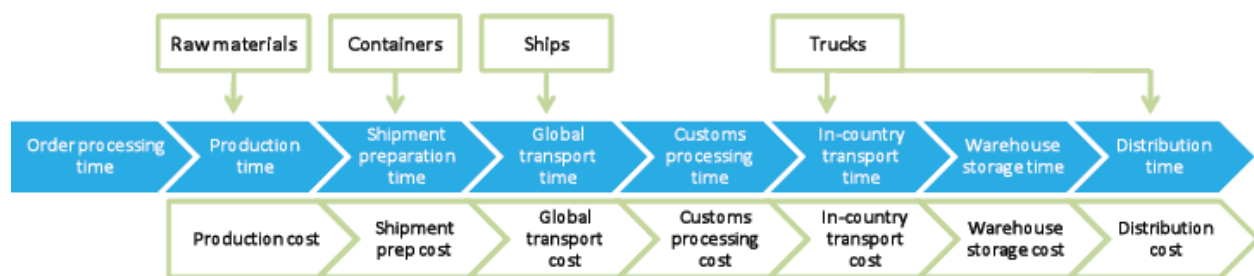
The supply chain for RUTF is not like the supply of other food products where end users are consumers who pay for the products. Users of RUTF are mostly children, mothers and HIV/AIDS patients who get the products for free. RUTF is funded through humanitarian action and world government support. Donations can be specific to a certain program or just general

funding. In 2017, UNICEF required US\$110.5 million for its humanitarian program in Ethiopia; as of July 2017 it had received US\$34.5m and had US\$33.5m funds carried over from the previous period (UNICEF, 2017).

### 2.3.1 Product flow

RUTF manufacturers can be local, global or both. Local manufacturers are producers located in countries that are major users of RUTF, like Hilina foods in Ethiopia and Valid Nutrition in Malawi. Global manufacturers produce mainly for export, e.g. Nutriset in France, Insta Products in Kenya and Edissa in the USA. Global producers are required to produce and ship the product to an agreed location, mostly the nearest port or airport (Komrska et al., 2013). Most of the global RUTF for use in Ethiopia is shipped from Nutriset in France which ships the product (Plumpy’nut) to Mombasa (in Kenya) which is then delivered by road to Addis Ababa or it is directly air flown from France. After arriving in Addis Ababa, it is transported by truck to regional offices and warehouses where it is stored until needed (Swaminathan, 2009). Some of the RUTF manufacturers produce for both local use and export like Meds & Food for Kids in Haiti and Samil Industry in Sudan (UNICEF, 2017). Currently there are 23 producers that supply to UNICEF (government agencies and other NGO’s procure through UNICEF) of which seven are local, 13 are international and the remaining three are both local/international (UNICEF, 2017). Figure 2.1 shows the global product flow of one of the RUTF products, in particular the Plumpy’Nut in UNICEF’s supply chain.

Figure 2.1 Product flow of Plumpy’Nut in UNICEF’s supply chain.

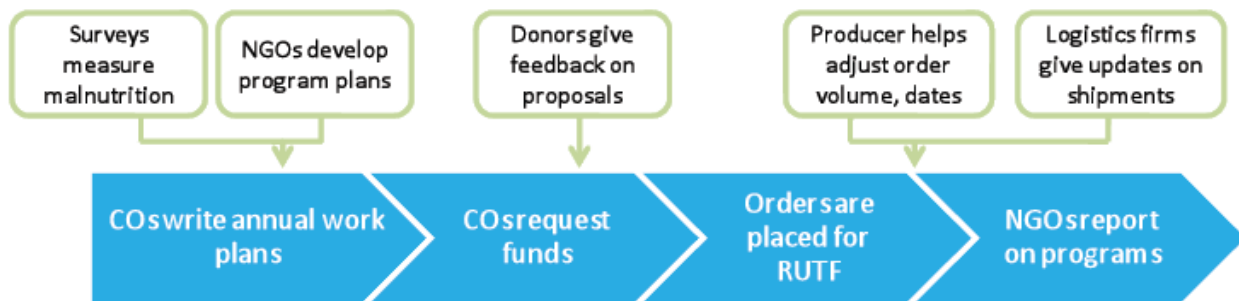


Source: (Swaminathan, 2009)

### 2.3.2 Information flow

The needed amount of RUTF is calculated based on surveys that measure the level of malnutrition. Based on these surveys the country office and different NGOs write proposals to funding agencies. After donors review the proposals and give feedback, UNICEF country offices places orders to RUTF manufacturers. RUTF manufacturers communicate the available amount and date of arrival while logistic firms communicate information regarding shipment to desired locations. Figure 2.2 below shows the information flow for tRUTF in the UNICEF supply chain.

Figure 2.2 Information flow of Plumpy’Nut in UNICEF’s supply chain



Source: (Swaminathan, 2009)

### 2.3.3 Funding flows in the Plumpy’Nut supply chain

UNICEF’s country office develops fundraising proposals and different donors make commitments to the amount of funds they will give. The funding is given in different installments on varied schedules. Once these funding promises are obtained, the UNICEF country office places orders for RUTF. Producers of RUTF and transporters send their bills to the supply Division of UNICEF. The UNICEF country office transfers the payment to the supply division which then pays these bills.

### 2.4 Issues in the local and global supply chain of RUTF

Even though UNICEF is the largest buyer of RUTF, it currently reaches only 15% of those suffering from severe acute malnutrition while other agencies that procure RUTF like USAID, Médecins Sans Frontières (MSF) and others reach only 5% of the people that need RUTF (UNICEF, 2017). This fact implies there is a significant need and a non-utilized opportunity in

increasing production and improving supply chains to address the large number of the severely malnourished population.

A supply chain analysis of RUTF in the Horn of Africa found variability in lead time (time between order and delivery), delays in deliver/transportation delays, uneven ordering, lack of information sharing among supply chain agents, demand uncertainty and high cost of logistics to be the major challenges in the supply chain of RUTF (UNICEF, 2009). Lead time is the length of time from the start of production to the final delivery. The lead time for the delivery of RUTF was long and variable in the Horn of Africa. Variability in lead time prohibits effective planning as it is hard to predict arrival dates for RUF leading to inefficiency, eroding trust and making it difficult to plan effectively. Even when dates are set after taking into consideration potential interruption in the supply chain, orders arrive later than the set dates. This variability is due to long delays at customs, poor local transport infrastructure which restricts the load a truck could carry and seasonal roads that are not accessible during rainy season. In emergency situations, air transportation has been used to reduce time between order and delivery but air transport raises costs by up to 35% (UNICEF, 2009). Since the cost of RUF's is covered by different funding agencies which make commitments before UNICEF makes purchase orders, variable lead time makes a quick response to hunger emergencies challenging both in terms of availability of funds and product delivery. The high cost of logistics and length of time required for delivery are the major challenge in global RUTF supply (UNICEF, 2009).

Uneven ordering is when the demand for RUTF increases during emergencies. During emergencies, the volume of RUTF that is ordered is higher which puts pressure on the production lead time (UNICEF, 2009). The limitation in terms of low production capacity/volume further puts pressure on lead times. Uncertainty of future demand for RUTF as new alternatives to treat malnutrition are developed or the volume of malnourished population decreases further limits increased production and private sector involvement. The lack of information flow between supply chain actors and lack of correct forecast/ assessment of need and demand for RUF affect the performance of the supply chain. Lack of data about forecasts and consumption limits proper planning for production and transportation of RUTF. Uncertainty about availability and timing of funding limits production volume. Thus, it becomes a challenge



to match demand and supply. The Horn-of- Africa study recommended: the establishment of buffer stocks (by RUTF buyers/humanitarian agencies) to reduce lead times and delays in delivery; the diversification of RUTF suppliers as it would increase volume and enable better supply; improvement of collaboration and communication between agents in the supply chain which improves information flow and forecasting (Komrska et al., 2013).

The above-mentioned challenges in the international supply chain have led to local procurement. Local procurement solves some of the challenges like delays at shipment and port of entry/customs and shortens delivery/transportation time. Local production also provided increased familiarity of local community and government with the product. The physical presence of local production provides an opportunity for increased attention to malnutrition within the country and inclusion of RUTF in the government's national nutritional strategies (Troubé, 2012). The use of local language on the product package also increases the recognition of the product (UNICEF, 2009). UNICEF is highly committed to local procurement as it is buying local even when local procurement costs 60 percent higher than off-shore (UNICEF, 2009). The organization has also achieved its plan to supply 50% of total procurement from local sources in 2016 (UNICEF, 2017). Additional benefits of local procurement include development of local agriculture, promotion of economic self-sufficiency, reduction of risk associated with procurement from a single source and increased production capacity (Manary, 2006; UNICEF, 2009).

Local procurement also has its own challenges in the local supply chain. Locally produced RUTF is often found to be more expensive than the imported version due to the need to import powdered milk and vitamin and mineral mix that are key ingredients in RUTF (Segre et al., 2016). The timely arrival of these imported ingredients and the availability of foreign exchange and working capital are also challenges in local production (Komrska et al., 2013; Segre et al., 2016).

In addition to the higher cost of local RUTF, the absence of market institutions (like a stable foreign exchange and input market) can cause lack of information and proper market signals regarding raw material quality, price and demand which increases transaction costs. Lack of

legal institutions to enforce and monitor agreements further increases monitoring costs. In addition, patent protection for some RUTFs and related products which require some payment to manufacture such products can present a challenge, although Nutriset does not charge a fee in developing countries. In addition, distribution is found to be the most logistically challenging step in the supply chain for RUF (Komrska et al., 2013) and local procurement often does not solve this distribution challenge due to poor infrastructure. There are also financial challenges in local production related to high start-up costs and the willingness of investors to invest in such products. Quality control is another obstacle in local production as there is often lack of proper grading for agricultural commodities and lack of quality assurance institutions at the food processing level (Segre et al., 2016). RUTF has tight quality and nutrient specifications and in order to be a supplier, producers need to meet these specifications. Therefore, a lack of facilities to provide certification for the fulfillment of these specifications would be a limit to production. A study into why local production is not meeting demand in Ethiopia found that lack of market information (the price and supply/availability of raw materials), low access to finance (limited capacity of manufacturers to expand production, to buy seasonally available local inputs and to obtain foreign currency to buy imported inputs) and a weak value chain to be the main issues (Isogai, 2011).

## **2.5 Social capital in supply chains**

Even though the challenges mentioned in the previous sections are current issues, change is happening at various levels. Supply chain management in agriculture and food products is changing, mainly driven by changes in transportation technology, communication technology, modern agricultural practices and technologies, the policy environment and increases in consumer incomes. Supply chains are becoming more integrated, complex, and are often likely to be international (Reardon, Chen, Minten, & Adriano, 2012). Supply chain organization in developing countries, which were and still are, characterized by missing markets, poor transport and communication infrastructure, non-conducive policy environments, low use of technological advances and high post-harvest loss is also changing (Daniels & Fors, 2015). Non-conducive policy environment and low use of technological advances is also changing. The changes are due to greater emphasis of governments on agriculture and agricultural policy, the recognition of the importance of agriculture in addressing issues in economic development and health;

improvements in infrastructure, and adoption of new technologies (Reardon et al., 2012; Alemu, Maertens, Deckers, Bauer, & Mathijs, 2016). The development of institutions and markets and non-market forces like social capital has also contributed to the way supply chains are organized in developing countries.

Social capital is the network of relationships between people that enable cooperation for common gain (Putnam, 1995). There are different types of social capital but the emphasis of this thesis is the two types of social capital, namely trust and information sharing. In economic dealings, better connected agents (social network) can have positive or negative effects. Better connection between trading partners can potentially lead to agreements to collude, charge higher prices and control the market with adverse effects on economic welfare. Alternatively, agents with a good social network can reduce transaction costs by eliminating negotiation and search costs as they trust each other and share information between them (Fafchamps & Minten, 2002). Fafchamps & Minten find that social capital is as important as human capital in improving the efficiency of economies, which are characterized by high transaction costs and weak market institutions. They find that a positive relationship with other agricultural traders and lenders improves the performance of the supply chain by building trust which enables the use of credit instead of always demanding cash payment; by exchanging price information; and by reducing time spent on inspection of the product's quality. However, good relationships do not always have a positive effect on supply chains as they found that family relationships may affect productivity negatively. This could be due to the mixing of family and business matters, though a family relationship might be important during the initial stage of a new business.

Social capital particularly reduces transaction costs in markets characterized by weak contract enforcement and poorly defined property rights by creating trust between agents (Landa, 1994). Opportunism is likely to occur in situations where there is inadequate access to courts and the legal system to enforce contracts, in imperfect markets, and where property rights are weak. Landa argues that the lack of an effective legal system and market imperfections create/ find their own remedies. As frequent transactions occur and some form of information is shared during these transactions, a basis for trust and further cooperation is created. Traders develop a routine/practices that makes transactions more convenient, resulting in the formation of informal

“institutions” that facilitate trade. Entrepreneurs not only engage in exchange but also structure the rules of the transaction. Transactions characterized by trust will yield better profits and mutually beneficial outcomes.

Middlemen play multiple roles in such settings. They create markets, bring together buyers and sellers, they provide information, reduce search costs, exploit economies of scale, and create trust between buyer and seller (Landa, 1994) Middlemen deal with both suppliers and buyers so they can create a “ridge of trust” between buyers and sellers who do not trust each other but trust the middleman. This trust reduces costs associated with searching for trading partners or prices, getting acquainted with partners, negotiating the exchange and the anxiety of getting a good deal or being cheated. (Klein, 1997).

A study in China (Zhang & Hu, 2011) found that contracts and trust function as complements. Furthermore, a positive relationship between environmental uncertainty and the use of contractual governance was found. That is, the more the organization is uncertain about the information regarding the situation/environment it is operating under, the more likely they are to use contractual agreements. Another study (Cai et al., 2010) found that legal protection as an institutional force did not have any effect on trust or information sharing. This could be due to the traditional culture that sees law as an administrative tool unlike in Western countries where formal contracts and legal protections provide reassurance. However, traditional systems significantly affected the level of trust between trading partners. Informal socialization between manufacturing firms also played a greater role than formal socializations in improving supplier relationships in manufacturing firms (Cousins, Handfield, Lawson, & Petersen, 2006). Good supplier relationships reduce supply chain costs, increase flexibility and shorten product development time by promoting accurate information sharing (Kalyar, Naveed, Anwar, & Iftikhar, 2013) . However, very close relationship of supply chain agents was found to negatively affect knowledge acquisition as it might have prevented agents from obtaining information from other sources and when there is high level of trust the need to monitor action and negotiate deals might decrease leading to lower processing of information and thus lower knowledge acquisition (Cousins et al., 2006).

## **2.6 Institutions and transaction costs**

Institutions are “the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction” (North, 1990, p. 3). Institutions (formal and informal) are the rules and procedures that shape social interaction. Formal institutions are the official structures that include government, markets, labour unions, legal systems, financial institutions, courts and grading systems (Helmke & Levitsky, 2004). These institutions can impose restrictions directly through authoritative orders and indirectly through rules or incentives (subsidies or tax). Informal institutions are “unofficial” values and customs that influence behavior through social obligations and expectations (Helmke & Levitsky, 2004). They can also be termed as non-market institutions. Non-market institutions are the interactions between different economic agents that are not mediated through the market. These expectations can enforce “contracts” even in the absence of government or other formal institutions.

Examples of informal/non-market institutions in Ethiopia are Iddir and Ikkub. Ikkub is a traditional saving and credit institution with a rotating fund where people form groups and contribute a fixed amount of cash into a common pool periodically (weekly, biweekly or monthly or any other agreed interval). Then each member of the group receives the whole sum of the contribution one after the other based on a lottery system. This fund is usually used by the individual to buy expensive consumption goods, to start or expand a business, to save and as collateral to borrow from members outside the group. Iddir is another institution, which mainly provides financial and moral support during death/funeral service. Members of the group contribute small sums of money monthly or biweekly and in return social and financial support is provided during funerals. These institutions are common throughout Ethiopia and arise privately (without any government involvement or direction) to meet the needs of the community.

Institutions have been shown to play a major role in supply chain organization and management, especially in developing countries (Alemu, Maertens, Deckers, Bauer, & Mathijs, 2016). One of the main roles institutions play is lowering transaction costs. The transaction cost approach in Economics deals with the transaction as the main unit of analysis, unlike the neoclassical approach which considers price analysis and equilibrium as the main points of interest. There are three main transaction costs - search, negotiation, and monitoring and enforcement costs. Absence of market signal regarding a product’s quality, price or demand creates information

search costs, called search costs. For instance, to know the price of chickpea a buyer needs to go to the open market and ask around a few shops before determining the on-going price of chickpea. Spot market transactions increase time to find buyers and sellers and negotiate exchange, creating negotiation costs. E.g. If there are different quality chickpeas with different prices on sale by many different farmers/sellers; one needs to negotiate with individual sellers to reach agreement on the quality and price of the chickpea. Lack of legal institutions to enforce agreements increases the tendency to violate contracts and it is time consuming to resolve such disputes. This creates monitoring and enforcement costs.

The major reasons for the existence of transaction costs are bounded rationality, opportunism, asset specificity and information asymmetry. Bounded rationality refers to an individual's limitation to obtain or process all the information needed to make rational decisions in today's complex world. In addition, bounded rationality limits the completeness of contracts in that during the signing/writing of contractual agreements, it is hard to foresee all the issues that might arise and thus contracts might not be fully contingent. Therefore, an individual's action might not always be optimal. Opportunism refers to the selfish nature of individuals in seeking their own interest at the expense of others. Opportunistic behavior could lead to low information sharing between trading partners as one partner hides information about the quality or other characteristics of a product.

Asset specificity arises when one party in the transaction has made a significant investment in the relationship that cannot be used easily in other transactions. This could lead one party to act opportunistically. For instance, once a processor invests in a facility to produce and test RUTF quality, the buyer can lower the price he offers for the end product or require frequent upgrades to machinery. The processors would be forced to comply if there are few alternative RUTF buyers. Or the processor can demand higher prices since there are no other RUTF producers in the region. Information asymmetry refers to the possibility of one or both parties having hidden information prior to a transaction or hidden (unobservable) actions following a transaction. This can erode trust between trading partners and lead to fewer transactions. When a transaction does occur, it becomes less efficient due to the search and negotiation costs.

In the absence of formal institutions, opportunistic behavior is more likely. When such behavior is possible, agribusinesses may prefer to have contracts instead of trading in the spot market

(Hobbs, 1996). A study in Northern Ethiopia has found that product characteristics (quality adulteration and perishability), market information and firm characteristics significantly influenced agribusiness to conduct transactions through contracts instead of the spot market (Alemu & Adesina, 2015). The study also found that credit based payment options, where payments can be done later, determine the decision to use contracts. A similar study also found traders are more likely to vertically coordinate to get credit from suppliers (Alemu et al., 2016). In addition, studies show that farmers using services provided by institutions like credit unions have higher farm productivity and that institutions enhance a farmer's market orientation (Gebremedhin et al., 2009). It was found that productivity of honey producers in Northern Ethiopia increased when transacting under contract; better access to technology and skill transfer were the reasons production increased under contract and having a contractual agreement with a trader offered motivations for the farmers to increase production and supply their output to larger markets (Alemu et al., 2016).

## **2.7 Market Institutions and Government Policy in Ethiopia**

Institutions play a role in the development and effectiveness of supply chains. Pressure from members in an institution may make firms keep on operating through traditional trading/communicating channels rather than adapting new innovations in supply chain organizations (Bello, Lohtia, & Sangtani, 2004). These institutions can have regulative, normative, or cultural–cognitive effects. The regulative element refers to the demands of governments and regulatory bodies like courts to comply with laws and other requirements. They can impose restrictions directly through authoritative orders and indirectly through rules. Or they can influence/induce action through incentives in the form of subsidies, taxes and tariffs. For instance, fear of a court ordered sanction for violating a contract can provide enough incentives for contract partners to adhere to their agreements. Enforceable contracts or even trust between supply chain actors is found to improve logistics performance and confidence in market information (Kalyar et al., 2013). Society's values and norms influence behavior through social obligations and expectations. These expectations can enforce “contracts” even in the absence of government or other formal institutions. Therefore, trust and informal institutions play a role in reducing transaction costs in a supply chain.

Governments have promoted the growth and development of efficient supply chains in developing countries by investing in and subsidizing the agriculture sector (Reardon et al., 2012). Examples are the ways the Indian government has encouraged development through investments in research, irrigation canals, transport and communication technology. The Ethiopian government has also increased attention to agriculture and agricultural markets (MANR, 2017). Although there have been improvements in the Ethiopian agricultural sector over the last few years, there is still great potential in terms of improving production and productivity. The major factors contributing to low productivity are smallholder farmers' limited access to modern inputs, financial services and agricultural markets (Chaka, Kenea, & Gebresenbet, 2016; Gabre-Madhin, 2001). These issues are also some of the challenges in Ethiopia to increasing local RUTF production to meet current demand (Isogai, 2011).

In order to address these challenges the government has implemented different policies and strategies and has increased expenditure on the agriculture sector. Since 1991 Ethiopia has been following Agricultural Development-Led Industrialization (ADLI) that recognizes agriculture as the engine of growth. The main purpose of this strategy has been to improve market access, rural infrastructure, and access to financial services and promote proper use of land. In line with this strategy, both the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and the Five Year Growth and Transformation Plan (FYGTP) established in 2005-2010 and 2011-2016, respectively have specific agricultural development strategies of establishing effective agricultural marketing systems and specialization, diversification and commercialization of agricultural production (MOFED, 2006, 2010).

According to the midterm review of the Agriculture Sector Policy and Investment Framework, agricultural production of major food crops grew at an annual average rate of 10.3 percent which was credited to the rapid adoption of improved agricultural technologies and improved infrastructure and access to credit and extension services (Chipeta et al., 2015). During the first FYGTP, the use of chemical fertilizers increased by 10 percent per annum in terms of area to which they were applied, and by 24 percent in terms of quantity. Similarly, the area benefiting from improved seeds increased by 24 percent per annum, while the seed quantity increased by 17 percent per annum. But the program was not as effective as expected in addressing smallholder



farmers because households are heterogeneous and a specific policy was not set to take this into consideration (Chipeta et al., 2015). Some of the specific programs launched and institutions established aimed at addressing smallholder farmers and agricultural markets are discussed below.

### **2.7.1 Ethiopia Commodity Exchange (ECX)**

The establishment of the Ethiopian Commodity exchange (ECX) in April 2008 by the government of Ethiopia was intended to improve the efficiency of the agricultural market and decrease market costs. According to the institution's statement, the mission of the ECX is to connect all buyers and sellers in an efficient, reliable, and transparent market to create opportunity for growth in the commodity sector and create industry linkage (ECX, 2009). It was established to deal with marketing export commodities, minimize the involvement of middle men in the supply chain and provide a price signal to farmers to lower the high disparity between end-user prices and farm gate prices at which farmers sell their produce. The ECX mainly deals with coffee, sesame, haricot beans, maize and wheat (ECX, 2009). It facilitates long-term legally binding contracts between farmers and traders, which is believed to reduce market risk. ECX works with 11 settlement banks to facilitate trading. It also has a Compliance Division which monitors and enforces member's contracts and an Arbitration Tribunal to deal with disputes between members or between the company and members (ECX, 2009). It benefits small-scale farmers, by providing better access to information regarding quality and prices of product which improves their profit by lowering their market cost. The Ethiopian Commodity Exchange has warehouses in 16 major locations in Ethiopia which offer an integrated warehouse system from the purchase of quality commodities based on the grades and standards for each traded commodity to the ultimate delivery of end-users (ECX, 2009). Commodities are deposited in warehouses operated by ECX in major surplus regions of the country. At the ECX warehouse, commodities are sampled, weighed and graded using grading technology and weighing equipment and then certified. Sales occur through open outcry trading system, there are more than 200 different spot contracts that are traded by the ECX members (ECX, 2009).

ECX disseminates market information to all market actors through rural based market information ticketers, mobile phone short messaging services (SMS), mass media and its website. Electronic displays, located in 200 strategically selected regional market sites, put on

view the traded commodities prices, commodity offers to sell and bids to buy in real time (less than 4 seconds) (ECX, 2009)

Currently only major export commodities like coffee, sesame, haricot bean, in addition to maize and wheat are the commodities handled by the company. It is illegal to trade coffee or sell export quality coffee on domestic markets since 2009 (FAO, 2014). Though it has been argued that a significant amount of foreign currency has been earned through improved markets for exports, specifically through coffee (ECX, 2009), an expansion in terms of including other commodities would further improve the market for agriculture and reduce transaction costs as it provides market information, grades and certifies commodities, and monitors contract enforcement in partnership with partner financial institutions. The positive and significant impact of ECX on the Ethiopian coffee price has been disputed (Hernandez, Rashid, Lemma, & Kuma, 2017) but the institution's performance with respect to other commodities and other dynamics is not yet fully assessed.

### **2.7.2 The Ethiopia Grain Trading Enterprise (EGTE)**

The Ethiopian Grain Trade Enterprise was established by the Ethiopian government in 1949 under a different name but it has been renamed and reorganized through the years to its current role of purchasing grain, oilseeds, coffee and pulses for local wholesale and export. The Enterprise has 10 branch offices and 91 trade centers throughout the country. It procures and exports chickpea among different pulses. It buys different pulses from wholesalers and smallholders and supplies it to consumers, local food processing companies, the government and non-governmental organizations. It generates a significant foreign currency and income for the country through the sale and export of oilseeds, coffee and pulses (EGTE, 2017). In addition to supplying commodities, it owns and rents storage facilities, owns heavy and light trucks to facilitate transportation and provide transportation service when required, operates cleaning and bulk packing facilities, grades and issues quality certificate (EGTE, 2014). Its main role is to stabilize local agricultural markets and to promote export of agricultural commodities.

### **2.7.3 Agricultural Growth program (AGP)**

The Agricultural Growth Program (AGP), established in 2011 is a wide-ranging program with the aim of creating sustainable growth in agriculture. It is part of the five-year growth and transformation plan that had existed earlier but the current program is more focused on

underdeveloped areas (woredas). It currently works in 96 woredas to increase the competitiveness of value chains and the productivity of actors in the supply chain - this includes smallholders, commercial farmers, traders, processors and exporters. The targeted commodity value chains are Sesame, Chickpea, Coffee, Honey, Wheat, Maize, Teff, Barley, Livestock, Meat, Dairy and Sorghum (Berhane et al., 2013).

AGP-Agribusiness Market development program which is one of the programs under AGP has been successful in establishing “market linkages for Farmers’ Cooperative Unions (FCUs), assisting FCUs in obtaining seats at the Ethiopian Commodity Exchange (ECX), facilitating more exports by funding the construction of warehouses and promoting out grower schemes as a way to control the quality of available output for trade” (USAID, 2012).

#### **2.7.4 Financial Institutions and Cooperatives**

The expansion of the Commercial Bank of Ethiopia (with more than 700 branches in the country), cooperative banks and emergence of government backed microfinance institutions in Ethiopia is expected to improve smallholders access to financial services and loans which could be used to invest in farm land and productivity. But banks are reluctant to loan to the agricultural sector as it is perceived riskier due to fluctuating prices and its dependence on natural conditions. The Ethiopian government has stated its strong interest in providing financial institutions for the agriculture sector but the increased financial investment to other sectors/projects have made it harder for agri-business to access financial services (USAID, 2012).

Cooperative membership has been found to have varying effects for different farmers. Studies found that agricultural cooperative membership positively impacted fertilizer adoption while non- agricultural cooperatives memberships had a mixed impact on farmers in Ethiopia (Abebaw & Haile, 2013). Being a member of a cooperative was found to reduce the farmers’ probability of participation in wholesale, retail and consumer markets which usually have better price offers than farm gate trading (Tefera, 2014). Another study has found the effects of microfinance institutions to be contrary to expectations and had relatively no impact on increasing agricultural incomes (Tarozzi, Desai, & Johnson, 2015). The slow process of deciding and signing a contract has also affected the performance of farmers in cooperative unions (USAID, 2012). Since

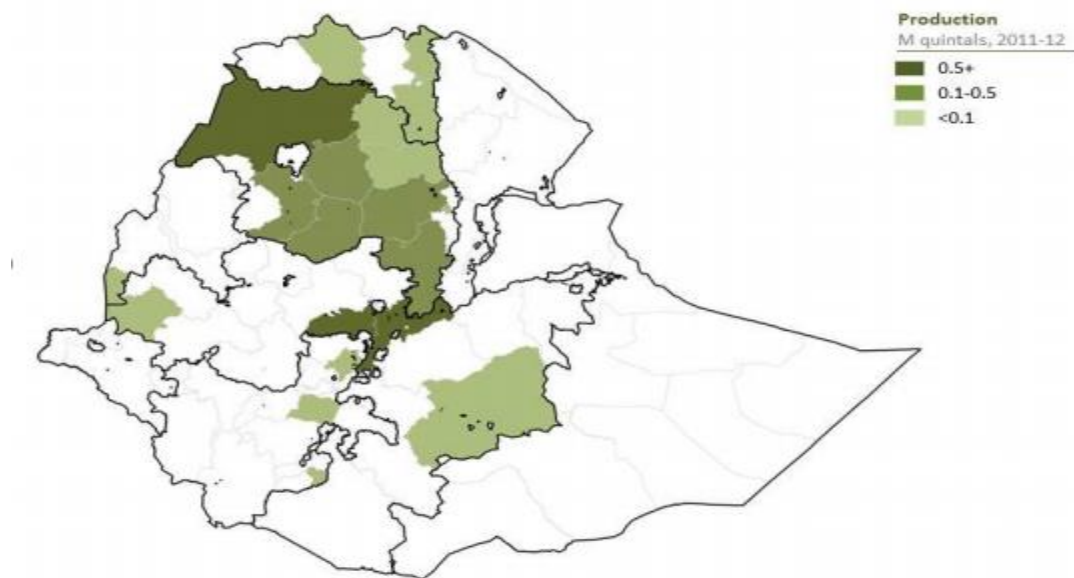
cooperatives have failed to effectively address the small holder financial needs, it calls for an analysis of another “institution” that might be effective.

## 2.8 Market Structure and supply chain of chickpea

As has been discussed, agricultural supply chains in Ethiopia face a number of challenges including poor information flow, lack of transport and warehouse services (Chaka et al., 2016). The supply chains of chickpea which can be used as an ingredient in RUTF production, and is the primary focus of this thesis, is no different.

Chickpea is mainly produced in select areas of Amhara (North Gondar) and Oromia (West Showa), regions accounting for 92% of total production (AGP, 2017). Figure 2.3 shows the regions where chickpea is primarily grown. Ethiopia mainly produces the Kabuli and Desi type of chickpea. Kabuli is larger and has a creamy white colored seed coat while the Desi chickpea, which is more widely grown in Ethiopia, has a smaller size and a reddish- brown colored seed coat (Kassie et al., 2009). Chickpea has high resistance to drought and farmers grow it after the main rainy season has passed which allows them to grow a second crop (Kassie et al., 2009).

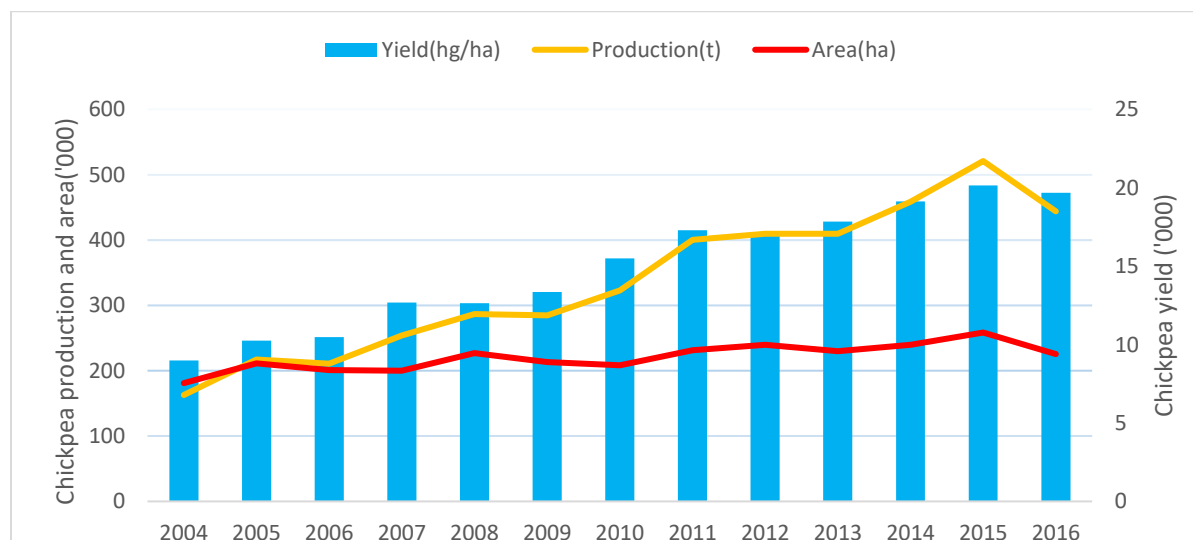
Figure 2.3 Primary chickpea growing regions in Ethiopia



Source: EIAR, MOH and EATA, 2013

Production volumes of chickpea have been increasing through the years though the crop is not well established and other crops like teff still dominate overall production. However, from the different pulses grown chickpea accounted for 15% of total production and 14% of total land in 2014; faba bean and haricot bean combined take 50% of both the land and total production of pulses (Kassie et al., 2009; Ojiewo, 2016). Chickpea production has grown over the years though the areas of production have remained the same. The increase in production volumes is mainly due to increase in productivity/yield of the crop. Figure 2.4 shows the trend in Ethiopia in chickpea productivity, land allocation (area) and production amount from 2004 to 2016. The figure shows that the area of land allocated to chickpea has increased by 24% in 2016 from its value in 2004 while production has increased by 173% in 2016 from its initial value in 2004. Adoption of improved varieties of chickpea increased from 30% in 2007 to 80% in 2014. Eighty percent of the chickpea produced is sold in the local market due to low volume available for export, unreliable supply, failure to meet quality standards and numerous actors in the supply chain that make it long and increase transaction costs. These factors reduce the incentive for the increased involvement of exporters. Ethiopia’s chickpea exports account for 63% of total chickpea export in the continent. However, it accounts for only 4% of the world export in value and volume.

Figure 2.4 Trend in chickpea production, yield and area harvested in Ethiopia



Source: FAOSTAT, 2017

There are three major market structures classified as primary, secondary and tertiary markets based on the different actors involved in the supply chain (Abera, 2010). Primary markets are rural spot markets where most smallholder farmers sell their outputs. They mostly sell to nearby rural actors (travel between 1- 10 km to reach the primary markets) like direct to consumers, rural assemblers and retailers, brokers, and primary cooperatives. Farmers bring their produce by carrying it on their back, by donkey or by horse driven carts. Primary markets, administered by the municipality, are usually held once a week and smallholder farmers trade small quantities (20kg-300kg). There is a slight price difference among buyers based on negotiation skills but there is no clear quality grading mechanism except by visual examination of size, color, pest damage and amount of foreign material in the chickpea. Chickpea price increases as it moves further from the area of production so farmers may also take their produce to a woreda (a small administrative division) markets based on distance, transport cost and price differential in order to sell to consumers, wholesalers and retailers at the woreda level (Abera, 2010).

Secondary markets are markets at the woreda level where produce is exchanged in larger quantities and rural assemblers and rural retailers sell chickpea to woreda and urban wholesalers, urban retailers and consumers. There is no standard grading technique at this stage either except for visual inspection. Tertiary markets are markets that include urban wholesalers, processors, exporters, small retailers and supermarkets. Urban wholesalers are the major supplier to urban retailers and exporters and are based in the major market (Merkato) in Addis Ababa, the capital city of Ethiopia (Abera, 2010). Urban wholesalers use mainly brokers (agents) to buy and sell chickpea from and to different actors in the supply chain. It is difficult to trace the accurate origin of chickpea delivered to the wholesalers. But wholesalers sell chickpea to retailers, processors, supermarkets and exporters in Addis Ababa and other chickpea deficit areas in the country as chickpea is mainly produced in the Amhara and Oromia regions. The Ethiopian Grain Trade Enterprise also buys and sells chickpea in addition to the wholesalers in the tertiary markets (EGTE, 2017).

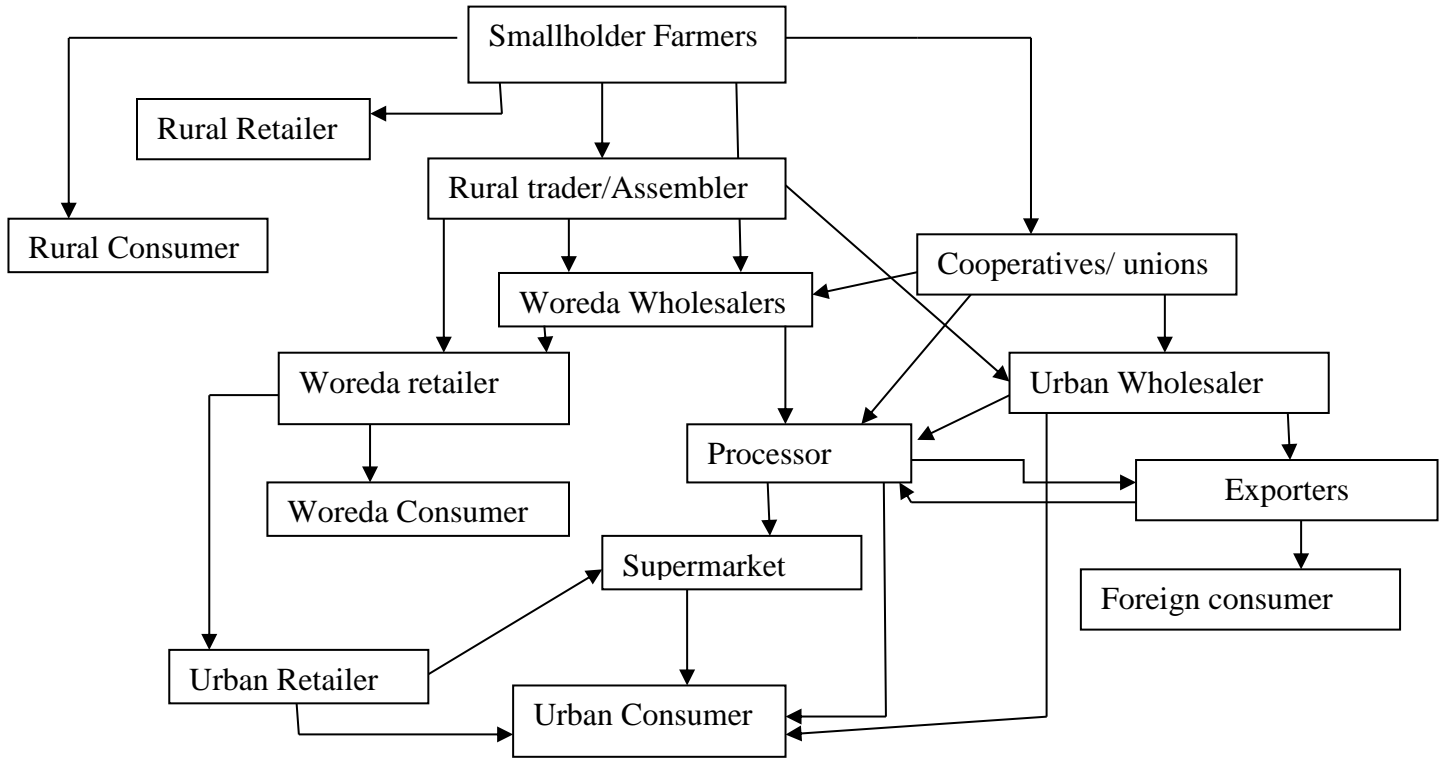
At the tertiary market level, there are two types of processor - large food-processing companies like FAFA, Health Food, Green Star and Guts Agro that buy large amounts of chickpea from wholesalers and brokers mainly in Addis Ababa and small-scale business that buy small

quantities from wholesalers from the nearest market to process traditional chickpea based foods like *Shiro* powder (ground chickpea with spices) and *Kolo* (roasted chickpea) to the local markets (Abera, 2010). Due to the government promotion of Micro and Small Scale Enterprise development, especially in the food processing sector, small food processing business are many in number and face the challenge of hard competition. Exporters own their own buying points in major towns, cleaning and grading facilities and are highly organized. A number of pulse exporters have come together and formed the Ethiopian Pulses, Oilseeds and Spices Processors and Exporters Association (EPOSPEA) as major pulses are not handled by the Ethiopian Commodity Exchange. The objectives of the association are to “establish market information and market linkage, build advocacy capacity and strategy on policy formulation process, provide training service for members, and create participation opportunities in international trade fair and exhibitions” (EPOSPEA, 2017). The Ethiopian Grain Trade Enterprise is also an exporter of chickpea (EGTE, 2017).

Most farmers sell at the primary market/spot market where prices are lower due to transportation cost and lack of resources to produce large quantities to make travel worthwhile to a woreda, where prices are higher. (Shiferaw & Teklewold, 2007). The actors at the bottom of the chickpea supply chain are the urban retailers and supermarkets that trade the final product-processed or unprocessed- chickpea to end-users. Supermarkets get their supply of chickpea from processors and urban wholesalers while urban retailers get their supply mainly from urban wholesalers. Brokers and transporters play an important role in each stage of the supply chain and grading facilities play an important role at the tertiary market level (Shiferaw & Teklewold, 2007). The value chains that exist in the chickpea market are identified below in Figure 2.5.

The product moving along the value chain experiences little change in form - mainly unprocessed chickpea passes along the supply chain. Lack of grading and quality control systems, and asymmetry of information, especially about export demand and prices are also severe constraints in chickpea marketing (Abera, 2010; Shiferaw & Teklewold, 2007).

Figure 2.5 Marketing Channels and value chains of Chickpea



Source: (Abera, 2010; Shiferaw & Teklewold, 2007)

A study in the Aba-Liben woreda in Ethiopia found that Desi Chickpea producers sold their products to long standing customers at a lower price while producers selling to new customers sold at a higher price (Shiferaw & Teklewold, 2007). This was explained as a reduced information/search cost associated with regular customers and the additional search cost of looking for a new customer. In the same region, the quality of chickpea did not increase its price as grading existed only at the export level and not in the primary markets. In markets where grading exists quality fetches a better price. The major challenges in the chickpea supply chain include lack of information regarding changing prices and demand; quality requirements; lack of grading equipment and facilities; low productivity and production level due to lack of access and knowledge on the use of pesticide and improved seed (USAID, 2012).



### **2.8.1 Transaction costs in chickpea supply chains**

Chickpea farmers trading in primary and secondary markets incur high negotiation costs, especially price negotiation due to several reasons. First, the limited options they have in selling their produce in other markets puts them at a disadvantage to the buyers who threatens to not buy unless the price is reduced. As could be observed in many markets around Ethiopia, a considerable amount of time is lost in negotiating price between traders. Second, lack of standard quality or grades in both commodities gives a reason for buyers to demand a lower price due to quality uncertainty or the producer to demand higher price claiming that his products quality is high. Such arguments take the time and energy of both the buyer and producer and appear legitimate as it is only by visual inspection that quality is determined. In the traditional market, chickpea is identified based on its area of production (origin). However, the most popular method currently is grading based on physical observation, amount of dirt (foreign matter), bean size and color, damage due to pests or handling. Modern methods of chickpea grading are done only at the export market level based on the Ethiopian Quality and Standards Authority (EQSA) criteria.

The absence or inaccessibility of standard quality and grading facilities by farmers makes monitoring or enforcing pre-determined arrangements or contracts difficult as farmers can put the visibly better looking crop at the top and the lower quality crop at the bottom and sell the whole at the higher quality price. The mixing of different quality is a phenomena observed by any customers who has ever bought large quantity of grains from farmers selling their output at a road-side. The absence of traceability makes such opportunistic behaviour by the farmer more likely. This can be reduced if frequent transactions occur but since most producers sell small quantities, consumers, wholesalers or processors who buy from numerous sellers could not effectively identify which crop is whose. This monitoring cost makes transactions in such circumstances undesirable. This leads to a longer supply chain as buyers try to find a broker or an agent/broker who knows producers at the primary market (through frequent purchase) and try to buy chickpea through these agents. This cost can go beyond a one-time cost in developing countries as trading happens with numerous and varying sellers as the desired quantity cannot always be obtained from a single source or the same source every time. This is due to farmers

selling different amounts of their crop based on their need for cash and on the amount of produce they harvest.

Food processing companies and traders in Ethiopia have problems securing a constant supply of different inputs as signing of contracts is not easy due to trust issues; the cost of signing contracts with a high number of smallholders - each supplying a small amount; the violation of signed contracts and lack of judicial courts where legal action could be taken on defaulters; the low share of price that farmers receive are some of the reasons that push transaction costs higher and limit participation in existing agricultural markets (Alemu & Adesina, 2015; Gabre-Madhin, 2001; Jabbar, Benin, Gabre-Madhin, & Paulos, 2008).

## **2.9 Performance measures in agri-food and humanitarian supply chains**

In addition to the level of transaction costs that can measure the effectiveness of supply chains, there are other elements that can measure the effectiveness of supply chains. This section discusses the different performance measures used in agri-food and humanitarian supply chains. Performance indicators are the criteria with which the performance of products, services and production processes can be evaluated. A performance indicator helps to inform whether set/planned goals/targets are met; identify sources and areas of inefficiencies; discover where there is potential for improvement; compare competing alternative systems; and better inform the design and management of supply chains (Beamon, 1998). The conflicting goals of supply chain actors which prevents sharing of information which has strategic value to one firm but also to the overall performance of the supply chain makes information sharing and performance measurement difficult and complex (Aramyan, Oude Lansink, van der Vorst, & van Kooten, 2007). However different methods have been applied to measure supply chain performance despite these challenges. The main indicators used in the literature are discussed below. Measures can be either qualitative or quantitative.

Qualitative measures are measures that do not have a direct numerical measurement but they can later be quantified for analysis. Qualitative measures include customers' satisfaction, flexibility, information and material flow integration, risk management and supplier performance. Customer satisfaction is the satisfaction with a product or a service before purchase, during purchase and support given after purchase (during use of the product). Flexibility is the capacity of the supply

chain to deal with random changes or fluctuation in demand or other variables. Information integration is the level of information communicated within a supply chain. Material flow is how effectively materials are transported along the chain. Effective risk management is a measure of how agents in the supply chain manage the effects of the risk that is present due to uncertainty and opportunism. Supplier performance is the measure of the regularity of supplier in timely and in good condition delivery of raw materials.

Quantitative performance measures are directly described numerically. They can be based either on cost and profits or customer responsiveness. Measures based on cost include cost minimization, sales and profit maximization. Measures based on customer responsiveness include lead time minimization (time from production start date to end date), response time minimization (time from order placement to delivery to customer), maximize the number of customers whose orders are filled on time, product lateness minimization (minimize time between promised delivery date and actual delivery date).

In addition to the above measures, a study built a conceptual model to measure supply chain performance for small and medium scale agricultural markets in developing countries based on marketing performance that include effectiveness, efficiency, adaptability, food quality and customer satisfaction (Mutonyi & Gyau, 2013). Marketing margins and long-term buyer seller relationships (trust, satisfaction and power dependence) have also been used to measure performance in agricultural settings (Batt, 2003).

Humanitarian supply chains are different from other product supply chains and there is a need to adopt performance measures that are sensitive to such chains. The commercial supply chain aims to maximize profit and customer satisfaction while the humanitarian supply chain's main goal is to save as many lives as possible while efficiently using donor funds. Key success factors which measure whether an organization is meeting its objectives in the strategic, tactical and operational levels can be used to assess the success of humanitarian supply chain (Freund, 1988 as cited in Abidi, Leeuw, & Klumpp, 2013). The strategic level is an organization's plan/direction in deciding how to use its available resources. The tactical level is the method used to achieve the plans of the organization while the operational level links the strategic plans to the tactical methods (Awan, 2016).

Strategic, tactical and operational measures that are key success factors in humanitarian supply chains include sustainability, beneficiary involvement, qualified and experienced staff, inventory management, quality management, coordination, speed, flexibility and cost efficiency (Abidi, Leeuw, & Klumpp, 2013). Humanitarian projects have to be sustainable in such a way that affected areas are resilient and can develop the capacity to avoid humanitarian crisis in the further or deal with them effectively if they occur. Building sustainability and cooperation of local personnel is an important strategic measure of success. Standardized procedures and continuous care while the aid is required are additional strategic measures. Abdi et al (2013) outline factors (Table 2.1) that are key to a successful humanitarian supply chain based on a case study of four humanitarian aid agencies.

Table 2.1 Key success factors for humanitarian supply chains

Strategic level	Tactical level	Operational level
<ul style="list-style-type: none"> <li>• Sustainability</li> <li>• Cooperation</li> <li>• Performance measurement</li> <li>• Standardization of relief items, processes</li> <li>• Growth</li> <li>• Security</li> <li>• Independence and impartiality</li> <li>• Continuum of care</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination</li> <li>• Beneficiary involvement</li> <li>• Proper assessment and planning</li> <li>• Qualified and experienced staff</li> <li>• Inventory management</li> <li>• Long-term contracts</li> <li>• Quality management</li> </ul>	<ul style="list-style-type: none"> <li>• Speed</li> <li>• Flexibility</li> <li>• Local procurement</li> <li>• Order management</li> <li>• Cost efficiency</li> <li>• Enough staff members in the field</li> <li>• Availability of relief items</li> </ul>

Source: Abdi et al., 2013

The key success factors outlined in table 2.1 are used to qualitatively evaluate the RUF supply chain in Ethiopia. The funding and financial resources are addressed in the strategic level through measures that include sustainability, security and continuum of care. The interviews carried out with different stakeholders are discussed in the context of the above identified success indicators in humanitarian supply chains.

## **2.10 Conceptual framework**

The conceptual framework in this section builds upon the literature review discussed above which shows the positive role institutions play in improving the supply chain organization by lowering transactions costs. The framework includes the relationship between institutions, social capital and transaction cost along with the performance measures of supply chain to tie together the points discussed in the literature review. This section further discusses the components of the conceptual framework found in Figure 2.6. The discussion regarding institutions in this thesis primarily relates to domestic institutions. International institutions are also discussed as they do play a role in the RUF supply chains as international agencies are the main donors and buyers of RUF in Ethiopia. However they are not discussed in detail in terms of their role in lowering transaction costs or building/strengthening social capital.

Trust is an important element in explaining the behaviour of economic agents in economic transactions. Just as individuals' actions made in their own self interest will also be in the interest of all economic agents, the trust between economic agents is an important element in economic transactions (Berg, Dickhaut, & McCabe, 1995). Some degree of trust is also necessary for any transaction to take place. The economic theory addressing trust is based on reciprocity and reputation (Greif, 1993), suggesting that a person who acts in a trustworthy manner today can be trusted to act in a trustworthy manner tomorrow. One can build trust either by multiple repeated transactions or by observing how an economic agent acts in transactions with others. Reciprocity is acting in a particular way in the hope that others will act similarly. The trust/investment game carried out by Berg and colleagues, where two participants who do not know each other receive and give back money, shows that people have the tendency to reciprocate. The rules of the game are that the first partner has to send some money (including sending zero) to the other player. The amount the first player sends will be tripled by the experimenter and given to the second player. The second player likewise has to give back some money (including not sending anything) to the first player who sent him money. The result shows, unlike the prediction of economic theory that the first player sent about half of the original money and the second player sent back an amount greater than the original amount he received. A repetition of the experiment in different places and conditions has given similar results providing evidence that in economic dealings people have the tendency to reciprocate and trust the person they are dealing with in the expectation that it will be mutually beneficial (Johnson & Mislin, 2011).

This study examines the role of trust between trading partners in the Northern Ethiopia chickpea market. Though some level of trust is present in any transaction, an increased level of trust among trading partners or the perception of being trusted increases participation in transactions that would not have happened without that level of trust (Blandon, Henson, & Cranfield, 2009). Trust between trading partners also facilitates coordination among traders and improves the efficiency of a transaction (Dyer & Chu, 2003). In Northern Ethiopia, where markets for small scale agricultural products are either missing or are weak, trust can aid in the undertaking of transactions by minimizing the fear of opportunistic behaviour. Trust reduces costs associated with searching for trading partners or prices, getting acquainted with partners, negotiating the exchange and the anxiety of getting a good deal or being cheated (Klein, 1997). Trust has also been found to improve the rate trading partners are able to respond to changes in demand or supply (Handfield & Bechtel, 2002). Trust also improves logistic performance and the confidence of agents regarding prices and quality (Cai, Jun, & Yang, 2010),

Institutions are the frameworks that guide how humans interact with each other (North, 1990). They are the rules and procedures that shape social interaction and trading relationships. The absence or presence of institutions affect the trading relationship between partners through facilitating or impeding the way for information sharing, trust and cooperation (Cai, Jun, & Yang, 2010). The presence of effectively functioning institutions can build trust by imposing proper behavior through the provision of incentives for trusting a trading partner or the punishment or reduced gain from acting opportunistically or not trusting a partner. The presence of institutions and institutional systems can also build trust in transactions through the enforcement of contracts as default can be effectively traced or litigated (Hobbs, 2004; Zhang & Hu, 2011). Institutions have been shown to play a major role in supply chain organization and management, especially in developing countries (Alemu, Maertens, Deckers, Bauer, & Mathijs, 2016). Institutions through the development of trust and facilitation of information sharing can improve the performance of the supply chain. Institutions might also provide channels and opportunity to share information. However, institutions, particularly formal institutions that are characterized by corruption or biases can negatively affect trust and information sharing. Individuals might avoid the use of these institutions, prefer other informal institutions, or use formal institutions with caution as they believe they are corrupt and would not serve their best interest.

Transaction costs are the costs of obtaining information regarding transacting partners and terms of the transaction, negotiating a deal, and enforcing the terms of that deal are met. These costs can be high such that they might prevent a transaction from happening or they can alter the nature of the transaction (Coase, 2013). For instance, to mitigate transaction costs that arise from legal costs of signing a contract which addresses all the issues involved in carrying out a particular business, agents might revert to the spot market or integrate their businesses which might not be desirable had it not been for the transaction costs. Therefore, reducing or eliminating these costs is beneficial for all transaction parties.

The performance of the supply chain could be measured through flexibility, responsiveness, efficiency and product quality (Aramyan, Oude Lansink, van der Vorst, & van Kooten, 2007). Flexibility is the ability to adjust to change in market conditions. It could be measured by how the supply chain handles change in volume requirement, change in delivery time or level of customer satisfaction (Beamon, 1998). Information sharing could facilitate the communication of these changes and the subsequent expectations and required actions which reduced frustration and unmet expectations between partners. Responsiveness is how quickly and effectively products are delivered, it could be measured by the amount of orders that arrive on time and the length of time it takes to produce and deliver a product. Trust between trading relationship have been found to improve the responsiveness of supply chains (Handfield & Bechtel, 2002 ).

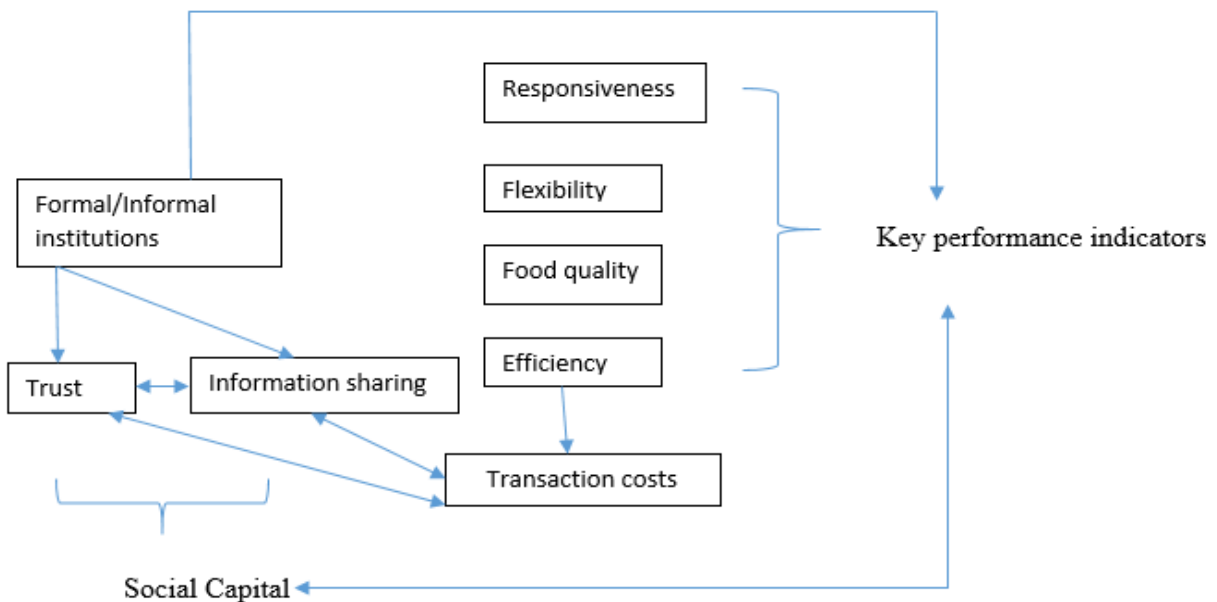
Efficiency could be measured through production, distribution and transaction costs. A minimization of these costs could lead to a more efficient supply chain. One of the roles institutions play is lowering transaction costs. Transaction costs are the cost of making a transaction. The existence of trust and information sharing reduce transaction costs by reducing the time and resource trading partners spend in searching for information regarding price and demand; by reducing time and resource spend in negotiating a transaction as trading partners are less likely to question the offer another partner makes as they trust the price offered is fair and one is not being cheated or taken advantage of; by reducing resources spent in guarding against default and enforcing agreements.

The other measure of supply chain performance is product quality which is measured in terms of shelf-life, product safety, product reliability and convenience (Aramyan et al., 2007). Institutions can facilitate product quality by providing facilities and standardized procedures to effectively

test the quality of a product and increase convenience and reliability. This does not mean that low quality products signal poor performance of the supply chain. A firm may choose a niche market of a low quality good with a corresponding low price. It rather measures the availability and proper identification of the desired quality, whether high or low quality.

The schematic representation of the conceptual framework is shown in Figure 2.6 below. The relationship between social capital and transaction costs and performance indicators is also bidirectional. A responsive, flexible supply chain enhances information sharing and trust. Lower transaction costs and an efficient system will also further promote information sharing and make information communication easier and information more easily accessible. Trust is also further strengthened by a system that has a history or reputation of efficiency and reduced production and transaction costs. Information sharing and trust also have a bidirectional relationship as trust increases information sharing between economic agents and information sharing trading partners trust each other. Though there is the problem of imperfect information which has the potential to change the interaction between institutions and individuals, it is not modelled in this framework.

Figure 2.6 The conceptual framework





## **2.11 Conclusion**

This chapter discussed the development of RUTF products and the supply chain challenges in both global and local production and delivery of the product. Major challenges include long delivery time, high transportation cost and expensive imported ingredients. The supply chain and the existing transaction costs in the chickpea sector which could possibly be used in the formulation of new, locally sourced RUTF has also been discussed. The challenges in these supply chains include weak legal institutions and absence of quality assurance and grading facilities. Social capital and its role in terms of improving supply chain performance by reducing transaction costs through building trust and increasing information has also been discussed. Key performance indicators could be used to measure the efficiency of the supply chain, to identify the major bottle necks in these supply chains and work towards a solution. Taken together, these elements inform the conceptual framework that is used to examine the role of informal institutions and trust in chickpea-based RUTF supply chains in Ethiopia.

## Chapter 3 : Empirical Methods and Results

### 3.1 Hypothesis of the study

Based on the conceptual framework developed in the previous section (section 2.10), this section states and tests a set of hypotheses. The hypotheses are developed based on the discussion in the conceptual framework and the literature review. The main research question of this thesis which is how informal institutions affect level of trust and information sharing in the RUF supply chain in Ethiopia is examined through the set of six hypotheses stated in this section. The other issue which the study intended to examine was the role the level of trust and information sharing played in household involvement in contractual agreements regarding chickpea marketing. However, the small number of observations obtained from the survey regarding contractual agreements (very few households with contractual agreements regarding chickpea) has limited the analysis. The initial examination of the relationship with trust and contractual agreements used a logistic regression model with contractual agreement as the dependent variable. Further discussion of the model and the results obtained from the trust regression analysis are attached in Appendix A.

Trust between trading partners facilitates coordination among traders and improves the efficiency of a transaction (Dyer & Chu, 2003). In Northern Ethiopia, where markets for small scale agricultural products are either missing or are weak, trust can aid in the undertaking of transactions by minimizing the fear of opportunistic behaviour. Trust reduces costs associated with searching for trading partners or prices, getting acquainted with partners, negotiating the exchange and the anxiety of getting a good deal or being cheated (Klein, 1997). Trust has also been found to improve the rate trading partners are able to respond to changes in demand or supply (Handfield & Bechtel, 2002). Trust also improves logistic performance and the confidence of agents regarding prices and quality (Cai, Jun, & Yang, 2010). Drawing upon these insights, the first hypothesis of this study is as follows.

*H1: An increase in trust between trading partners is associated with a reduction in transaction cost related with chickpea marketing.*

Trust is built based on a number of factors. According to Greif (1993), trust is built either by repetitive transactions where frequent dealing with trading partners establishes trust, or through the reputation of a partner in his dealing with other partners. In line with this theory reputation of

a trading partner is used as an indicator of trust in the model described in figures 3.1 and 3.2 below. In addition, an agent's judgment of the reliability, credibility, goodwill, ability and integrity of trading partners and satisfaction with trading partners is used to measure trust in transactions (Blandon et al., 2009; Yee & Yeung, 2010). Close relationship with and confidence in a trading partner are the additional two measures of trust that are relevant to this study. Trust can also be measured from the risk perspective where the level of trust is measured based on the agent's perception of the riskiness of the relationship/partnership (Laequddin, Sahay, Sahay, & Abdul Waheed, 2010). That is, trust is the willingness to participate in a transaction with the belief that the probability of an agent acting in one's favour is high (Williamson, 1993). However, even though included in the survey question for this study, risk is not used as a measure of trust in the model as the factor analysis (discussed below) failed to group it with the other measures of trust. The selection of these three indicator variables (reputation, close relationship, and confidence in trading partner) is discussed further in the methodology section.

Trust in exchange relationships also improves information sharing and coordination (Dyer & Chu, 2003). Information sharing can also reciprocally enhance trust in trading partners. Information sharing improves the level of trust by lowering uncertainty (Kwon and Suh, 2004). Good supplier relationships reduces supply chain costs and increases flexibility by promoting accurate information sharing (Kalyar, Naveed, Anwar, & Iftikhar, 2013). Hilary, Sseguya, & Kibwika (2017) found that the level, type and quality of information sharing was determined by the level of trust in rice value chains in Uganda. The four indicators of information sharing in the conceptual model described in figure 3.1 and 3.2 are extracted from 17 survey questions using both exploratory and confirmatory factor analysis. Based on the literature discussed, the following hypothesis is tested in the model:

*H2: An increase in information sharing between trading partners is associated with an increase in trust between trading partners.*

The absence or presence of institutions affects the trading relationship between partners through facilitating or impeding information sharing, trust and cooperation (Cai et al., 2010). The presence of effectively functioning institutions can build trust by imposing proper behaviour through the provision of incentives for trusting a trading partner or the punishment or reduced gain from acting opportunistically or not trusting a partner. Institutions might also provide the

avenues and opportunity to share information. Memberships in institutions such as cooperatives or farmers organizations was also found to lower transaction costs, increase marketed output and strengthen negotiating power (Barrett et al., 2012).

Grief (1993) and Landa (1997) both discuss non-market institutions that play a significant role in economic transactions. Their study of non-market institutions in different periods in history emphasised the importance of the interrelation between political, societal and economic factors. Non-market institutions refer to the interaction between different economic agents that is not mediated through the market. Landa discusses how “middlemen” create markets, connect buyers and sellers, provide information, reduce search costs, and create trust between buyer and seller. Grief discusses how 11<sup>th</sup> century tradesmen of the Maghribi tribe formed coalitions that had implicit contractual agreements and specific information-transmission rules. These coalitions reduced the opportunistic behavior of trading partners and created a reliable transaction environment based on reputation. Even when a merchant no longer had the intention of continuing a relation with other merchants, he dealt fairly and favorably with him to preserve his reputation. Greif mentions the story of a merchant who was handling another merchant’s pepper. Prices were low for the product and they were getting even worse so for fear that price would go down further, the merchant sold his partner’s pepper on the day a certain ship was departing. However, after this ship departed, another one arrived with buyers looking for pepper, so he sold his own pepper for a better price. To avoid appearing as a dishonest handler or not looking well after his partners dealings, he shared the profits from his own pepper sale with this partner even though he made it clear that he no longer wants to handle this partners business in the future. Other multiple stories are mentioned by Greif that show traders going the extra mile to guard their reputation or other traders losing profits due to ruined reputations. Even when formal market institutions exist informal institutions have been found to complement these institutions to improve market performance (Cai et al., 2010; Zhang & Hu, 2011). This study examines the role of such institutions in economic transactions, focusing on five formal and informal institutions to which survey participants belonged. The following four hypotheses are tested.

*H3: Membership in informal institutions is associated with an increase in information sharing between trading partners*

*H4: Membership in formal institutions is associated with an increase in information sharing between trading partners*

*H5: Membership in informal institutions is associated with an increase in trust between trading partners.*

*H6: Membership in formal institutions is associated with an increase in trust between trading partners.*

The remaining elements of the conceptual framework that are not addressed through the hypothesis, i.e. the performance indicators, are discussed later in section 3.7 through the insights from the interviews.

## **3.2 Survey design and Implementation**

### **3.2.1 Study area**

Data collection took place in Northern Ethiopia specifically in the Tigray region of the Lailay Maychew woreda in Aksum. Figure 3.1 depicts the location of Aksum in a map. The region was selected based on the higher production of Chickpea in the Tigray region. Chickpea farmers were selected from four woredas, namely Dura, Hatsebo, Mayweyni and Hadush Adi based on a list obtained from the woreda agriculture office. The list was based on the amount of chickpea production and the proximity to the woreda office. Farmers from the first four woredas on the list participated in the study. A total of 148 chickpea farmers were part of study. Retailers, wholesalers and small-scale chickpea processors were also included in the study and were randomly selected from the nearest markets found in Aksum, the capital city of the regional state, Mekelle and the capital city of the country, Addis Ababa. Interviews with key informants in the RUF supply chain included six food processing companies, 3 of which produced some form of relief food products, 5 RUFs buyers (government and NGOs) and four hospitals that have patients that use these products. The primary data was collected using structured questionnaires, structured interviews and focus group discussion administered by trained enumerators and the author in December 2017 and January 2018<sup>2</sup>. Mekelle University assisted in data collection by providing experienced research assistants, providing support letter to

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<sup>2</sup> The study received ethics approval from the University of Saskatchewan behavioural research ethics board (BEH number 17-374) on November 28 2017.

administrators of the research site and by identifying chickpea growing regions. The farmer survey included question regarding the socio-economic characteristic of households, chickpea production and marketing questions. The survey had questions that inform the relationship farmers have with their trading partners as well as the level of trust and information sharing between trading partners. It also had a section that gathered further information regarding the transaction costs involved in producing, selling and storing their crops. Farmers' participation in formal\informal institutions was also included in the survey. The survey instruments used are found in Appendix C. There are a number of challenges in data collection in Ethiopia including the difficulty of getting accurate data due to participant's bias towards responding in a way they think will please the researcher and fear of retribution if they say something negative against the government or senior administrators in their region. To minimize these challenges the respondents were assured in the informed consent information that their responses will not be shared with anyone and the personally identifying information page will be detached and kept separate from the information they provide. The use of research assistants from Mekelle University (instead of local research assistants from the woreda) who have a lower chance of personally knowing the respondents or the local administrators have lowered the above bias for the case of this study. In addition, the affiliation with Mekelle University who the participants are likely to see as an independent institution which uses data only for research is believed to have further reduced the bias. The use of qualitative data obtained from the focus group discussions and informal chats have given useful perspective and a better understanding of the data obtained from the surveys.

Figure 3.1 Map showing the location of Aksum



Source: <http://news.bbc.co.uk/2/hi/africa/7505957.stm>

The study areas were identified from a list provided by the region's Agriculture and rural development office. Contacts of agricultural extension workers for each kebele were also provided from the same office. The farmers that participated were identified with the help of these agriculture extension workers and community leaders. The agriculture extension workers asked chickpea farmers to come to a certain location for participation in a research study. The farmers were selected based on whether or not they produced chickpea. Only farmers who had previously grown chickpea were included in the survey, as the region was implementing a new program where breeder seed was being multiplied through a contract agreement with farmers and a number of farmers who had not grown chickpea previously were involved in these programs. These farmers were not included in the study as they have not yet harvested chickpea.

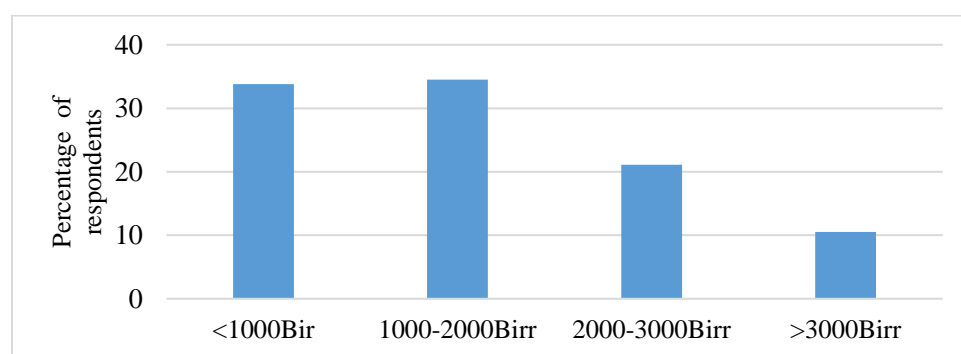
### **3.3 Descriptive statistics**

#### **3.3.1 Background and socioeconomic characteristics**

Table 3.1 shows the descriptive statistics of the farmer survey sample population. The majority of the farmer survey participants are men (78%) and most households are male headed (88 percent). Mean household size was seven. The mean age of the participants is 45 years. About 80 percent of the participants had some formal education while 13 percent had some post-primary education, which is higher than the national adult literacy rate which is 39 percent

(UNSECO, 2007). Average household income was 1654 Birr per month with 68.3% of households earning less than or equal to 2000 Birr per month (Figure 3.2). Most households own mobile phones (79%) and a radio (56%). Mobile coverage is higher than the average for the country's population which was around 50% in 2016 (Statista, 2018). Figure 3.3 shows household's ownership of other equipment such as radio and transportation vehicles. Twenty one percent of the respondents were tenant farmers who did not own the land they cultivated but rented it from other landowners (family, relatives or any community member) who could not farm their lands. Most times the agreement is to either share the harvest in half or some agreed percentage. Off-farm activity was limited, with 58% of farmers not doing any activity besides farming. The most common off-farm activity is daily labour where 14% of respondents participated.

Figure 3.2 Household income level per month (n= 142)



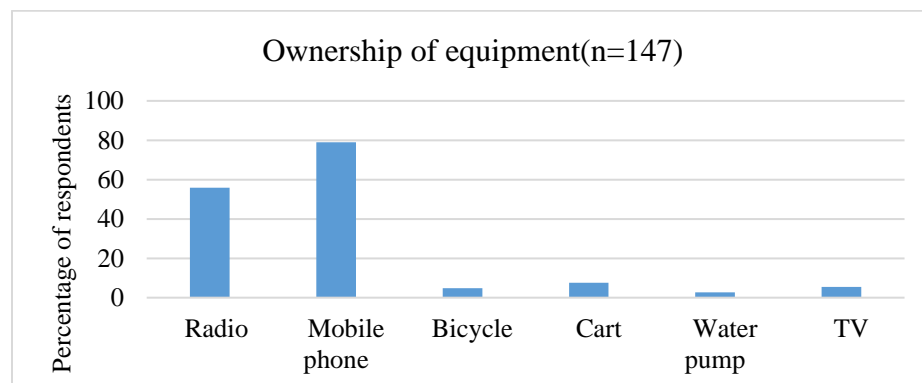
Source: Survey data from chickpea farmers



Table 3.1. Background characteristics of farmer survey sample

Background characteristics	Mean ( $\pm$ SD) N=148
Age	45.3 (13.5)
Household size	7 (2.20)
Gender (%)	
Male	78.4
Female	21.6
Household head (%) <i>n=147</i>	
Male	87.8
Female	10.9
Parents	1.4
Formal education (%)	
No formal education	19.6
Primary	67.5
Post primary	12.9
Usual occupation (%)	
Farmer	78.4
Tenant farmer	20.9
Off-farm employment (%)	
None	57.5
Daily laborer	13.6
Civil servant	5.4
Security guard	6.8
Builder(construction)	3.4
Trading	2.1
Spiritual activity	2.7
Tenant farming	4.8
Own Business	1.4

Figure 3.3 Farmer survey participant ownership of equipment (n=147)

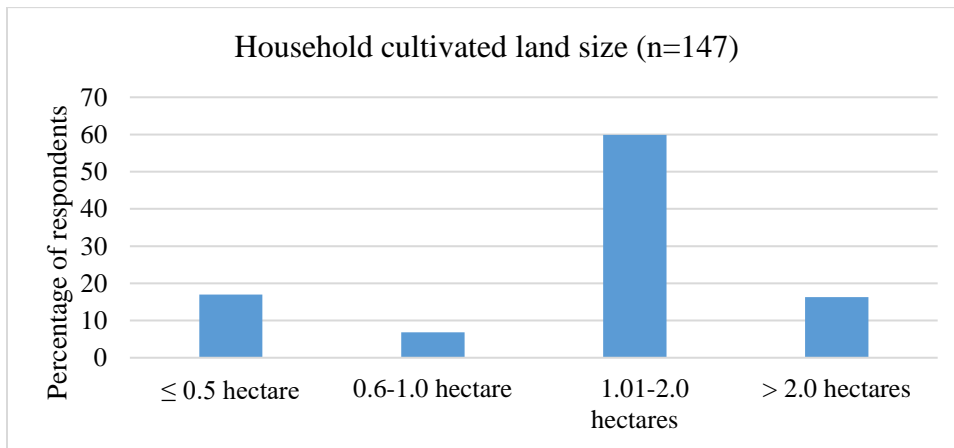


Source: Survey data from chickpea farmers

### 3.3.2 Agricultural and chickpea production statistics

As shown in table 3.2, about 76% of households owned the land they cultivated. The average size of land farmed and owned was 1.25 hectares, the median was 1.125 hectares and the range was 0.125 to 3.5 hectares. Figure 3.4 shows the distribution of cultivated land area across the survey participants. The agriculture office's statement of yield (1200kg/hectare) of the most commonly grown chickpea varieties is higher than the one reported by the households in the survey, which was 678.46kg/hectare on average. Sixty percent of survey participants reported a yield lower than 600kg/hectare, about 17% reported a yield above 1000kg/hectare and 23% reported a yield between 600 and 1000kg/hectare.

Figure 3.4 Farmer survey participant area cultivated (n=147)



Source: Survey data from chickpea farmers

The most common type of chickpea variety grown is the Desi variety. About 14% of the survey participants had traded chickpea for more than ten years, 19.5% had traded chickpea from six to ten years while 67% had traded chickpea for less than five years. Forty nine percent of participants use fertiliser, pesticide and improved seed on their farms while 46.66% use fertilizers and pesticide. These inputs were mostly obtained from the local government office (for 77% of households). About six percent of household bought their inputs directly form the market.

All households had access to agriculture extension workers who can provide training on how to cultivate chickpea and use fertilizer, improved seed and pesticide, information about demand/price of chickpea, and information about services available to farmers. Households who

obtained their price information from agriculture extension workers were more likely to engage in microfinance and breeder seed contractual agreements (regression results attached in Appendix A). Of the total 148 survey participants, 110 households had no written agreement with respect to chickpea transaction. The remaining households had written agreements regarding credit from microfinance institutions. Seven households have agreements with the government/farmer unions to take a special type of seed, plant it on their land and then sell the harvest to the government/union at a good price. Twenty three households had written agreements about price, quantity, quality and/or delivery time of chickpea.

Surplus chickpea is stored inside the house by 92% of households. Only about 5% had a separate storage facility and 2% did not have any surplus to store. The most common reason for storing surplus is for the purpose of both home consumption and seed (44%) while 30% store it just for home consumption. Twenty percent of households store chickpea, along with other reasons, to sell when prices go up. The sole reason for storing surplus was to sell when price goes up only for 3.4 % of households.

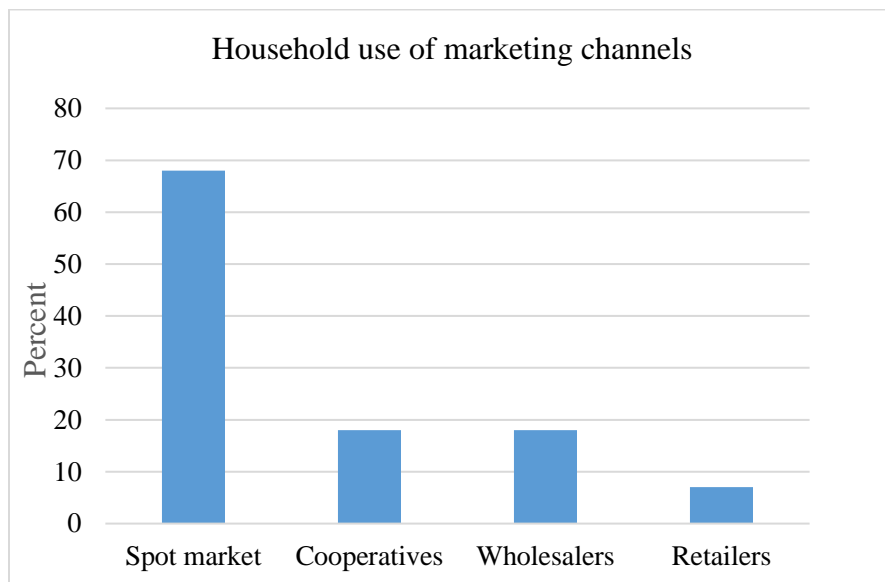
Table 3.2 Household land ownership and chickpea production

Background characteristics (n =148)	Percent (%)
Ownership of cultivation land	
Own land	76.2%
Own land and tenant land	16.4%
Relative/family land	3.4%
Tenant land	2%
HH cultivated land size	
≤ 0.5 hectare	17%
0.6-1.0 hectare	6.8%
1.01-2.0 hectares	59.9%
> 2.0 hectares	16.3%
Amount of harvested chickpea	
Low(<250kg)	48.6%
Average(250-500kg)	36.5%
Moderately high (500-750kg)	6.1%
High(>750kg)	8.8%
Yield (%)	
Low (<600/Hec.)	60%
Average (600-1000kg/Hec.)	22.8%
High (>1000kg/Hec)	17.2%

The common informal institutions were Iddir and Ikkub. Iddir is the most common with 54.1 percent being a member. It is a type of social capital that people use during funerals. Members contribute a small amount monthly and they benefit from the provision of labour and materials ranging from tents to cooking and eating utensils and some cash following the death of a family member. Funeral ceremonies are events that require a significant expense in Ethiopia thus individuals use this as an insurance. It is rarely used for agricultural related activities. About 35 percent of households are members of an Ikkub. Ikkub is a form of informal credit institution where members contribute cash periodically and a lottery system is used to give the collective sum to each member in each round. The length of the round is based on agreement among members and it can be either weekly, biweekly, monthly or any agreed length of time. About 47 percent of households used the money obtained from Ikkub to buy seeds, fertilizer or pesticide. Of these households, about 50 percent used money from Ikkub only occasionally for costs related with chickpea production and marketing.

Cooperatives and farmers associations are also common in this region, with almost 60 percent of surveyed households being members. Different types of cooperatives exist in the region including multipurpose coops, irrigation, saving and credit, dairy, and livestock cooperatives etc. This study did not differentiate between the different types of cooperatives. Agricultural output marketing through these cooperatives or farmers associations are very low, in particular for chickpea, instead they are mostly used for input purchases and for marketing of *Teff*. Only 17.8 percent of the participants sold their chickpea output to cooperatives or government agencies. This finding is in line with other studies in the region that found the use of cooperatives mostly for agricultural input purchasing (Atsbaha, 2008). Most households preferred selling directly to consumers (68 percent) as they stated it offered the highest price for their chickpea. Households also sold chickpea through wholesalers (18 percent) and retailers (seven percent). Figure 3.5 describes the marketing channels used by survey participants for chickpea. The major deciding element in choosing a marketing channel was the difference in price offered for 40% of participants.

Figure 3.5. Marketing channel used for chickpea



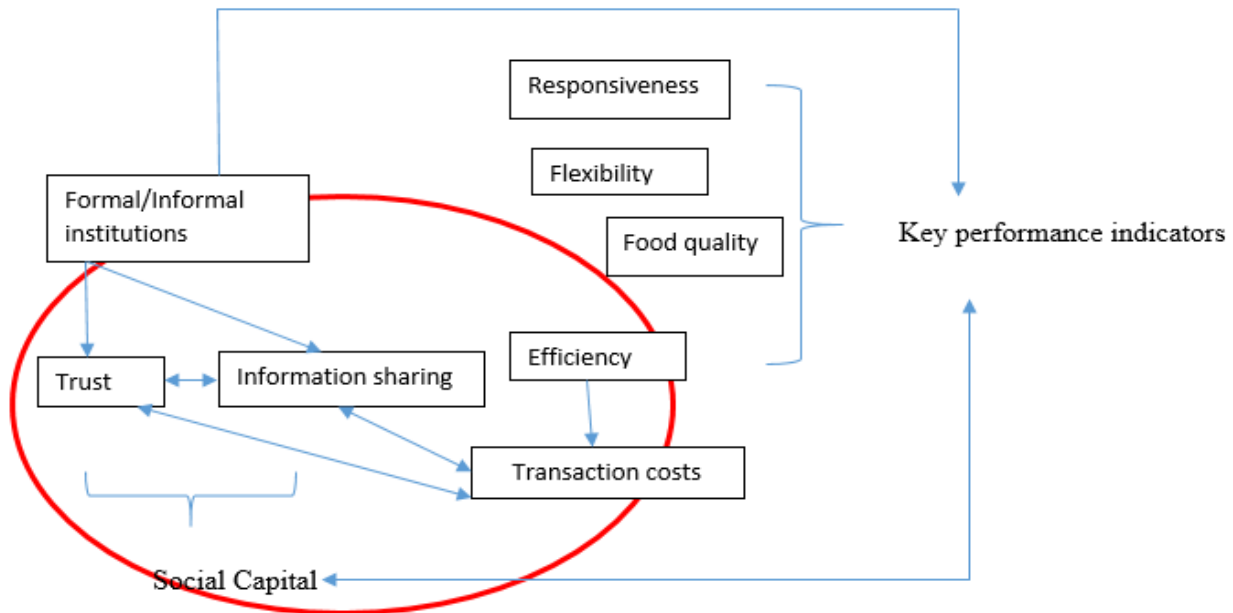
Source: Survey data from chickpea farmers

On average it took farmers about an hour and half to reach the market where they sold chickpea. Forty-two percent travelled on donkey while 26 percent went by foot, 15 percent used both foot and donkey. Only five percent of households used public transport (cars or three wheel vehicles). Most households are able to sell their chickpeas at the first day of taking it to the market as 66% of households reported that their output has never been returned from the market or remained unsold. For the remaining households that sometimes do not sell their chickpea during the first or subsequent visit to the market, the leading reason is a low price offered for their chickpea followed by low demand for the product.

### 3.4 Research methodology and the structural equation model (SEM)

Figure 3.6 highlights in red the part of the conceptual framework that is examined using the structural equation model. The remaining parts of the conceptual framework are addressed later with qualitative analysis from the interviews with different stakeholders.

Figure 3.6 The section of the conceptual framework examined by the SEM



Structural equation modeling (SEM) is a statistical method that generalizes and extends upon regression, path analysis and factor analysis to test hypothesized theoretical models (Schumacker & Lomax, 2010). It is very flexible in terms of allowing the creation of latent variables that are unobservable, allowing multiple dependent variables, and an ability to model errors in measurement by testing if the measurement of a construct is consistent with empirical data (Chin, 1998). Structural equation modeling has two components, the measurement model and the structural model. The measurement model is where the unobserved latent variables are specified based on the covariance of the observable indicator variables that are uniquely associated with them (Hoyle, 1995). The measurement model is the part where a confirmatory factor analysis, which tests the relationship between the observed variables and the latent variables, is carried out. The structural model is where the hypothesized relationship between latent variables, and between latent variables and other observable variables that are not indicators of the latent variables, is tested (Hoyle, 1995). The measurement model and the structural model together form the structural equation model (SEM).

The SEM requires certain assumptions in order to have reliable estimates and accurate test statistics. The most commonly used estimation methods in SEM are Maximum Likelihood and Generalized Least Squares which require that variables be continuous and multivariate normally distributed (Andreassen, Lorentzen, & Olsson, 2006). However, alternative procedures have been developed to carry out SEM with non-normally distributed data. The asymptotic distribution-free (ADF) estimation method can be used with non-normally distributed data as the test statistics for model fit are robust to the shape of distribution (Hu & Bentler, 1998). The variables used in this model are mostly categorical and the data is not normally distributed, therefore, the ADF estimation method is used. Table 3.3 gives a description of the variables used in the SEM model.

How well the estimated model fits the data can be tested with a number of indices in SEM (Schumacker & Lomax, 2010). The most widely used measures of fit include the Chi-squared divided by the degrees of freedom, where a value less than or equal to two shows a good fit and values less than or equal to five show acceptable fit. Also, the Comparative fit index (CFI), Tucker\_Lewis index (TLI) and the Goodness-of-fit index (GFI) that have values close to 0.9 or 0.95 show a good fit. For the Root-mean-square error of approximation (RMSEA), values from 0.05 to 0.08 show a good model fit.

Table 3.3 Description of the variables used in the model

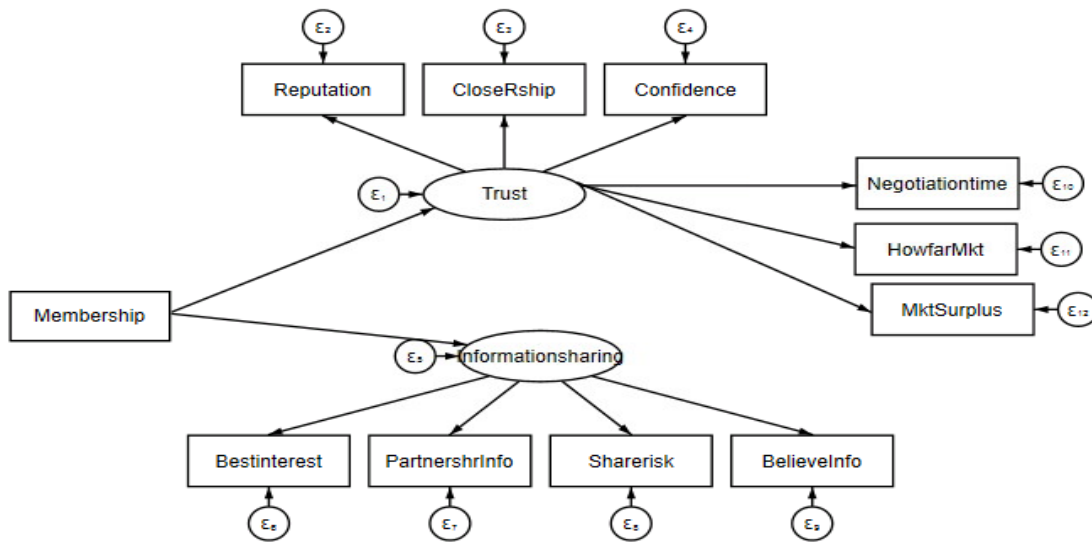
Variables used in the SEM				
Variable name	Variable code	Variable description	Variable measurement	Mean(SD)/proportion
Membership in institutions	Member	Whether a farmer is a member of one of the following: Iddir, Ikkub, cooperative or farmers association, microfinance or political party	0 if not member 1 if member	Idir (54%), Ikkub (35%), Coop/farmers assoc (60%), Microfinance (43%), Political (9%)
Trust				
Reputation	Reputation	My major trading partner has a good reputation	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	

Close relationship	CloseRship	I have a close relationship with my major /most important trading partner	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Confidence in trading partner	Confidence	I have confidence in my major trading partner	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Information sharing				
Best interest in dealings	Bestinterest	My major/most important trading partner considers my best interests in our dealings	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Partner shares information	PartnershrInfo	My major/most important trading partner shares useful information with me	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Risk sharing	Sharerisk	My major/most important trading partner is willing to share risk with me	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Believe the information	BelieveInfo	I believe the information my major/most important trading partner provides	1-5 Likert-scaled questions (Strongly disagree – Strongly agree)	
Negotiation time	Negoatiatio ntime	How long does it take to sell a kilo of your chickpea, average time spent in finding and negotiating a deal	Minutes	116.93(140) n=148
Marketed surplus	MktSurplus	How much of harvested chickpea is sold?	Kilograms	217.47 (234.33)
Transportation time	Howfarmkt	How far do you typically travel to sell your chickpea?	Minutes	91.05 (54.77)



Figure 3.7 is the conceptual framework as well as the proposed full SEM that includes all the hypotheses to be tested in this model. In Figure 3.7, the items in the rectangular boxes are observed variables and the items in oval frames are latent variables. Figure 3.7 includes both the measurement and the structural model of the SEM. Membership in an institution depicts membership in one of the following institutions: Iddir, Ikkub, cooperative or farmers association, microfinance and political party. Five separate models are run for each single institution. A detailed discussion of these institutions is found in the descriptive statistics section (Section 3.3.2)

Figure 3.7 The proposed full structural equation model



A regression analysis was initially done to examine the relationship between trust, information sharing and membership in institutions before the SEM was used. However, the relationships outlined in the conceptual framework was better captured through the SEM due to the flexibility of the SEM and the nature of the data. The results from the regression analysis are attached in Appendix B for further insight and reference.

### 3.5 Assessment of the measurement model

This section tests the structural equation model described above. The measures for trust, information sharing and satisfaction with major trading partner are calculated from the farmers'

responses to scaled survey questions shown in table 3.4. The measures are mainly adopted from Blandon, Henson and Cranfield (2009) and the conceptual framework discussed in section 3.1.

Measures for trust, information sharing and satisfaction are constructed using exploratory factor analysis based on the 17 Likert-scaled survey questions included in the survey. A Principal component analysis using the Varimax rotation method was applied. Factor loadings above 0.5 with Eigen values greater than one were used. These variables are later used in the SEM measurement model in a confirmatory factor analysis. Table 3.4 also provides the Cronbach's alpha values, which measures the internal consistency or the reliability of the constructs. A Cronbach's alpha value of 0.9 and above is excellent, values around 0.8 are good while values above 0.7 are acceptable\adequate (Kline, 2005). The exploratory factor analysis was carried out using IBM SPSS Statistics 24 Software.

The variables loaded to three different factors except for two questions that did not load to any factor. These two measures were dropped from the model. One measure in the factor "Satisfaction" which asked a participant's perception of his trading partner's confidence in him showed a low loading (0.44). In addition, the Cronbach's alpha value for the factor "Satisfaction" was 0.49, which is below the acceptable level at 0.7, therefore, the construct "satisfaction" was dropped from further analysis<sup>3</sup>. The remaining variables and factors had high or acceptable loadings and Cronbach's alpha values. Table 3.5 and Figure 3.8 show the six measures that loaded to the construct "Information sharing" and the other five measures that loaded to "Trust"<sup>4</sup>. Figure 3.8 is the measurement model that is also the confirmatory factor analysis. The variable in rectangles are the variables that explain the unobserved latent variables which are in the oval shapes.

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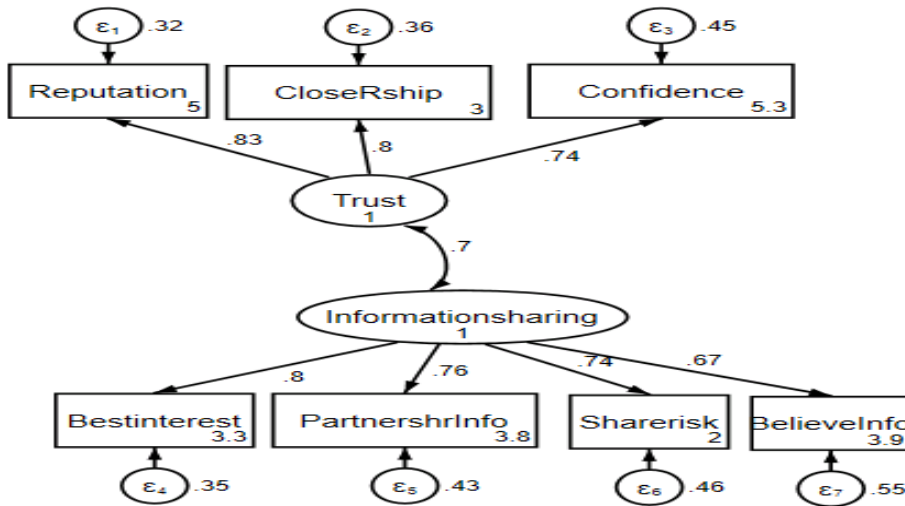
<sup>3</sup> The satisfaction variable has failed to be significant even after the questions with lower factor loading were dropped from the analysis.

<sup>4</sup> The trust variable is treated as a latent variable with a reflexive model as a formative model did not find any path from the latent variable trust to the observed variables.

Table 3.4 Trust, Information sharing and satisfaction survey questions

Constructs (Cronbach's alpha)	Survey questions	Factor loadings
Information sharing ( $\alpha=0.827$ )	My major/most important trading partner shares useful information with me	0.733
	I share useful information with my major trading partner	0.679
	My major/most important trading partner is willing to share risk with me	0.731
	My major/most important trading partner has the best offer relative to other alternatives	0.603
	I believe the information my major/most important trading partner provides	0.622
	My major/most important trading partner considers my best interests in our dealings	0.572
	Trust questions ( $\alpha=0.803$ )	My major trading partner has a good reputation
I have confidence in my major trading partner		0.776
I have a close relationship with my major /most important trading partner		0.699
My major trading partner is honest		0.674
My major/most important trading partner treats me fairly and equitably.		0.51
Satisfaction ( $\alpha= -0.492$ )		I have good cooperation with my major trading partner. he/she is cooperative
	My major trading partner always keeps his (her) promises	0.64
	My major/most important trading partner has confidence in me	0.44
	Items that didn't load to any factors	I have a number of conflicts with my major/most important trading partner.
My major/most important trading partner provides financial assistance when I need it		0.511

Figure 3.8. The measurement model



Based on results obtained from the explanatory factor analysis a confirmatory factor analysis (CFA) was carried out on the measurement model (figure 3.8). Two measures from each factor (trust and information sharing) were further dropped due to poor factor loadings. Partner's fair and equitable treatment and trading partner being honest were the two items dropped from the trust construct in the measurement model due to poor loadings. A factor loading should be above 0.5 to be acceptable or above 0.7 to be a good fit to the data. Trading partner having the best offer was dropped from the information sharing construct due to poor factor loading. The item measuring a participant's willingness to share information with a partner was dropped from the model due to high correlation with a similar item measuring a trading partner's willingness to share information with the participant. Figure 3.8 also shows that reputation of a trading partner, close relationship with trading partner and confidence in trading partner are the measures of the Trust construct. Information sharing with a trading partner is measured by the variables: a partner having the best interest of his other trading partner, a partner sharing information, a partner sharing risk and believing information shared by a trade partner. Therefore, the trust and information sharing variables enter the analysis as latent variables that are inferred from the variables that had high loadings in each construct. The standardized factor loadings and the standardized variance of the error term are displayed in figure 3.8 which are also reported in table 3.5.

Table 3.5 shows the results of the CFA, including the factor loadings and error terms associated with the measurement model. The measurement model showed a good overall model fit with  $\chi^2/df=1.25$  ( $p>\chi^2=0.23$ ), RMSEA=0.04, CFI=0.978, TLI=0.965, SRMR=0.06. The factor loadings were also above the minimum required level.

Table 3.5. Results of the measurement model

The measurement model			
		Standardized loadings	Error term/ Std.variance
<b>Trust</b>			
	Reputation	0.83	0.32
	Close relationship	0.8	0.36
	Confidence	0.74	0.45
<b>Information sharing</b>			
	Best Interest	0.8	0.35
	Partner share info	0.76	0.43
	Share risk	0.74	0.46
	Believe information	0.67	0.55

### 3.6 Hypothesis testing and model results

Based on the constructs that were established in the earlier section, i.e. trust and information sharing, this section discuss how these constructs are affected by membership in informal/formal institutions. How trust and information sharing relate with each other and how they affect transaction costs is also tested. The path analysis of the structural equation model is performed. The hypotheses restated below are the paths tested in the structural equation model. The trust and information sharing variables enter the SEM as latent variables which are inferred from the variables obtained from the exploratory and confirmatory factor analysis. Five separate structural equation models are run based on the five institutions identified. Each of the five models represent a different institution that has different role/purpose, organization, level of participation and structure. The frequency of meetings, the reason for meetings and the frequency of use of these institutions also vary. The entire path analysis is run for each model separately. Each of the five separate models are based on a common single trust and information sharing question. Therefore, the models show the moderation effect of the path analysis. The institutions are Iddir, Ikkub, cooperatives, microfinance and political organization. Iddir and Ikkub are treated as the informal institutions while cooperatives, microfinance and political party are treated as formal institutions. These institutions moderate the relationship between the trust and information

variables and the transaction cost measures. The hypotheses are tested for each model and the results from the structural equation modeling (SEM) show that most of the hypothesized relations are supported by the data. Table 3.6 summarizes the results from the models while table 3.7 summarizes how the hypothesis relate with the results of the model.

The first hypothesis, which states H1: *An increase in trust between trading partners is associated with a reduction in transaction costs related with chickpea marketing* has support from the model except for transportation time, as can be seen in Table 3.6. The variables that measure transaction costs in the models are negotiation time, marketed surplus and transportation time. The results indicate trust between trading partners increased marketed surplus and reduces time spent negotiation price and/or quality for the four institutions/models. All the 4 models except the political party model (model 5) support this hypothesis that trust between trading partners increases marketed surplus and reduces negotiation time involved in chickpea marketing. Model 5 does not support the hypothesis that trust reduces negotiation time as the path estimate between trust and negotiation time is not significant, as shown in Table 3.6. The transportation time spent in chickpea marketing is also not significantly affected by trust between partners for model 2 and 3 (Iddir and Coop). The relationship (between trust and transportation time) is negative for the other models (Ikkub, microfinance and political party).

The second hypothesis which states *an increase in information sharing between trading partners is associated with an increase in trust between trading partners* is supported by all five models as expected in accordance with theory and other studies that found a positive relationship between trust and information sharing where exchange of information improved the level of trust by lowering uncertainty (Fafchamps & Minten, 2002; Kwon and Suh, 2004).

The third hypothesis which states *membership in informal institutions is associated with an increase in information sharing between trading partners* has a mixed result. While it is true for Model 1(Ikkub) but there is no significant relationship between membership in Model 2 (Iddir) and information sharing. This could be due to the different nature of the institutions. Ikkub is strongly based on trust as it deals with money and thus financial trust and members interact among each other more often due to few number of members at a time and also the need to ensure there is no default by members. Iddir is a type of community insurance where a large group of people come together during a time of need. Therefore, the size of membership and the

context of meeting (usually during funerals) might lower the level of information sharing going on regarding chickpea. In addition, the formation of Ikkub requires disclosure of why the fund is needed by the person who is initiating the organization or any other person in the group who asks for priority in obtaining the fund. This set up increases the information shared between members. In Iddir, there is no need to share any information and the only obligation is the contribution of funds and physical presence which does not necessarily lead towards information sharing about markets. However, the opportunity that Iddir provides in terms of social gathering might to a limited extent promote information sharing though this supposition is not supported by this study's results.

The fourth hypothesis which states *membership in formal institutions is associated with an increase in information sharing between trading partners* also has mixed results. While membership in cooperatives or farmers organizations (Model 3) affects information sharing positively. Model 4 (microfinance institutions) fails to be significant and model 5 (political institutions) has a negative coefficient. The negative relationship between membership in a political party and information sharing regarding chickpea marketing could be due to opportunism. Being a member of a ruling political party in a developing country context might give members an extra information advantage regarding upcoming policies or government programs that benefit farmers. Since these members are themselves farmers who want to benefit from exclusive information, information might not freely flow or they might be reluctant to share it.

The fifth hypothesis which states *membership in informal institutions is associated with an increase in trust between trading partners* is supported by the two informal institution models (model 1 and model 2). The last hypothesis, which states *membership in formal institutions positively affects trust between trading partners* is not significant for model 4 (microfinance) while it is positive as expected for model 3 (Cooperative) and 5 (political institution).

Membership in microfinance institutions is defined in the data as any credit received from a formal or informal credit institution (including from trading partners). The negative relationship could be due to the mistrust that is usually associated with microfinance institutions. Most microfinance institution users in Ethiopia use the regular banking system to save money but use-

Table 3.6 Results from the structural equation model

Path	Estimates( Standardized coefficients)				
	Informal institutions		Formal institutions		
	Model1 (Ikkub) n=51	Model2 (Iddir) n=80	Model3 (Co-op) n=88	Model4 (Microfin) n=64	Model 5 (Political) n=13
<b>Trust → Negotiation time (H1)</b>	-0.2*** (0.001)	-0.19*** (0.001)	-0.12** (0.05)	-0.17** (0.039)	-0.09 (0.16)
<b>Trust → Transportation time (H1)</b>	0.21*** (0.003)	0.09 (0.26)	0.14 (0.07)	0.007* (0.09)	0.15* (0.07)
<b>Trust→ Marketed surplus (H1)</b>	0.3*** (0.00)	0.16*** (0.005)	0.2*** (0.00)	0.2* (0.078)	0.19*** (0.008)
<b>Info Sharing→ Trust (H2)</b>	0.65*** (<0.001)	0.71*** (<0.001)	0.59*** (<0.001)	0.68*** (<0.001)	0.8*** (<0.001)
<b>Membership → Info share (H3 and H4)</b>	0.18** (0.02)	0.03 (0.72)	0.26*** (<0.001)	-0.12 (0.19)	-0.39*** (<0.001)
<b>Membership →Trust(H5 and H6)</b>	0.1* (0.06)	0.25*** (0.00)	0.34*** (<0.001)	-0.05 (0.56)	0.25*** (<0.001)

\*\*\*, \*\*, \* significant at 1%, 5% and 10% level of significance, respectively.

+Values in parenthesis are p-values

microfinances to obtain loans (Mackie, Brown, Smith, & GebreEgziabher, 2015). The corruption and inefficiency that exists in many cooperatives strains the trust farmers have in this institutions. Microfinance institutions, though playing a significant role in poverty reduction (Berhane & Gardebroek, 2011), have yet to build sufficient trust to realize their full potential (Association of Ethiopian Microfinance Institutions, 2010). The lack of trust of farmers in microfinance institutions in turn can constrain the capacity of the institutions to serve the farmers (as farmers are not saving enough) which can lead to further inefficiencies and deterioration of trust. The negative relationship observed in the results can thus be due to both the farmers' lack of trust which comes from the inefficiency of the institutions and also the inefficiency of the institutions which arises from the lack of sufficient participation from farmers.



Table 3.7 Support for hypotheses from the SEM

Paths	Support for Hypothesis
H1: An increase in trust between trading partners is associated with a reduction in transaction cost related with chickpea marketing.	
Negotiation time	Yes, except for Political
Marketed amount	Yes
Transportation time	No
H2: An increase in information sharing between trading partners is associated with an increase in trust	Yes
H3: Membership in informal institutions is associated with an increase in information sharing	Yes for Ikkub, No for Iddir
H4: Membership in formal institutions is associated with an increase in information sharing	Yes, only for cooperatives
H5: Membership in informal institutions is associated with an increase in trust	Yes
H6: Membership in formal institutions is associated with an increase in trust	Yes except for microfinance

Table 3.8 shows the SEM model has a satisfactory fit with the chi-square to degrees of freedom ratio ranging from 1.3 to 1.9. The CFI ranges from 0.93-0.84 which is a little low for Model 1 and 5. The RMSE ranges between 0.05-0.08 which is a good fit. In general models 2 and 3 had the best fit, with model 4 having a good fit, while Model 1 and 5 have low a CFI.

Table 3.8 Model fit indices for the SEM

	X <sup>2</sup> /df	CFI	RMSE	SRMR
Model1(Ikkub)	2.03(p=0.00)	0.846	0.084	0.130
Model2(Iddir)	1.39(p=0.04)	0.931	0.052	0.09
Model3(Cooperative)	1.47(p=0.03)	0.916	0.057	0.106
Model4(Microfinance)	1.81(p=0.001)	0.877	0.075	0.116
Model5(Political)	1.94(p=0.00)	0.842	0.081	0.125

### 3.7 Conclusion

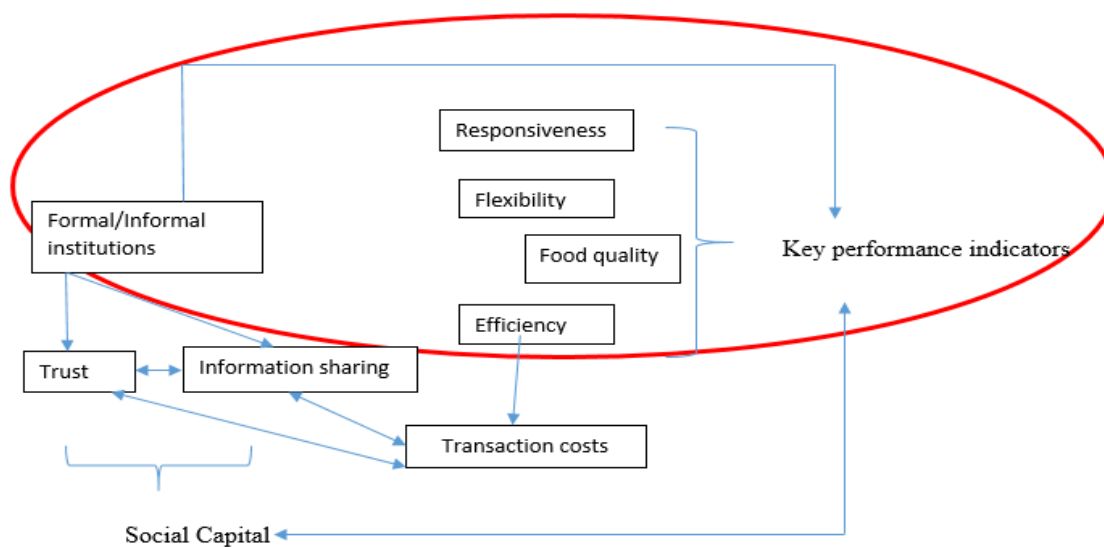
This chapter developed a series of hypotheses based on the conceptual framework and presented the results from qualitative and quantitative analysis of the survey data and interviews. The

descriptive statistics gave insights into the socioeconomic characteristic of chickpea farmers in Northern Ethiopia and the type and level of chickpea production and marketing. The structural equation model examined the relationships stated in the hypotheses. The results indicate institutions positively contribute to improved chickpea marketing by improving information sharing and trust among trading partners. Therefore, strengthening these institutions or encouraging participation could be an efficient way to improve performance of chickpea marketing. Existing, informal institutions in developing countries can be as effective as formal institutions so effort should be put towards their continuation and improvement.

## Chapter 4 Insights from the interviews

The SEM examined the relationships between membership in institutions and social capital as well as the relationship between social capital and transaction costs. The interviews with the different stakeholders in the supply chain for RUF examine the alignment of the supply chain with key performance indicators and the key success factors. The portion of the conceptual framework that is addressed by the insights from the interviews is highlighted in figure 4.1. In general, based on the conceptual framework and the literature which measures the success of humanitarian supply chains (Table 2.1), the supply of RUTF/RUSF is relatively efficient. Standardization of products, quality management, flexibility, availability of product, and speed of product delivery are the main measures of success discussed in the section below. The results from the quantitative analysis in chapter three can be used by food processing companies that have close dealings with chickpea farmers, wholesalers and other input suppliers. These companies can utilize the informal institutions that are predominant in the dealings of small-holder farmer, retailer, and wholesalers to reduce the transaction costs that arise from poor supply chains. The application of the results from the farmer survey to the other supply chain actors is further discussed in the insights from food processing companies in section 4.3.

Figure 4.1 The section of the conceptual framework examined by the interviews



#### **4.1 Insight from the health facilities**

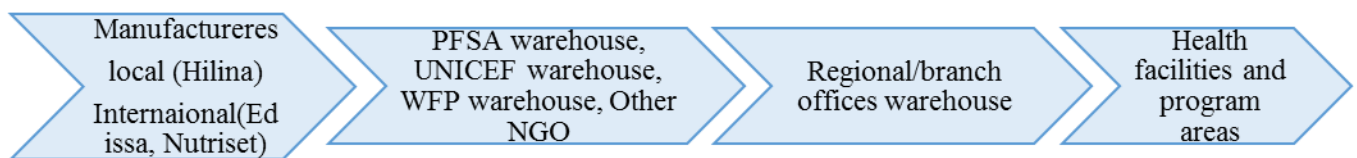
Four health facilities located in the capital Addis Ababa were included in the interviews. Of these, two were large general hospitals and two were smaller health facilities. The head of the facility's pharmacy and/or head of the pharmacy store were interviewed. The interview guide is attached in part 4 of Appendix C. The interview guide include questions regarding the source of funds and supply for RUF, the amount of time required to obtain RUF supplies, the level of discrepancy between demand and supply of RUF, the challenges\issues in the supply of RUF and, the level of acceptability of the products by beneficiaries. The pharmacy or the pharmacy store is the department that manages Ready-to-use food products in all facilities and they are mostly given to children and in some facilities to HIV patients (previously to TB patients as well but not anymore). Both the ready to use therapeutic food (RUTF) and the ready to use supplementary food (RUSF) are given at all facilities. The facilities get their supply of RUFs from the Pharmaceuticals Fund and Supply Agency (PFSA). The PFSA is a federal government institution established in 2007 with the aim of facilitating the uninterrupted supply of quality assured and affordable pharmaceuticals to public health institutions in a sustainable process. It has a central warehouse in its headquarters in Addis Ababa and branch offices in 16 locations/regions throughout Ethiopia. RUF is supplied and delivered free of charge to the facilities along with other "program drugs" that are sponsored. The health facilities have a format for reporting use of RUFs every two months which serves as the basis for the supply they will get for the next two months. They place orders to the PFSA based on the amount they have used in the previous two months. It is a consumption based supply. The quantity of RUF received depends on the facility's previous consumption as well as the available stock at PFSA. The quantity demanded depends on the size of the health facility and the type of people who receive them (HIV patients or/and children) and it ranges from 20-150 cartons (two months' supply). One carton contains 150 sachets. The RUFs are given based on weight of the patients who can either be hospitalized or in the outpatient department.

In general, the health facilities receive the quantity they requested but there have been some instances where demand was not met. Two of the facilities stated that they overstate their demand knowing the PFSA is going to undersupply and because some outpatient users need to take more than a two month's supply of RUTF/RUSF. They order what they call the "Maximum

stock”. Orders are placed/reported a little above what is exactly needed. This has enabled them to meet extra demands.

Some patients that needed RUF have not been able to obtain them due to shortages of RUF at the health facility. In one facility as many as 10 people have failed to receive them in the prior six months. These are usually adults with low body weight due to HIV/AIDS. It is the ready to use therapeutic food that is usually in shortage. Interviewees indicated that no RUF has ever expired while in stock in any of the facilities. It takes 15-20 days, on average, for the RUF to arrive at the health facilities after an order/report has been sent. Sometimes it arrives earlier and sometimes it is late but this has not seriously affected the smooth running of the facilities and it mostly arrives on time. Emergency orders are not common but if they happen the PFSA does not deliver them. The health facility would have to send personnel to go and process the request. It takes 2-3 days to get emergency supplies. However, all these facilities are located in Addis Ababa where the central PFSA office is located and proximity to the headquarters might expedite the process. Health facilities in other regions far from the central warehouse in Addis Ababa might face challenges regarding emergency supply even though PFSA has branches in these regions. Figure 4.2 describes the product flow of RUF in Ethiopia.

Figure 4.2 Product flow of RUF in Ethiopia



Source: Interviews with stakeholders

The level of beneficiary involvement is limited as recipients complain about the RUFs with regards to taste (new users), being too salty, causing nausea and acne. Some patients had to stop taking them due to nausea while others get used to the taste after repeated use. But no statistical data exists in regards to actual number of these cases. Recipients selling their supply of RUF is another issue in these health posts. This is usually a problem for recipients in the HIV unit and not children as parents value their children’s health and tend to give it to them as recommended. Recipients graduate from the RUF foods after six months and if no change in weight is observed the provision is stopped but until this is detected interviewees indicated that most users/recipients

sell the supply of RUF they receive. Both RUTF and RUSF can be found in retail shops for sale. The interviewees believe that it is RUF recipients who do not like the taste that sell it instead of consuming it. The lack of synchronized system in the health facilities to identify users is also a problem because users have been found to register in multiple health facilities for the RUFs and make a business of selling the product to retailers.

In addition to the challenges of recipients selling the product and lack of synchronized supply system, not having enough supply to meet demand is one of the major challenges the health facilities report. Users of the products have increased and existing users want more than what is necessary (want to use it as regular food instead of as supplementary). Due to shortage of the product only severely affected children are prioritized and TB patients who previously used this products no longer receive them. Other than the above mentioned challenges the supply of RUTF and RUSF to hospitals is relatively efficient.

#### **4.2 Insights from RUF buyers**

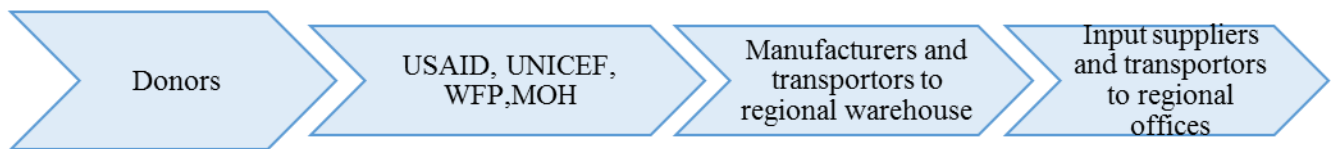
Three major buyers and two distribution agents of RUF were interviewed including representatives from the World Food Program (WFP), United Nations International Children's Fund (UNICEF), United States Agency for International Development (USAID), Ethiopian Ministry of Health (MOH) and PFSA. The latter two are the major administrator/managers and distributors of RUF in Ethiopia though there is a parallel distribution channel used by UNICEF and other small local NGOs. There are NGOs and humanitarian organization like Save the Children International, United Nations High Commissioner for Refugees (UNHCR), UNICEF Somalia, Medicine San Frontier and local NGOs which buy RUTF. The insights discussed in this section are obtained only from the three major buyers and two distributors. The interview guide is attached in part five of appendix C. It included questions regarding the supplier of RUF, the lead time from order to delivery, the use of contractual agreements with manufacturers, quality requirements and the transportation and distribution of RUFs.

The RUTF in Ethiopia is obtained from either local or international sources. There is currently one local supplier/manufacturer and two major international suppliers. The local supplier is Hilina Enriched Foods while the international suppliers are Nutriset (France) and Edesia (USA). The majority of the RUTF is obtained from international (offshore) suppliers due to the limited capacity of the local manufacturers. In some organizations in certain years there was no local

procurement and all procurement was international. For instance, all the supply obtained by PFSA for the current year came from offshore, and WFP made 100% of its RUF purchase from international sources in the years 2013, 2016 and 2017. When there is local procurement it is still 20-30% of the total procurement. Local procurement is particularly important when the international supply is delayed or cannot arrive in a timely manner during emergencies due to long lead times.

The United States Agency for International Development (USAID) is the major funder for both the purchase and distribution of the supply that goes through the government body of PFSA. It is only recently (one year) that this supply has been managed by the field office in Ethiopia. Previous procurements have been done by the Head office abroad and the local office only had the role of follow up. The supply of USAID is managed through the Global supply chain management system which has an agent (Chemonics International) which manages the supply in Ethiopia. Figure 4.3 describes the funding flow of RUF purchases.

Figure 4.3 Funding flow of RUF in Ethiopia



Source: Interviews with stakeholders

Interviewees reported that the price of the local RUTF is about 20% more expensive than offshore RUTF. The offshore price varies based on exchange rate but it is on average 43 dollars per carton. When transport cost is added to the international product it becomes around 48-50 dollars per carton which is still lower than the local price. This has limited the cost efficiency aspect of the supply chain as the price of local RUF is not competitive due to a number of factors discussed in section 4.3 below.

International procurement takes on average 3 months from order to delivery. International supplies mostly arrive through ocean shipments which take from 2-3 months. The local procurement takes as much time as the international due to vendor and production lead times,

limited capacity, and raw material shortage. Producers do not keep stocks due to unpredictable and variable demand for RUF and they only start production when requests for the product is made. Since some of the inputs they use are imported it takes time to process their letter of credit and obtain their inputs. Difficulty of obtaining foreign currency is another major delay as Ethiopia has been experiencing a foreign currency shortage in the last few years, with the situation getting worse recently. Some industries that are highly dependent on imported inputs are producing below capacity while others have been forced to suspend production (Capital, 2018). However, some industries get preferential treatment in obtaining foreign currency or any credit based on the government initiative to promote economic growth. These industries include manufacturing industries and among these, manufacturers that process agricultural products get priority. In addition, industries that earn foreign exchange are high priority in terms of getting government support. Hilina foods meets all this criteria so even though it is affected by these issues it has managed to deliver without significant delays.

In addition to unpredictable demand and foreign currency shortage, national shortage of local raw materials has further lengthened the lead time to three months. RUF buyers have mentioned that there were huge improvements regarding shorter delivery times for local procurement before the country started experiencing a raw materials shortage. For instance, it was hard to obtain sugar in the country. Consumers had to show residency cards and later ration cards to purchase sugar from shops. Other inputs like crops (including chickpea and peanuts) are abundantly available only during peak/harvest season. In other seasons they are either unavailable or are very expensive. In some instances, producers have been forced to import these raw materials. A recent nationwide shortage of peanuts, which are the main ingredients in the RUF's produced has also been a major challenge. Lack of raw material stock due to uncertainty of the long-term or continued demand for the end-product further exacerbate the problem. Hilina foods has been/is undergoing production plant maintenance and upgrades which took a long time and which led to a longer lead time and insufficient provision of the demanded product.

The shortest lead time so far mentioned by the interviewees is 6 weeks which is also the usually promised time frame for delivery. However, there has been variance in delivery ranging from 2 weeks to 6 weeks due to unforeseen and uncontrollable circumstances.



Most of the procurement contracts signed with RUF food processors are long term agreements. USAID currently has an indefinite delivery/indefinite quantity (IDIQ) agreement with Hilina Foods and Edesia while dealings with Nutriset are still on-going. An IDIQ contract is a contract commonly used for on-call service and where an indefinite quantity of supply is required. USAID'S contract is a purchase order which sets a range to the price of the RUF (ceiling price) and the manufacturer's price quotes are made within that range. It also specifies delivery time and price and has clauses to deal with default or contract breach in case they occur. UNICEF and WFP have a long term agreement (LTA) contract with their suppliers. UNICEF Ethiopia has a two year LTA with the local producer. For instance, 2018's target quantity is 21,000 cartons from local procurement. However, purchase orders are issued until the target quantity is met. Similar LTA arrangements are made with international suppliers and offshore procurements are managed by the UNICEF headquarters office in Copenhagen which acts based on the request/need of the local office. UNICEF Ethiopia also receives in-kind donations of about 40,850 cartons from USAID (which is bought from MANA (Mother Administered Nutritive Aid). WFP has not established a long term supplier agreement with the local supplier though there is the potential for one in the future. It has a LTA with the international supplier while it uses tenders for the local procurement. Tenders are issued which aim to obtain the best offers among offers from different competing potential suppliers. Serious violation of contract terms have not occurred with all three buyers though lead times have been extended when unforeseen circumstances occur and clauses for penalties exist in case of default.

Emergency orders for Ethiopia had not been handled by most of the personnel interviewed. But emergency procurements are usually made from international suppliers as the local supplier has limited capacity. International emergency procurement is usually transported by air. However, Hilina foods has been able to deliver more than 20,000 of RUTF to the UNICEF Somalia office during an emergency procurement that occurred in 2017 due to drought in Somalia. This availability of urgent RUTF supply from neighboring Ethiopia was a significant contribution as using the traditional delivery method from ports to towns located along the Ethiopian border had security issues (UNICEF, 2017). The supply was procured from Ethiopia and delivered by truck from Addis Ababa to the border towns. Hilina foods has also been able to source other WFP operations in the East African region.

Regarding quality assurance of the products, all buyers have departments and third party organizations that do quality assurance inspection for all product bought by their offices. Manufacturers must comply with international standards like the Codex Alimentarius which are the internationally recognized standards and guidelines for food production and safety. Compliance to this standard is verified by physical factory audit. Physical factory audits are also done to inspect if manufacturers met the ISO 22000:2005 “Food Safety Management Systems- Requirements for any organization in the food chain<sup>5</sup>”. Any other international and national food specific standards, including the WFP food product specification and Nutriset’s (which has given a franchise to Hilina Foods) are also verified via physical factory audit and sample laboratory testing. Cost for the testing are paid by the buyers. For the RUTF product quality inspection is done for every batch of production. Samples are taken from every batch and tested for meeting quality standards and testing for salmonella, aflatoxin etc. Quality requirements are strict and samples have been rejected from local producers due to failure to meet these specifications. Other Specialized Nutritious Foods (SNF) like the corn soya<sup>6</sup> blend (super cereals) currently have no Ethiopian manufacturers due to the failure of the food processing companies to continuously meet the food quality and safety standards. Prior to 2014 ten Ethiopian manufacturing lines were set up by humanitarian agencies and the Ethiopian government to supply specialized nutritious foods. As of 2014, four manufacturer were compliant to food quality and safety standard to carry out production. However, follow up audits had found deviation from the food quality and safety requirements which has forced buyers to fully rely on international suppliers.

The Ethiopian Food, Medicine and Health Care Administration and Authority (FMHACA), formerly known as the Drug Administration and Control Authority, checks the quality of all imported and local RUFs. USAID/SIAPS have provided support for the institution in terms of strengthening its capacity to regulate the distribution of counterfeit products and monitor complains to safety and quality standards (USAID/SIPPS, 2014). None of the buyers/distributors

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<sup>5</sup> This has been updated to ISO 22000:2018. It is a document that “specifies requirements for a food safety management system where an organization in the food chain needs to demonstrate its ability to control food safety hazards in order to ensure that food is safe at the time of human consumption”(ISO, 2005).

<sup>6</sup> Corn-soya blend is a partially precooked flour where users have to further prepare it by adding water and boiling it. It is not classified as a Ready-to-Use food product.

interviewed reported major quality standard violations though damages like packaging bursting open and spillage happen during transport and storage. There is no data on how much and how often this occurs.

The distribution channels are effective and short, though there are parallel distribution channels that supply chain personnel say can reduce efficiency. The Ethiopian Ministry of Health (MOH) along with humanitarian organization and other stakeholders forms a technical working group to do quantification of demand/forecast and distribution plan for RUFs. Annual demand is forecasted every quarter (3 months) for each region and based on this forecast a distribution plan is prepared and the product is distributed to all the regions one month before the quarter starts. The MOH does not directly purchase RUFs. Hospitals and health posts throughout the country send their requests/demands to their respective regional branches/administrative units' health offices. The regional/administrative unit health offices send this request to the Central PFSA office. The office then sends the requested RUF to its branch offices located throughout the country. The branch PFSA offices then transport the RUTF to each health facility using their own trucks. This process takes on average 15-30 days. Figure 4.4 lays out the information flow in the RUF supply chain. USAID covers the procurement, storage and distribution cost of the product in this supply chain which is also the major RUF supply chain in the country.

Figure 4.4 Information flow in the RUF product supply chain in Ethiopia



Source: Interview with stakeholders

The local manufacturer, Hilina, delivers the product to the buyers (WFP, UNICEF, USAID) warehouse. Finished products are delivered free of charge to warehouses in the capital city, Addis Ababa. Transportation to regional warehouses and/or program areas is paid for by the buyers which use their own trucks or private transporters. UNICEF has three warehouses located in Addis Ababa, Gambella and Jijjiga. It has long-term agreements (LTA) with transporters (currently two) which are renewed every two year. Additional local transporters exist for Gambella and Somalia because they are emergency areas. USAID's supply, both local and

international is delivered to the PFSA warehouse and further distribution is handled by PFSA. The supply procured from offshore arrives by third party ocean shipment through the ports of Djibouti and Berbera and then through land transport. International shipping and associated handling costs are covered by the buyers. Ocean shipment cost is on average 20% of the product cost (5USD per carton).

Local procurement has the following advantages compared to international procurement: it is easily accessible; shorter lead time; communication is fast and easier as there is no time zone challenge; transportation is easier as it is shorter distances and suppliers deliver to warehouses unlike international transportation which takes time as it is ocean shipment and is expensive; local supplier are more accommodating of storage problems as they can hold delivery while storage space is arranged while if the international shipment arrives it has to be picked up immediately. However, international procurement is more reliable in terms of conformity to food safety management standards, it is more competitively priced and there is no production capacity limit except for expensive transport of large shipments. In terms of local procurement, which is one measure of key success factors for humanitarian supply chains, it has been a challenge to procure locally due to the capacity limitation of producers and the failure of additional producers to meet quality requirements. So even though there is support and priority for local producers a significant portion (70-80%) of the supply still comes from international sources. Based on the food quality and sustainability aspects discussed in the conceptual framework and the literature, there is still work to be done in improving the capacity of local manufacturers in meeting the quality requirements of RUF production.

There are multiple challenges for buyers within the RUTF supply chain. First, the resources it requires for transport and the space it requires for storage is bulky. It also needs a good storage facility as it has an appealing element to rodents and some sachets that break apart worsen this problem. However, the fact that it can be shipped to program areas directly from containers without coming to a storage facility (cross-dock) is an advantage. The fact that it is bought based on demand/forecast reduces the risk of product expiry in stock and lengthy storage time. Second, the long lead time for international procurement makes timely arrival during emergencies a challenge and will thus require air shipment which is expensive and have implications for the cost efficiency of the supply chain. Third, the nature of the product makes it difficult to integrate

it into other product supply chains and thus requires its own management which has implications for coordination of the supply chain. Fourth, the inadequate number of suppliers limits the options and quantity of supply available. Fifth, the heavy reliance on donors and humanitarian aid for buying and distributing RUFs makes the supply chain weak in terms of achieving the sustainability measure which is one of the key success factors in humanitarian supply chains.

#### **4.3 Insights from food processing companies**

Five major food processing companies and three small-scale food processing business were interviewed to gain insights into the chickpea supply chain and RUF supply chain. The major food processing companies included in this study include Hilina Enriched Foods, Kality Foods, FAFA Food Complex, NAS foods and Guts Agro Industry. All the companies are located in or around the capital Addis Ababa except Guts Agro that has its manufacturing facilities located in Bishoftu and Hawassa. From the small food processing companies that participated in this study one is located in Addis Ababa, another one in Mekelle and the third one in Wukero, Tigray. All the food processing companies are privately owned though FAFA Food complex was state-owned from its establishment in 1962 until its privatization in 2009. It is now owned by Petram Private Limited Company. Hilina Foods is currently the only RUTF and RUSF producer in the country<sup>7</sup>. Chickpea is not regularly used in the products that they produce. However, Hilina have developed an RUSF called Denboch which was developed in partnership with the WFP. This RUSF was made from chickpea and maize. Chickpea was bought in the spot market through middle men who collected chickpea from different farmers, took the risk regarding price and quality and were willing to return chickpea that did not meet the quality. However, the plan in the future is to source chickpea from farmers associations though there is a fear that buying from farmers might not be as flexible as the middle men. For the middle men, price is paid within 30 days of delivery. But for farmers unions, the money is required right away as they are constrained for the availability of cash.

Kality Food, located in Addis Ababa, is the first industrial food processing enterprise in Ethiopia and it processes flour, biscuits and pasta/macaroni which are all wheat based. NAS foods is another biscuit food factory and the first sandwich biscuit manufacturer in Ethiopia established in 2002. FAFA foods complex is a pioneer food processing company in nutritious food for

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<sup>7</sup> Guts Agro is not currently producing RUFs but had produced RUSF in 2015 and RUTF in 2012. FAFA food complex produces corn soya blend when it is requested by humanitarian agencies or the government.

children. The company was initially established in 1962 as a non-profit company to produce a balanced diet, nutritious food for children. It was later changed into a for-profit business company. It has continued to produce children's food and also relief food products like corn-soya blend. It uses chickpea as an alternative for the soya in the corn soya blend and in its children foods. Guts agro Industry, established in 2005 is a nutritious food processing company that has produced corn-soya blend products for WFP, RUTF (in 2012) and RUSF (in 2015). It has sourced its inputs, including chickpea from cooperative unions and commercial farms. It has entered into pre-harvest agreements where its pays 30% of the agreed amount before harvest so that the farmer unions can address their cash constraints. The remaining 70% is paid immediately after delivery. The payments received before harvest helps farmers in the farmers union use the appropriate type of seed and fertilizer and hire labor for harvest. Guts Agro's current products include complementary children's food<sup>8</sup>, snacks, iodized salt, poultry feed and *shiro* (chickpea flour mixed with species).

The small-scale food processing companies roast the chickpea to make a common snack called *kolo* or; roast, grind and mix the chickpea with spices to make *shiro*. All three of the interviewed food processors were established in the last 8-10 years. The chickpea they used for their product is obtained from the spot market which is usually near to where their business is located. It is bought in small quantities every 7-10 days. Price for the chickpea is established by going around 2-3 wholesalers/retailers and asking and negotiating the price based on physical inspection of quality (like dirt level, pest damage and size) or by calling merchants they know over the phone. The challenge they face is finding a consistent supply of quality chickpea for their food products. Finance for their business is mostly from "dube". Dube is a system where a buyer purchases goods with the oral promise of paying later. These business "take dube" when they need to buy chickpea but do not have cash or they "give dube" when customers do not have the cash to pay them for their products. They give dube to a customer they have known for at least 2-6 months. Ikkub is also used as a means of financing. The extensive use of dube and the limited use of formal financial institutions like banks further strengthen the findings of the empirical model in the previous chapter that found trust to be have increased when trading partners make use of informal institutions. The dube system is based on trust and small-scale processors are willing to

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<sup>8</sup> Complementary foods are "foods that are readily consumed and digested by the young child and that provide addition nutrition to meet all the growing child's needs" ("Complementary feeding", 2018)

take the risk associated with using this informal institution. Food processing companies can also further exploit the informal institutions that already exist in the dealing of farmers with buyers to increase the access to credit of their input suppliers. The increased marketed output to farmers gained from improved trust between trading partners can help in reducing the challenge food processing companies face from low supply and the mixing of high and low quality produce.

Among the major companies interviewed, none used chickpea in very large amounts and so it was not very hard to get enough supply. However, price varies based on the time of year/ season the purchase is made. It is possible to have the desired amount of supply delivered within 2-3 days during harvest season but it might take weeks in non-harvest times. The same price volatility is true for other local inputs like wheat, corn and soya beans. Price for soya beans have been more than 4 times than it was during harvest season. Chickpea is also exported out of the country so this can cause local shortages and further drive prices higher. Ethiopia is the largest producer of chickpea in Africa (63% of the continents production) and the 6<sup>th</sup> in the world (Ojiewo, 2016). The location of the factory also plays a role in the lead time for delivery. Chickpea is available in most parts of Ethiopia including around Addis Ababa where most factories are located. It is most abundantly available in Northern Ethiopia (particularly Amhara region). For companies sourcing their inputs from nearby locations the transit time is short. But those that buy from the Amhara region to minimize middle men cost and that demand a higher quantity might encounter longer lead times.

The spot market, merchants (middle men), cooperatives/farmer unions, commercial farms and tenders might be used to obtain chickpea and other crops. It is not common to buy chickpea from commercial farms. Food processing companies buy wheat and corn from commercial farmers which are farms owned either by the government or privately and which grows crop in a large scale level using modern technology. The most common channel for chickpea used by the companies that participated in this study is the merchants (middle men) who collect it from different farmers. This channel was also used for the purchase of other crops like wheat and corn. The major advantage in using this channel is the availability of the product whenever it is needed. The merchants are highly networked and are able to obtain crops when needed. The challenge of this channel is quality problems due to the deliberate mixing of different quality chickpeas to inflate the perceived quality.

Quality requirements for chickpea include the level of foreign matter (impurity), moisture, pest damage and, chickpea variety (varies based on the intended output). Quality is usually inspected by physical examination and laboratory during each delivery. Original price agreement is usually higher in the expectation that the quality is high. In cases where quality is compromised, products are returned or price is renegotiated in some companies. Price is renegotiated for lower quality only in the case where the issue is dirt level. Most inputs are further cleaned at the facility therefore, some companies are willing to take the extra time it is going to take to remove the dirt. In some instances, the sellers themselves offer a lower price than agreed as they do not want to incur additional transportation costs for returning with an unsold load. Though companies did face some problems with regards to chickpea quality, the problem with chickpea was not as severe as other crops like wheat and peanuts. One company has suspended its pasta production due to shortage of quality wheat. Quality inspection of production facilities is done by the government for both small and large scale food processing companies.

Formal credit is available for the large scale-food processing companies as the government is currently implementing a policy which supports manufacturers that are processing agricultural products. However, access to foreign currency is a major challenge. Inputs like vitamin and mineral mix, milk powder, packaging (aluminum), whey powder, vegetable fat, different flavors and enzymes are imported. Due to the foreign currency shortage the country is facing, these companies have to wait longer (3-6 months) to obtain foreign currency even when priority is given to food processors.

The processing companies are member of associations who share information about the market, new opportunities and available trainings and workshops. They also have a collective bargaining power in regards to government policy, tax issues and issues that arise with suppliers/buyers. These associations are the likes of Ethiopian Millers Association. This association represents the companies in putting forward complaints to government bodies regarding a certain policy or taxation or any common issues faced by the companies. The government also holds discussions with the associations before or during the implementation of different policies that might affect the industries.

In summary, the interviews provided insights into the supply chain organization of the RUF product supply chain and the challenges encountered by different stakeholders. The challenge



facing many of these food processing companies is the unavailability of raw material/crops at a reasonable price except during harvest/peak season. Companies either have to buy all of their needs at the peak time which requires large sums of capital or suffer from low availability and very high prices at other times. Quality problem due to poor post-harvest practices, deliberate mixing/adulteration of different quality, and poor transportation is another major challenge. The foreign currency challenge is a significant hindrance to those companies that heavily rely on imported inputs, particularly for production of RUFs. However, the results from the quantitative analysis in chapter three which found the increased marketed output to farmers gained from improved trust between trading partners can help in reducing the challenge food processing companies face from low supply and the mixing of high and low quality produce. The existence of trust can increase the perceived trustworthiness of trading partners as there is the belief that honesty is expected from them and it will be reciprocated.

## **Chapter 5. Summary and Conclusion**

The objectives of this study were to identify the main actors and their interaction in the RUF product supply chain and to identify the areas where transaction costs are high and how institutions (formal and informal) could reduce these high transaction costs. The study investigated what role institutions play in promoting trust and information sharing and how trust and information sharing relate with each other. It also examined how trust and information sharing between trading partners impacted chickpea trade. The efficiency of the supply chain was also examined through insights gained from interviews with stakeholders. To meet the objectives and address the research questions, a structured questionnaire, focus group discussions and key informant interviews were carried out. Chickpea farmers, retailer and wholesalers and food processors, humanitarian organizations, national agencies and hospitals have participated. Qualitative analysis was used to gain insights about the supply chain from the interviews with RUF stakeholders, the focus group discussions with farmers and the wholesaler/retailer surveys. Structural equation modeling was used for the chickpea farmer's survey data. The main findings are summarized in section 5.1 below. Sections 5.2 and 5.3 discuss the policy implications of the study results, and the limitations and areas for further research, respectively.

### **5.1 Summary of major research findings**

The study examined the effectiveness of informal institutions in building trust, information sharing and lowering transaction costs. It proposed that informal institutions can play a significant role in reducing opportunism and enhance information sharing in situations where it is hard to have formal institutions or where they are slow to develop, if ways are devised to utilize them tactfully. The main research question of the study was how informal institutions affect the level of trust and information sharing in the RUF supply chain in Ethiopia.

The results from the structural equation modeling showed how participation and membership in formal/informal institutions impacts trust and information sharing and how trust and information sharing in turn affects the transaction costs associated with chickpea marketing. Chickpea farmers participated in five major institutions, Ikkub, Iddir, cooperatives, microfinance and political organization. The results indicate that membership in formal institutions like microfinance institutions and political institutions promoted information sharing between chickpea trading partners. Membership in cooperatives did not significantly affect information

sharing between trading partners. Participating in informal social institutions like Ikubb also promoted information sharing between partners but participation in Iddir did not affect information sharing. The level of trust between chickpea farmers and buyers positively affected participation in informal institution like Iddir and Ikubb. Being member of cooperatives and political party also improved the trust between farmers and traders. Membership in a microfinance institution did not positively affect the trust level. The study also found that trust between trading partners reduces the time farmers spent negotiating price with buyers. Trust between trading partners also increased the marketed surplus of farmers. Information sharing among trade partners positively affects trust between partners.

The descriptive statistics in section 3.3 indicate that most of the farmer survey participants were well educated, male-dominated and had limited off-farm activity. Average land holding was 1.25 hectares and chickpea yield was below the estimated level. Most farmers prefer to sell at the spot market due to the higher price obtained in this channel. The study identified survey participants were members of five major institutions. Two of these, Iddir and Ikub are informal institutions while microfinance, cooperatives and political organizations are categorized as formal.

Food processing companies face a number of challenges which include the unavailability of raw material/crops at a reasonable price except during harvest/peak season; quality problems due to poor post-harvest practices, deliberate mixing/adulteration of different qualities, and poor transportation is another major challenge and; foreign currency shortage to buy imported inputs.

The interviews provided insights into the supply chain structure of the RUF in Ethiopia. There are two parallel supply chains of RUF. One is run by UNICEF and the other by the government body of PFSA. USAID funds most of the procurement and distribution cost of the RUF available in the country. Local procurement is preferred and encouraged though it is limited as it accounts for only 20-30% of total procurement. The supply chain is efficient based on the key success indicators though there are areas for improvement. This potential areas of improvement include better storage facilities, increased number of local producers and reduced dependence on donor and humanitarian agencies.

## **5.2 Implications**

Institutions have been recognized as an important element in economic behavior, transactions and economic growth and for this reason have been acknowledged and integrated into

development policy thinking (Dorward, Kydd, Morrison and Poulton, 2005). However, Doward and colleagues argue that the institutional policies devised have not been strong enough in addressing the challenges of poor rural areas in developing countries. The authors develop a conceptual framework where they propose the primary purpose of institutions in economies characterized by market failure and high transaction costs should not be to improve the performance of competitive markets. Rather, institutions should be the means/channels that perform the exchange and coordination function that could not be performed due to the absence of competitive markets. This way nonmarket institutions can effectively address market failure and high transaction costs in such countries. In line with this theory, the results of this study which found non-market institutions like Ikkub and Iddir to positively contribute to improved chickpea marketing, imply that such institutions facilitate exchanges and coordination. Therefore, policies that aim to solve the low marketed output and high transaction costs should strengthen such institutions or encourage participation.

In southern India they have what is called “chit funds” which has exactly the same principles and organizational structure as Ikubb in Ethiopia. In southern India they have been legally organized by companies and draw thousands of people who do not even know each other. They function as well as banks, giving better interest rates than banks and can rival the formal banking system in terms of volume of funds if both the legally registered and informally organized chit funds were put together (Munshi, 2006). This is an example of non-market financial institutions that could well serve the purpose of formal financial institution. Ikubb in particular is a widely practiced form of obtaining credit throughout the different regions in Ethiopia with very minimal defaults and high participation rates. People have effectively used it for centuries to obtain credit in times of need. It is a well-established, widely accessible, easily formed/established organization that could provide participants with large sums of money which is not available any other way. The strong social and moral values associated with participation in Ikubb has minimized defaults and thus has made Ikubb an efficient and reliable source of obtaining credit in areas where it is difficult or impossible to monitor individual action or use legal institutions to enforce deals. Therefore, based on the finding of this study that find participation in Ikkub to improve information sharing and trust between chickpea traders, existing, local, nonmarket institutions in Northern Ethiopia can be as effective as formal institutions in providing financial services. Local governments and other NGOs that aim to promote agricultural growth and

development could help in formalizing and legalizing such institutions. Informal institutions can also be used by food processing companies. These companies can utilize the informal institutions that are predominant in the dealings of small-holder farmers, retailer, and wholesalers to reduce the transaction costs that arise from poor supply chains. Companies can encourage participation by prioritizing farmers that are engaged in such informal institutions or by supporting the adaption and application of informal institutions to suit the organization and need of their company.

In addition, new RUFs supply chains and food processing companies can utilize these institutions to increase supply chain performance. However, issues like foreign currency problems and quality adulteration require policy measures that promote availability of foreign currency to manufactures and putting in place stricter quality assurance mechanisms and quality testing facilities. Additionally, the challenges food processing companies face in terms of obtaining a consistent amount and quality of inputs can be improved through the increased marketed output experienced by farmers due to increased trust between trading partners. The existence of trust further improves the dealing of trading partners by increasing honesty and fairness in trade as the same level of moral is expected (reciprocity).

### **5.3 Limitation of the study and areas for further research**

The chickpea farmer survey was carried out only in Tigray in Northern Ethiopia which has a significant production of chickpea. However, the Amhara and Oromia regions are also major producers. Most of the chickpea that ends up in food processing companies comes from these two regions and a study in these areas will better inform chickpea marketing. The limitation of the study in only one area limits the implication of the findings to the whole country even though similarities exist in some features in all chickpea producing regions in Ethiopia. Further research in these other regions needs to clearly establish the applicability of the implications in these regions.

There was also a difficulty in contacting middle men in the chickpea supply chain that play a crucial role in the supply chain. These middle men/ wholesalers are the major suppliers of chickpea to food processing companies and indeed serve as a bridge between several smallholder farmers scattered geographically and the food processing companies. Further studies about

supply chains that include these agents could provide important insights into the organization of the supply chain.

The study has limitation in the total sample size used in the structural equation model. A large sample size can improve the fit of the model and makes the interpretation of the results more reliable. This study can draw only limited implications from the results and the lower CFI index of model 1 and model 5 call for a cautious interpretation of the results. Further studies that have larger sample sizes can strengthen the findings of this study and be a basis for government policy guidelines. The limited number of stakeholders, particularly food processing companies, interviewed also limits the insight gained from the interviews. All food processing factories were also located in the capital, Addis Ababa, thus limiting the application of insights to other regions. A country wide analysis of food processing companies can provide further insights.

The study only identifies the challenges in the supply chains and does not investigate in detail the causes or the solutions of these issues. Further research that investigates the solutions to the challenges identified would inform policymakers about potential areas of intervention to improve the supply chain. How the lack of perfect information in such settings affect the interaction among institutions and trading partners is also an area that might be of interest for further research. In addition, only the role of domestic institutions is discussed in detail in relation to social capital and transaction costs. Further research could explore the role international institutions play in promoting trust and information sharing as well as lowering transaction costs in the RUF or other similar supply chains.

The existence of corruption in formal institutions might hinder the trust and information sharing that are found to be improved by institutions examined in this study. Further research could explore how institutional failure due to corruption or other priorities of stakeholders in this institutions can lead to poor performance of supply chains and failure to remove the existing bottle necks in the supply chain.

In conclusion, the thesis has examined the role institutions play in supply chain organization and has found that membership in informal institutions strengthens the trust and information sharing between trading partners and this in turn reduces the transaction costs associated with chickpea trade. In addition, the current performance of the RUF supply chain in Ethiopia is relatively efficient with some room for improvement in increasing quality adherence of manufactures in

order to increase the current level of local production and stabilizing the market for consistent availability of local and imported inputs.

## References

- Abebaw, D. & Haile, M. (2013). The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia. *Food Policy*, 38, 82-91.  
doi:10.1016/j.foodpol.2012.10.003
- Abera, H. (2010). *Chickpea production, Supply, Demand and Marketing Issues in Ethiopia*. Ethiopia Commodity Exchange Authority
- Abidi, H. , Leeuw, S. & Klumpp, M. (2013). Measuring Success in Humanitarian Supply Chains. *International Journal of Business and Management Invention*, 2(8), 31-39.
- AGP, Agricultural Growth Program. (2017). *Chickpea*. Retrieved from <http://ethioagp.org/chickpea-2/>
- Alemu, A. & Adesina, J. (2015). Market or Hybrid? Determinants of Agribusiness Actors' Decision Behaviour in the Agrifood Supply Chain. *The Journal of Commerce*, 7(1), 23-41.
- Alemu, A., Maertens, M., Deckers, J., Bauer, H. & Mathijs, E. (2016). Impact of supply chain coordination on honey farmers' income in Tigray, Northern Ethiopia. *Agricultural and Food Economics*, 4(1). doi:10.1186/s40100-016-0053-x
- Andreassen, T., Lorentzen, B., & Olsson, U. (2006). The Impact of Non-Normality and Estimation Methods in SEM on Satisfaction Research in Marketing. *Quality & Quantity*, 40(1), 39–58. <https://doi.org/10.1007/s11135-005-4510-y>
- Aramyan, L., Oude L., Alfons G. J. M., van der Vorst, Jack G. A. J., & van Kooten, O. (2007). Performance measurement in agri-food supply chains: a case study. *Supply Chain Management: An International Journal*, 12(4), 304-315.  
doi:10.1108/13598540710759826
- Association of Ethiopian Microfinance Institutions. (2010). *Agricultural finance potential in Ethiopia: Constraints and opportunities for enhancing the system*. Retrieved from <https://agriknowledge.org/downloads/5m60qr91n>
- Atsbaha, A. (2008). *Analysis of the Role of Cooperatives in Agricultural Input and Output Marketing in Southern Zone of Tigray, Ethiopia*. Mekelle University, Mekelle. Retrieved from [https://cgspace.cgiar.org/bitstream/handle/10568/85/Final\\_AlemaWoldemariam.pdf?sequence=1&isAllowed=y](https://cgspace.cgiar.org/bitstream/handle/10568/85/Final_AlemaWoldemariam.pdf?sequence=1&isAllowed=y)



- Awan, G.(2016). Retrieved from <https://www.bayt.com/en/specialties/q/305392/what-are-the-strategic-tactical-and-operational-levels-of-integrated-system/>
- Batt, P. (2003). Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach. *Supply Chain Management: An International Journal*, 8(5), 442-454. doi:10.1108/13598540310500277
- Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H. C., Narayanan, S., & Walker, T.F. (2012). Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries. *World Development*, 40(4),715-730.  
<https://doi.org/10.1016/j.worlddev.2011.09.006>
- Beamon, B. M. (1998). Supply Chain Design and Analysis:Models and Methods *International Journal of Production Economics*, 55(3), 281-294.
- Bello, D., Lohtia, R. & Sangtani, V. (2004). An institutional analysis of supply chain innovations in global marketing channels. *Industrial Marketing Management*, 33(1), 57-64.  
doi:10.1016/j.indmarman.2003.08.011
- Berhane, G., & Gardebroek, C. (2011). Does Microfinance Reduce Rural Poverty? Evidence Based on Household Panel Data from Northern Ethiopia. *American Journal of Agricultural Economics*, 93(1), 43–55. <https://doi.org/10.1093/ajae/aaq126>
- Berhane, G. , Dereje, M. , Hoddinott, J. , Koru, B., Nisrane, F. , Tadesse, F. , . . . Yohannes, Y. (2013). *Ethiopia Strategy Support Program (ESSP) II: Agricultural Growth Program (AGP) of Ethiopia — Baseline report 2011*. Retrieved from [http://essp.ifpri.info/files/2013/03/ESSPII\\_EDRI\\_Report\\_AGP\\_Baseline.pdf](http://essp.ifpri.info/files/2013/03/ESSPII_EDRI_Report_AGP_Baseline.pdf)
- Berg, J., Dickhaut, J. & McCabe, K. (1995). Trust, Reciprocity, and Social History. *Games and Economic Behavior*, 10, 122-142
- Bezu,S., Kassie,T., Shiferaw, B., Ricker-Gilbert,J.(2014). Impact of improved maize adoption on welfare of farm households in Malawi:a panel data analysis. *World Dev.* 59, 120-131
- Blandon, J., Henson, S. & Cranfield, J. (2009). Small-scale farmer participation in new agri-food supply chains: Case of the supermarket supply chain for fruit and vegetables in Honduras. *Journal of International Development*, 21(7), 971-984. doi:10.1002/jid.1490
- Bowles, S. (1998). Endogenous Preferences: The Cultural Consequences of Markets and Other Economic Institutions. *Journal of Economic Literature*, 36(1), 75-111.

- Cai, S., Jun, M. & Yang, Z. (2010). Implementing supply chain information integration in China: The role of institutional forces and trust. *Journal of Operations Management*, 28(3), 257-268. doi:10.1016/j.jom.2009.11.005
- Capital.(2018). Retrieved from <http://capitalethiopia.com/2018/04/02/hard-times-hard-currency/#.W1JLU9JKjIU>
- Caron, O. (2013, September 12). *RUTF Product Specifications and Labeling Requirements* Paper presented at the UNICEF SD, RUTF pre-bid conference, Copenhagen.
- Chaka, A., Kenea, T. & Gebresenbet, G. (2016). Analysis of the Supply Chain and Logistics Practices of Warqe Food Products in Ethiopia. *Int. J. Food System Dynamics*, 7(3), 213-228. doi:10.18461/ijfsd.v7i3.733
- Chin, W. (1998). Commentary: Issues and Opinion on Structural Equation Modeling. *MIS Quarterly*, 22(1), 7–16.
- Chipeta, M., Emanu, B. & Chanyalew, D. (2015). *Ethiopia's Agriculture Sector Policy and Investment Framework (2010–2020), External Mid-term Review*. Retrieved from [http://www.agri-learning-ethiopia.org/wp-content/uploads/2015/10/Agriculture-Policy-MTR\\_FINAL.pdf](http://www.agri-learning-ethiopia.org/wp-content/uploads/2015/10/Agriculture-Policy-MTR_FINAL.pdf)
- Coase, R. H. (2013). The Problem of Social Cost. *The Journal of Law & Economics*, 56(4), 837–877. Retrieved from <https://doi.org/10.1086/674872>
- Complementary Foods and Feeding: Nutritional companion to breastfeeding after 6 months. (2018). Retrieved from <https://www.unicef.org/programme/breastfeeding/food.htm>
- Cousins, P., Handfield, R., Lawson, B. & Petersen, K. (2006). Creating supply chain relational capital: The impact of formal and informal socialization processes. *Journal of Operations Management*, 24(6), 851-863. doi:10.1016/j.jom.2005.08.007
- Daniels, H. & Fors, S. (2015). *Supply & Value Chain Analysis of Onions in Ethiopia*. (Master of Science), SLU, Swedish University of Agricultural Sciences, Swedish. Retrieved from <http://stud.epsilon.slu.se>
- de Janvry, A., Fafchamps, M., & Sadoulet, E. (1991). Peasant Household Behavior with Missing Markets: Some Paradoxes Explained. *The Economic Journal*, 101(409), 1400–1417. <https://doi.org/10.2307/2234892>

- Dong, M.C., Ju, M. & Fang, Y. (2016). Role hazard between supply chain partners in an institutionally fragmented market. *Journal of Operations Management*, 46, 5-18. doi:10.1016/j.jom.2016.07.006
- Dorward, A., Kydd, J., Morrison, J. and Poulton, C. (2005). ‘Institutions, Markets and Economic Co-ordination: Linking Development Policy to Theory and Praxis’, *Development and Change*, 36(1): 1–25.
- Dyer, J. , & Chu, Wujin (2003). The Role of Trustworthiness in Reducing Transaction Costs and Improving Performance: Empirical Evidence from the United States, Japan, and Korea. *Organization Science Informs*, 14(1), 57 - 68.
- ECX. (2009). Ethiopian Commodity Exchange. Retrieved from <http://www.ecx.com.et/Operations.aspx#WH>
- EGTE, Ethiopian Grain Trade Enterprise. (2017). Commodity Statistics. Retrieved from <http://www.egte-ethiopia.com/en/2014-03-29-12-35-07/egte/item/89-commodity-statistics.html>
- EIAR, MOH and EATA.(2013). Working Strategy for Strengthening Ethiopia’s Chickpea Value chain Vision, Systemic Challenges and Prioritized Interventions. Addis Ababa,Ethiopia
- EPOSPEA. (2017). Ethiopian Pulses, Oilseeds and Spices Processors-Exporters Association Retrieved from <http://www.epospeaeth.org/index.php/about-epospea>
- Fafchamps, M. & Minten, B. (2002). Returns to social network capital among traders. *Oxford Economic Papers*, 54(2), 173-206.
- FAOSTAT.(2017). Retrieved from <http://www.fao.org/faostat/en/#data/QC>
- Gabre-Madhin, E. (2001). *Market Institutions,Transaction Costs, and Social Capital in the Ethiopian Grain Market*. Retrieved from <http://ageconsearch.umn.edu/bitstream/16540/1/rr010124.pdf>
- GAIN. (2014). *Ethiopia Grain and Feed Annual Report* Retrieved from <http://www.agrochart.com/en/news/3902/ethiopia-grain-and-feed-annual-apr-2014.html>
- Gebremedhin, B., Jaleta, M. & Hoekstra, D. (2009). Smallholders, institutional services, and commercial transformation in Ethiopia. *Agricultural Economics*, 40, 773-787. doi:10.1111/j.1574-0862.2009.00414.x
- Greif, A. (1993). Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders’ Coalition. *American Economic Review*, 83(3), 525.

- Handfield, R. & Bechtel, C. (2002 ). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management*, 31(367-382).
- Helmke, G. , & Levitsky, S. (2004). Informal Institutions and Comparative Politics:A Research Agenda. *Perspectives on Politics*, 2(04), 725-740. doi:10.1017/S1537592704040472
- Hernandez, M., Rashid, S., Lemma, S. & Kuma, T. (2017). Market Institutions and Price Relationships: The Case of Coffee in the Ethiopian Commodity Exchange. *American Journal of Agricultural Economics*, 99(3), 683-704. doi:10.1093/ajae/aaw101
- Hilary, R. S., Sseguya, H., & Kibwika, P. (2017). Information quality, sharing and usage in farmer organizations: The case of rice value chains in Bugiri and Luwero Districts, Uganda. *Cogent Food & Agriculture*, 3(1).Retrieved from <https://doi.org/10.1080/23311932.2017.1350089>
- Hoyle, R. (1995). *Structural equation modeling : Concepts, issues, and applications*. Thousand Oaks: Sage Publications.
- Hobbs, J. (1996). A transaction cost approach to supply chain management. *Supply Chain Management: An International Journal*, 1(2), 15-27. doi:10.1108/13598549610155260
- Hobbs, J. (2004). Information asymmetry and the role of traceability systems. *Agribusiness*, 20(4), 397-415. doi:10.1002/agr.20020
- Hu, L., & Bentler, P. M. (1998). Fit Indices in Covariance Structure Modeling: Sensitivity to Underparameterized Model Misspecification, 3(4), 424–453.
- ISO.(2005). Retrieved from <https://www.iso.org/standard/35466.html>
- Isogai, Y. (2011). Value chain approach to increase production of RUTF/CSB. *Field Exchange*(40), 78-79. Retrieved from [www.enonline.net/fex/40/value](http://www.enonline.net/fex/40/value)
- Jabbar, M., Benin, S., Gabre-Madhin, E., & Paulos, Z. (2008). Market Institutions and Transaction Costs Influencing Trader Performance in Live Animal Marketing in Rural Ethiopian Markets. *Journal of African Economies*, 17(5), 747-764. doi:10.1093/jae/ejn004
- Johnson, Noel D., & Mislin, Alexandra A. (2011). Trust games: A meta-analysis. *Journal of Economic Psychology*, 32(5), 865-889. doi:10.1016/j.joep.2011.05.007
- Kalyar, M. , Naveed, T. , Anwar, S. & Iftikhar, K. (2013). Supply Chain Information Integration: Exploring the Role of Institutional Forces and Trust *Journal of Business Administration and Education*, 3(1), 1-24.

- Kaso, T. & Guben, G. (2015). Review of Barley Value Chain Management in Ethiopia. *Journal of Biology, Agriculture and Healthcare*, 5(10), 84-97.
- Kassie, M., Shiferaw, B. , Asfaw, S. , Abate, T., Muricho, G., Ferede, S., . . . Assefa, T. (2009). *Current Situation and Future Outlooks of the Chickpea Sub-sector in Ethiopia*. Retrieved from [http://www.icrisat.org/TropicalLegumesII/pdfs/Current\\_Situation.pdf](http://www.icrisat.org/TropicalLegumesII/pdfs/Current_Situation.pdf)
- Klein, D.. (1997). [Review of the book Trust, ethnicity, and identity: Beyond the new institutional economics of ethnic trading net-works, contract law, and. gift-exchange by Janet T. Landa]. *Journal of Economic Literature*, 35, 134-135.
- Kline, R. (2005). *Principles and Practices of Structural Equation Modeling*. New York, USA. The Guilford Press
- Komrska, J. (2012). Increasing Access to Ready-to-use Therapeutic Foods (RUTF). *Field Exchange*(42), 46-47.
- Komrska, J., Kopczak, L. R. & Swaminathan, J. M. (2013). When Supply Chains Save Lives. *Supply Chain Management Review*(January/ February), 42-49.
- Kwon, I.G. and Suh, T. 2004. Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships. *Journal of Supply Chain Management*, 40(1), 4-14. Retrieved from <https://doi-org.cyber.usask.ca/10.1111/j.1745-493X.2004.tb00165.x>
- Laequddin, M., Sahay, B. S., Sahay, V., & Abdul, K. (2010). Measuring trust in supply chain partners' relationships. *Measuring Business Excellence*, 14(3), 53-69.  
doi:10.1108/13683041011074218
- Landa, J. (1994). *Trust, ethnicity, and identity: beyond the new institutional economics of ethnic trading networks, contract law, and gift-exchange*: University of Michigan Press.
- Mackie, P., Brown, A., Smith, A., & GebreEgziabher, T. (2015). *Microfinance and Poverty Alleviation in Ethiopia*. Cardiff University. Retrieved from [https://www.cardiff.ac.uk/\\_\\_data/assets/pdf\\_file/0010/581509/Ethiopia-Report-Jun-2015-FINAL.pdf](https://www.cardiff.ac.uk/__data/assets/pdf_file/0010/581509/Ethiopia-Report-Jun-2015-FINAL.pdf)
- Manary, M.J. (2006). Local production and provision of ready-to-use therapeutic food for the treatment of severe childhood malnutrition. *Food and Nutrition Bulletin*, 27(3), 83-89.
- MANR, Ministry of Agriculture and Natural Resource. (2017). Policies and Strategies Retrieved from <http://www.moa.gov.et/web/pages/policies-and-strategies>

- MOFED, Ministry of Finance and Economic Development. (2006). *Ethiopia: Building on Progress. A Plan for Accelerated and Sustained Development to End Poverty (PASDEP)*. Retrieved from [http://siteresources.worldbank.org/INTETHIOPIA/Resources/PASDEP\\_Final\\_English.pdf](http://siteresources.worldbank.org/INTETHIOPIA/Resources/PASDEP_Final_English.pdf)
- MOFED, Ministry of Finance and Economic Development. (2010). *Growth and Transformation Plan 2010/11 -20 14/15*. Retrieved from <http://extwprlegs1.fao.org/docs/pdf/eth144893.pdf>
- Munshi, K. (2006). Nonmarket Institutions. Oxford Scholarship Online. DOI:10.1093/0195305191.003.0026.
- Mutonyi, S. , & Gyau, A. (2013). *Measuring performance of small and medium scale agrifood firms in developing countries: Gap between Theory and Practice*. Paper presented at the 140th EAAE Seminar, "Theories and Empirical Applications on Policy and Governance of Agri-food Value Chains" Perugia, Italy. <https://ideas.repec.org/p/ags/eaal40/163339.html>
- North, D. (1990). *Institutions, Institutional Change and Economic Performance*. New York: Cambridge University Press.
- Ojiewo, C. (2016). Chickpea Production, Technology Adoption and Market Linkages in Ethiopia. Pan-African Grain Legume and World Cowpea Conference. Livingstone, Zambia.
- Precise. (2014, November 04). Company Inaugurates First Ever Agri-Food Laboratory. *The Ethiopian Herald*. Retrieved from <http://preciseethiopia.com/company-inaugurates-first-ever-agri-food-laboratory/>
- Putnam, R. (1995). *Bowling Alone: America's Declining Social Capital*. . The Johns Hopkins University Press. Retrieved September 12, 2017, from Project MUSE database. *Journal of Democracy*, 6(1), 65-78.
- Rashid, S., Abate, G., Lemma, S., Warner, J., Kasa, L. & Minot, N. (2015). *The Barley Value Chain in Ethiopia*. Retrieved from <http://www.ifpri.org/publication/barley-value-chain-ethiopia>

- Reardon, T. , Chen, K., Minten, B. & Adriano, L. (2012). *The Quiet Revolution in Staple Food Value Chains: Enter the Dragon, the Elephant, and the Tiger*. Mandaluyong City, Philippines: Asian Development Bank and International Food Policy Research Institute.
- Schumacker, R. E., & Lomax, R. G. (2010). *A beginner's guide to structural equation modeling* (3. ed). New York, NY: Routledge.
- Segre, J., Liu, G., & Komrska, J. (2016). Local versus offshore production of ready-to-use therapeutic foods and small quantity lipid-based nutrient supplements. *Maternal & Child Nutrition*. doi:10.1111/mcn.12376
- Shiferaw, B., & Teklewold, H. (2007). *Structure and functioning of chickpea markets in Ethiopia: Evidence based on analyses of value chains linking smallholders and markets*. Retrieved from <https://cgspace.cgiar.org/handle/10568/571>
- Statista. (2018). Retrieved from <https://www.statista.com/statistics/502058/mobile-cellular-subscriptions-per-100-inhabitants-in-ethiopia/>
- Sutter, M. and Kocher, M. (2007). Trust and trustworthiness across different age groups. *Games and Economic Behavior* 59(2), 364-382. Retrieved from <https://doi.org/10.1016/j.geb.2006.07.006>
- Swaminathan, J. (2009). *UNICEF'S Plumpy'nut Supply Chain*. Retrieved from <https://www.kenan-flagler.unc.edu/~/media/Files/documents/cse/unicef-plumpy-nut-supply-chain.pdf>
- Tarozzi, A., Desai, J. & Johnson, K. (2015). The Impacts of Microcredit: Evidence from Ethiopia. *American Economic Journal: Applied Economics*, 7(1), 54-89. doi:10.1257/app.20130475
- Tefera, T. (2014). Analysis of Chickpea Value Chain and Determinants of Market Options Choice in Selected Districts of Southern Region: A Case of CIFSRF Call3 Project. *Journal of Agricultural Science and Technology*, 6(10). doi:10.5539/jas.v6n10pxx
- Troubé, C. (2012). Nutriset, a company at the heart of the nutritional revolution. *The journal of Field Actions Science Reports*(Special Issue 5).
- UNESCO. (2007). <http://uis.unesco.org/en/country/et>
- UNICEF. (2009). *A supply chain analysis of Ready-to-Use Therapeutic Foods for the horn of Africa: The Nutrition Articulation Project*. Retrieved from

<http://supplychainsforchildren.org/en/Supply-Chain-Stories/A-supply-chain-analysis-of-ready-to-use-therapeutic-foods-for-the-Horn-of-Africa>

- UNICEF. (2013). *Evaluation of Community Management of Acute Malnutrition (CMAM): Global Synthesis Report*. Retrieved from [https://www.unicef.org/evaldatabase/files/Final\\_CMAM\\_synthesis\\_FINAL\\_VERSION\\_with\\_ExSum\\_translations.pdf](https://www.unicef.org/evaldatabase/files/Final_CMAM_synthesis_FINAL_VERSION_with_ExSum_translations.pdf)
- UNICEF. (2017). *Ready-to-Use Therapeutic Food:Current Outlook*. Retrieved from [https://www.unicef.org/supply/files/Ready-to-use\\_Therapeutic\\_Food\\_Current\\_Outlook.pdf](https://www.unicef.org/supply/files/Ready-to-use_Therapeutic_Food_Current_Outlook.pdf)
- United Nations, Department of Economic and Social Affairs, Population Division. (2017). *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. Retrieved from [https://esa.un.org/unpd/wpp/Publications/Files/WPP2017\\_KeyFindings.pdf](https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf)
- United Nations Development Programme. (2014). *Human Development Report 2014: Sustaining Human Progress: Reducing Vulnerability and Building Resilience*. New York, NY: United Nations Development Programme.
- USAID. (2012). *Agricultural Growth Program- Agribusiness and Market Development(AGP-AMDE) Project: Business Enabling Environment Assessment*. Retrieved from [http://pdf.usaid.gov/pdf\\_docs/PA00KRTJ.pdf](http://pdf.usaid.gov/pdf_docs/PA00KRTJ.pdf)
- USAID. (2015). *Agricultural Growth Program- Agribusiness and market Development project.USAID Quarterly Report*. Retrieved from [http://pdf.usaid.gov/pdf\\_docs/PA00KRTW.pdf](http://pdf.usaid.gov/pdf_docs/PA00KRTW.pdf)
- USAID. (2017, August 15, 2017). Ethiopia: Nutrition. Retrieved from <https://www.usaid.gov/ethiopia/nutrition>
- van Dijk, M. & Trienekens, J. (2011). *Global Value Chains*. Amsterdam, NETHERLANDS: Amsterdam University Press.
- Verkaat, S., Munyua, B., Mausch,K., Michler,J. (2017).Welfare impacts of improved chickpea adoption: A pathway for rural development in Ethiopia? *Food Policy* 66, 50-61
- Wagh, V. & Deore, B. (2015). Ready to Use Therapeutic Food (RUTF): An Overview. *Advances In Life Sciences And Health*, 2(1), 1-15.
- WHO. (2017, May 2017). Malnutrition: Factsheet. Retrieved from <http://www.who.int/mediacentre/factsheets/malnutrition/en/>



- WHO, WFP, & UNICEF. (2007). *Community -based Managment of Severe Acute Malnutrion*. Retrieved from [http://www.who.int/nutrition/topics/Statement\\_community\\_based\\_man\\_sev\\_acute\\_mal\\_e ng.pdf](http://www.who.int/nutrition/topics/Statement_community_based_man_sev_acute_mal_e ng.pdf)
- Williamson, O. E. (1993). Calculativeness, Trust, and Economic Organization. *The Journal of Law and Economics*, 36(1, Part 2), 453–486. <https://doi.org/10.1086/467284>
- Yee, W. M. S., & Yeung, R. M. W. (2010). An Empirical Examination of the Role of Trust in Consumer and Supplier Relationship of Little Direct Contact: A Structural Equation Modeling Approach. *Journal of International Food & Agribusiness Marketing*, 22(1–2), 143–163. <https://doi.org/10.1080/08974430903373003>
- Zhang, X. & Hu, D. (2011). Farmer-buyer relationships in China: the effects of contracts, trust and market environment. *China Agricultural Economic Review*, 3(1), 42-53. [doi:10.1108/17561371111103534](https://doi.org/10.1108/17561371111103534)

## Appendix

### Appendix A: Results from the logistic regression

To examine if informal institutions/trust enhances RUTF supply chain performance by increasing the use of enforceable contractual agreements a binary logistic model was used. Whether a farmer has any form of written contractual agreement regarding the production or marketing of chickpea is used as the dependent variable (the dependent variable is 1 if the farmer has a written contractual agreement, 0 if not). The random selection of participants based on production of chickpea minimizes the selection bias that could occur due to unobservable traits that explain participation in contractual agreements. Of the 148 households 38 households (about 26%) had a written agreement. These contracts were either with microfinance institutions or the local government agriculture office for breeder seed.

Variable (Dependent Variable: Contractual agreement)	Coefficient (Robust standard errors)
Age(years)	-0.019(0.025)
Gender(Female)	-0.47(0.728)
Household size	-0.343**(0.235)
Education (years)	-0.010(0.102)
Income	-0.002(0.000)
Amount of harvested chickpea	0.002(0.002)
Land size	-0.47(0.537)
Ownership of Radio	-1.715**(0.852)
Ownership of Mobile phone	-0.352(0.697)
Member of a political party	1.736(1.473)
Member in a microfinance institution	2.539***(0.781)
Member in a Co-op or farmers association	3.439***(1.064)
Member in an Iddir	0.383(0.574)
Member in an Ikkub	-0.431(0.964)
Information source agriculture extension worker	2.529**(1.193)
Information source local market	0.797(1.175)
Information source buyers	-1.608(1.229)
Information source friends	-1.530(1.085)
Negotiation time	-0.002(0.004)
Sell to Wholesalers	-0.613(1.255)
Sell directly to consumers	-1.452(1.428)
Chickpea variety grown(white)	1.312(0.969)
Chickpea variety (both red and white)	0.863(0.682)
Off-farm activity	-0.221(0.951)
Trust in trading partner	0.501(0.460)
Constant	0.376(3.17)

n=140; Pseudo R<sup>2</sup>=0.493; Wald  $\chi^2$  (26) =58.04; Prob > $\chi^2$ = 0.0003

\*significant at 1%; \*\*significant at 5%; \*\*\*significant at 10%

The results show that obtaining information from an agricultural extension worker positively increased the likelihood of having a contractual agreement. Being members of a cooperative, microfinance or political party also increase probability of participation. This is in line with the hypothesis and other similar studies that found membership in a cooperative or some form of farmers organization mattered to farmers' decisions to participate in contract agreements because it lowered transaction costs and increased welfare of participants through increased marketed surplus, improved access to farm inputs and increased bargaining power (Barrett et al., 2012).

Trust did not have a significant effect on participation in a written contractual agreement, neither did membership in Ikkub or Iddir. This is in contrast to the expected result and the literature which finds significant positive relationship or complementary effect between the two variables (Blandon, et al., 2009; Zhang and Hu, 2011). This could be because the survey instrument measured trust with supply chain partners, whereas the contract variable measures participation in contracts related to microfinancing and breeder seed. Having a larger household size and owning a radio reduced the probability of having a contractual agreement.

The few number of observation obtained from the survey regarding contractual agreements (very few household with contractual agreements regarding chickpea) has limited the analysis and is the reason why the regression results are not included in the main thesis.

### **Appendix B: The OLS regression results**

The table below is results from an ordinary least squares regression with robust standard errors. The dependent variable is trust which is obtained from a principal component analysis based on 17 Likert-based survey questions. The variable trust is the average of the survey participants' response to the Likert questions that range from 1-5 based on the level of agreement /disagreement with regards to the statements related with trust. The variable information sharing and satisfaction are also obtained from the principal component analysis. Similar with the trust variable there value is the average of the responses to the questions that relate to each measure. Information sharing is used as an explanatory variable in the regression analysis along with contractual agreement variable, membership in institutions, source of price information and socio-economic variables. The description of all the variables used and the results of the regression are presented in the table below.

Variable description	Coefficient (Robust standard errors)
Dependent variable Trust	
Information sharing	0.489***(0.061)
Unwritten Contractual agreement	-0.073(0.103)
Written contractual agreement	0.122(0.103)
Off-farm activity	-0.052(0.084)
Trading partner member of the same institution	0.159(0.114)
Amount of harvested chickpea	0.084**(0.036)
Land size	0.214***(0.056)
Ownership of Mobile phone	-0.137(0.097)
Member of a political party	0.196*(0.112)
Member in a microfinance institution	-0.07**(0.033)
Member in a Co-op or farmers association	0.162**(0.073)
Member in an Iddir	0.210***(0.068)
Member in an Ikkub	0.005(0.079)
Information source agriculture extension worker	-0.088(0.116)
Information source local market	-0.1(0.098)
Information source buyers	-0.028(0.125)
Information source friends	0.003(0.096)
Negotiation time	0.0001(0.0002)
Income	-0.0001(0.000)
Gender(Female)	0.013(0.097)
Age	-0.007**(0.003)
School	-0.026*(0.014)
Constant	1.918***(0.3)

N=136; R<sup>2</sup>=0.644; F (22,113) =11.63; Prob>F=0.00; Root MSE=0.405

\*significant at 1%; \*\*significant at 5%; \*\*\*significant at 10%

The F-test and the small values of the root MSE show a good fit of the model. Some of the socio-economic factors are significant indicating the effect they have on the level of trust between trading partners. Age and schooling negatively affects the level of trust while land size and amount of chickpea harvested positively influence trust. As once age increases, one might have already experienced some incidences of defaults or being cheated and this might negatively affect trust with different trading partners. An experimental trust game carried out in eight different countries finds that trust increases with age up to early adulthood but becomes constant once adulthood is reached (Sutter and Kocher, 2007). Trust entails some risk and studies have shown that age and education are associated with risk aversion, mistrust of new technology and

lower rates of land allocation to new seed varieties (Bezu, Kassie, Shiferaw, Ricker-Gilbert, 2014; Verkaat, Munyua, Mausch, Michler, J., 2017).

An unexpected result is the fact that contracts, whether written or unwritten, had no statistically significant effect on trust. This could be due to the volatility of chickpea prices which farmers mentioned as a major challenge. Focus group discussion and interviews with the farmers revealed that farmers prefer to sell in the spot market at the going price as prices are volatile and pre-agreements on price is risky. In the contract farming literature price volatility is usually a positive case for preferring contract farming (Barrett et al., 2012). However, market failure in terms of missing markets, the lack of strong markets and or the high risk involved in such markets might deter farmers from acting rationally (de Janvry, Fafchamps, & Sadoulet, 1991). In addition, farmers who reported having an unwritten contract were mostly using short term agreements about price, quality and the quantity of the chickpea with known customers, which took the form of preordering chickpea for pickup or delivery in a few days. The other types of contracts were mostly with the local agriculture offices where the farmer is given seeds free of charge which could be a special variety or require a certain farming technique and the farmer has to return only the seed initially given out for the experiment.

The amount of chickpea harvested and the amount of land owned by a household positively influences the level of trust in a trading partner. A Pearson correlation coefficient shows the amount of harvested output and land size are not correlated, thus justifying the use of both amount of harvested chickpea and land size in the regression. Fertilizer, pesticide or improved seed were also not correlated with the amount harvested or with yield. In contrast, the marketed amount and harvested amount were highly and significantly correlated.

Membership in a political party, cooperatives or farmers association and Iddir positively and significantly affect the level of trust, while being a member of a microfinance organization negatively affects trust. Information sharing (a construct obtained from the factor analysis) is positively associated with trust as expected, and in line with another study that also found that information sharing improves the level of trust by lowering uncertainty (Kwon and Suh, 2004). Membership in microfinance institutions is defined in the data as any credit received from a formal or informal credit institution (including from trading partners). The negative relationship

could be due to the mistrust that is usually associated with microfinance institutions. Most microfinance institution users in Ethiopia use the regular banking system to save money but use microfinances to obtain the loans (Mackie et al., 2015). Microfinance institutions, though playing a significant role in poverty reduction ((Berhane & Gardebroek, 2011), have yet to build sufficient trust to realize their full potential (Association of Ethiopian Microfinance Institutions, 2010).

The results from this regression is not included in the primary analysis of the thesis because the structural equation model better explains the proposed hypothesis of the study and the data. In addition, the structural equation model better captured the objectives of the study and the results from the SEM model were consistent with prior expectation and literature in the area.

## Appendix C Survey Instruments



UNIVERSITY OF SASKATCHEWAN  
College of Agriculture  
and Bioresources  
DEPARTMENT OF AGRICULTURAL  
AND RESOURCE ECONOMICS  
AGBIO.USASK.CA

### Participant Consent Form (Survey participants)

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**You are invited to participate in a research study entitled: Role of informal institutions in the RUF supply chains in Ethiopia**

**Researcher(s):** Melat Adde, Graduate student, Agriculture and Resource Economics, University of Saskatchewan, +1 306-514-3601, [mla398@mail.usask.ca](mailto:mla398@mail.usask.ca)

**Supervisor:** Dr. Jill Hobbs, Agriculture and Resource Economics, +1 306 966-2445, [jill.hobbs@usask.ca](mailto:jill.hobbs@usask.ca)

**Purpose(s) and Objective(s) of the Research:**

- The purpose of the study is to examine the supply chain for ready-to-use food products in Ethiopia and identify bottlenecks and potential areas of improvement along the supply chain.

**Procedures:** (What you will be asked to do when you participate in the study):

- You will be asked to sit with the research assistant to answer questions about the production and marketing of some of the crops you grow
- This discussion might take about an hour.
- Please feel free to ask any questions regarding the procedures and goals of the study or your role.

**Funded by:**

- This study is supported by Global Institute for Food Security (GIFS) at the University of Saskatchewan (Canada)

**Potential Risks:**

- There are no known or anticipated risks to you by participating in this research

**Potential Benefits:**

- The outcome of the study can be used to identify challenges and potential improvements in the production and marketing of your crops.

**Confidentiality:**

- All the information we will collect from you will be kept strictly confidential. All data will be reported in aggregate form so that it will not be possible to identify individuals who participate in the survey.

**Storage of Data:**

- Consent forms and the questionnaire will be kept in a locked room with the student's supervisor for about five years until findings are published and shared to relevant bodies. All electronic files will be stored in password-protected files. When the data are no longer required, it will be destroyed safely with a program that will not allow deleted data to be recovered.

**Right to Withdraw:**

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time without explanation or penalty of any sort.
- Should you wish to withdraw, you can do so at any time
- Your right to withdraw data from the study will apply until data have been pooled. After this point, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data

**Follow up:**

- To obtain results from the study, please contact your local agriculture office.

**Questions or Concerns:**

- Contact the researcher(s) using the information at the top of page 1;
- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office [ethics.office@usask.ca](mailto:ethics.office@usask.ca) by calling +1-306-966-2975 collect.

**Consent (Oral Consent)**

- Do you have any questions regarding your participation in the study? Are you willing to participate in this study? Yes  No
- I read and explained this Consent Form to the participant before receiving the participant's consent, and the participant had knowledge of its contents and appeared to understand it.

---

*Name of Participant*

---

*Researcher's Signature*

---

*Date*



Participant's code: \_\_\_\_\_

**University of Saskatchewan**  
**College of Agriculture and Bioresources**  
**Questionnaire for assessing the supply chain of ready to use therapeutic food products**

Name of administrative unit/ Kebele: \_\_\_\_\_ Region: \_\_\_\_\_

Date of interview: \_\_\_\_\_ Interviewers name: \_\_\_\_\_

**Part I: Questionnaire for farmers**

No	Questions	Response options (coded)
1.1 The following questions are regarding yourself and the composition of your family/ household		
	<b>Do you grow chickpea?</b>	<b>0. No</b> <b>1. Yes</b> <b>*Proceed to the next questions only if participants answer Yes.</b>
101	How old are you?	_____ Years
102	Gender	1. Male 2. Female
103	Household Composition Number of :	Male children = _____ Female children= _____ Mother and Father= _____ Other people staying in the household= _____ Total household size= _____
104	What is the highest level of schooling you have achieved?	_____
*105	Who is the head of the household?	1. Myself 2. My spouse 3. My Parents 4. My spouse's parents 5. Other, specify _____
106	What is your usual occupation?	1. Farmer 2. Tenant Farmer 3. Civil Servant 4. Agricultural Labor 5. Non-agricultural daily Labor 6. Self- Employed 7. Unemployed 8. Other _____
107	What kind of work do you do other than your main occupation?	1. Farmer 2. Tenant Farmer 3. Civil Servant 4. Agricultural Labor

		5. Non-agricultural daily Labor 6. Self- Employed 7. Unemployed 8. Other _____																								
108	What is the average monthly income of your household?																									
109	Does your household own any animals? <u>Animals</u> Ox Cow Goat Sheep Donkey Horse/mule Other	<table> <thead> <tr> <th>No</th> <th>Yes</th> <th>Number</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> <tr> <td>0</td> <td>1</td> <td>_____</td> </tr> </tbody> </table>	No	Yes	Number	0	1	_____	0	1	_____	0	1	_____	0	1	_____	0	1	_____	0	1	_____	0	1	_____
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110	Do you have any of the following things in your house that are functioning?	1. Radio/ tape player 2. Television 3. Mobile phone 4. Weighing equipment 5. Bicycle 6. Horse/donkey cart 7. Other _____																								
1.2 The following questions are regarding your production of chickpea																										
111	Who owns the land you cultivate? *more than one option is possible	1. Myself 2. family/ relative 3. Landlord 4. Other_____																								
112	What is the size of all the land you cultivate (including own land, rented or tenant farmed land)?	_____ ha _____ <i>Timad</i>																								
113	How much chickpea did you harvest in the last 2 harvesting seasons (from all lands)?	_____ <i>quintals</i> _____ Madaberia (_____ <i>kg</i> )																								
114	What chickpea variety do you grow?	1. Desi 2. Kabuli 3. Both 4. Other _____																								

**115	How many chickpea per hectare/per <i>Timad</i> do you produce? *Yield per hectare	_____ Madaberia/gonya
1.3 The following questions are regarding the marketing of your produce and the relationship with your trading partners		
116	What do you do with the chickpea you produce? What percentage/amount is used for each?	1. Household consumption (_____ Madaberia) 2. Store it for seed (_____ Madaberia) 3. Sell it (_____ Madaberia) 4. Other _____ (_____ Madaberia)
117	During the previous harvest season how much did you sell to each of the following buyers?  *Answer should sum to 100%	1. Wholesalers(_____ Madaberia) 2. Retailers(_____ Madaberia) 3. Consumers(_____ Madaberia) 4. Cooperatives(_____ Madaberia) 5. Food processors(_____ Madaberia) 6. Local assembler/brokers(_____ Madaberia) 7. Other (_____ Madaberia)
118	How long (months/years) have you traded with your major/most important buyer?  *Answer only for the one that applies	1. Wholesalers _____ 2. Retailers _____ 3. Consumers _____ 4. Cooperatives _____ 5. Food processors _____ 6. Local assembler _____ 7. Other _____
119	Reason for choosing this buyer	1. Offers the highest price 2. Nearest to me 3. I know/trust him/her 4. I have always sold to this buyer 5. He/she buys my other crops 6. I have no other choice 7. Other _____
120	How far do you typically travel to sell your chickpea?	_____ hours
121	How is the chickpea usually transported?	1. On foot/back 2. Donkey 3. Cart 4. Public transport 5. Other _____

122	How long does it take to sell a kg of your chickpea Average time spent in finding and negotiating a deal	_____min/hrs
123	Where do you store surplus chickpea?	<ol style="list-style-type: none"> <li>1. Do not have surplus</li> <li>2. Inside house</li> <li>3. Separate storage facility on farm</li> <li>4. Shared storage facility outside farm (at a co-op or other location)</li> <li>5. Other _____</li> </ol>
124	Why do you store your chickpea?	<ol style="list-style-type: none"> <li>1. I don't store Chickpea</li> <li>2. To sell when prices go up</li> <li>3. To sell at another market with higher price</li> <li>4. For seed</li> <li>5. For consumption</li> <li>6. Other _____</li> </ol>
125	In transactions of the most recent harvest, has your chickpea been returned/remain unsold due to the following reasons  *more than one option is possible	<ol style="list-style-type: none"> <li>1. Low demand</li> <li>2. Disagreement about price/buyer offered low price</li> <li>3. Lack of buyers</li> <li>4. Low/poor quality</li> <li>5. Other _____</li> </ol>
126	How often has your chickpea been returned/remain unsold for the above reasons?	<ol style="list-style-type: none"> <li>1. Never</li> <li>2. Occasionally//less than 2-3 times</li> <li>3. Sometimes/ 2-3 times in the recent harvest</li> <li>4. Frequently/more than 2-3 times</li> <li>5. Always</li> </ol>
127	Which qualities does your most important buyer require from you?	<ol style="list-style-type: none"> <li>1. Size</li> <li>2. Chickpea variety</li> <li>3. Amount of dirt</li> <li>4. Level of pest damage</li> <li>5. Other _____</li> </ol>
**128	Do you use any of the following on your farm?	<ol style="list-style-type: none"> <li>1. Fertilizer</li> <li>2. Pesticide</li> <li>3. Improved seed</li> </ol>
**129	How do you access/find these inputs?	<ol style="list-style-type: none"> <li>1. I Purchase them directly from the Market</li> <li>2. I get them from Cooperatives</li> <li>3. I get them from Government office/local kebele or woreda</li> <li>4. Other _____</li> </ol>

130	Where do you get information on how to use the above inputs on your farm?	<ol style="list-style-type: none"> <li>1. Agriculture Extension workers</li> <li>2. Neighbours/friends</li> <li>3. Own experience</li> <li>4. Trading partners</li> <li>5. Other _____</li> </ol>
131	Where do you get price information for your chickpea?	<ol style="list-style-type: none"> <li>1. Friends/neighbours</li> <li>2. Buyer</li> <li>3. Local market</li> <li>4. Radio/Television</li> <li>5. Broker</li> <li>6. Agriculture extension workers</li> <li>7. Other _____</li> </ol>
*132	If a broker is used, how do you find a broker?	
133	Do you have any form of written agreement with your any of your buyers regarding price or quantity of chickpea? If yes, Please specify what type of agreement it is and with whom (retailer, wholesaler, local assembler...)?	
134	Do you have any form of unwritten agreement with any of your buyers regarding price or quantity of chickpea? If yes, Please specify what type of agreement it is and with whom (retailer, wholesaler, local assembler...)?	
135	Are you a member of any of the following? *More than one option is possible	<ol style="list-style-type: none"> <li>1. Ikkub</li> <li>2. Iddir</li> <li>3. Farmer Cooperatives</li> <li>4. Farmer's club/association</li> <li>5. I am not a member of any of these</li> <li>6. Other _____</li> </ol>
136	If member of a cooperative, what benefits do you get as a member?	<ol style="list-style-type: none"> <li>1. Credit/loan for farming</li> <li>2. Credit/loan for other non-farming activities</li> <li>3. demand for my chickpea/buys my chickpea</li> <li>4. demand for my other crops</li> <li>5. Farm inputs(seed, fertilizer, pesticide)</li> </ol>

		6. undertakes storing, selling, marketing on my behalf 7. Information about price/demand of chickpea 8. Other _____
137	Is your most important/frequent buyer a member of these associations?	1. Ikkub 2. Iddir 3. Farmer Cooperatives 4. Farmer's club/association 5. Other _____ 6. We are not a member of the same associations
138	How have you used money from your Ikkub for costs related with producing/transporting/packaging chickpea?	1. Have not used money from Ikkub for cost related with chickpea 2. To buy seeds, fertilizer or pesticide 3. To transport chickpea/ buy packaging material for chickpea 4. To build storage facility 5. To hire agriculture labour 6. Other _____
139	How often have you used money from Ikkub for costs related with chickpea production and marketing	1. Never 2. Occasionally 3. Frequently 4. Always
140	Do you have access to agriculture extension workers/services for your chickpea?	0. No 1. Yes
141	If yes to 142, what kind of service do you get from them?	1. Training on how to use fertilizer, improved seed, pesticide 2. Information about demand/price of chickpea 3. Training on how to plant and grow chickpea 4. Information about services available to farmers 5. Other _____
142	Have you used any other institutions that provide training on how to plant and sell chickpea? If yes, please list all of them.	1.No,I haven't used any 2. No, such institutions do not exist 3. Yes, I have used _____(this institutions)
143	How do you deal with disagreements with trading partners?	
144	How far do you have to go for the above service?	_____ hrs
145	What do you think is the major challenge you face in producing and selling chickpeas?	

**1.4 To what extent do you agree with the following statements regarding your major/most important/frequent trading partner (buyer) of chickpea?**

No.		Response options (coding)				
		Strongly disagree	Disagree	Neutral (neither agree nor disagree)	Agree	Strongly agree
301	I have good cooperation with my major trading partner/ he/she is cooperative	1	2	3	4	5
302	I have a number of conflicts with my major/most important trading partner.	1	2	3	4	5
303	My major/most important trading partner treats me fairly and equitably.	1	2	3	4	5
304	Trading with my partner is less risky than other partners	1	2	3	4	5
305	My major trading partner always keeps his (her) promises	1	2	3	4	5
306	My major trading partner is honest	1	2	3	4	5
307	My major trading partner has a good reputation	1	2	3	4	5
308	I believe the information my major/most important trading partner provides	1	2	3	4	5
309	I have a close relationship with my major /most important trading partner	1	2	3	4	5
310	My major/most important trading partner considers my best interests in our dealings	1	2	3	4	5
311	I have confidence in my major/most important trading partner	1	2	3	4	5

312	My major/most important trading partner provides financial assistance when I need it	1	2	3	4	5
313	My major/most important trading partner shares useful information with me	1	2	3	4	5
314	I share useful information with my major/most important trading partner	1	2	3	4	5
315	My major/most important trading partner is willing to share risk with me	1	2	3	4	5
316	My major/most important trading partner has the best offer relative to other alternatives	1	2	3	4	5
317	My major/most important trading partner has confidence in me	1	2	3	4	5



Name of community: \_\_\_\_\_

Date of Discussion: \_\_\_\_\_

## **Part 2. Interview Guide for Focus Group Discussion with local farmers**

1. A. Please mention the most commonly grown type of chickpea in your area and  
B. For what purpose do you normally grow chickpea? [Clue: own consumption, for market purposes, etc.?)
2. Can you discuss the challenges in the production of chickpea in your area?
3. What are the major marketing channels for the produced chickpea? / Who buys your chickpeas?
4. Are your buyer's good/considerate people, do they consider your interests when dealing with you?
5. Is there any association/cooperative between chickpea farmers in your region?
5. Do you use Ikuub/dube or other such associations for cost related with the production and distribution of Chickpea?
6. Consider the practice of many years of chickpea production, marketing and distribution in your area:
  - A. Has it changed from what it used to be in the past?
  - B. If there is any change in the crop production practice, marketing, or transport, what was/is causing it?
7. What do you think are the major issues that need to be addressed to increase the amount of chickpea marketed and the profit you earn from it?

## **Part 3. Interview guide questions for food processors**

1. When was your company established?
2. What are the products that your company produces?
3. Which products have chickpea as an ingredient? What do you prepare from the chickpea?
4. When did it start processing chickpea/Ready-to- use food products?
5. What type of processing does the chickpea undertake?
6. From where do you get your supply of chickpea? Do the seller bring it or you go get it?
7. Do you do contracts, cooperatives or spot market supply? When are price for purchase paid? Are suppliers reliable?
8. How long does it take to get supplies?
9. How often do you purchase chickpea? What quantity have you required annually? How is price for chickpea determined (negotiation, ongoing market price, suppliers offer)?
10. Are all your inputs imported or locally sourced? Why the preference for local/imported?

10. Are suppliers able to adjust supply to change in demand – if you require a larger or lower amount of supply? If so how long does it take to do so?
11. Have you received an amount that is lower than a pre-agreed amount? Breach of contract? How do you manage these?
12. Do you have quality requirements from/to suppliers including the type of chickpea? How do you inspect? Do you offer different price for quality? Do you face quality problems?
13. How much time do you spend buying chickpea, transporting it, checking out prices?
14. What is the major challenge you face in buying this crops?
15. How accessible is credit/ getting capital or, loans from banks or other financial institutions?
16. Are you a member of food processors association or any other association\club\Ikubb?
17. What are the benefits of membership in the above associations?

**For the processing companies that have ready-to –use or relief products (Hilina, Guts, FAFA)**

18. To whom do you supply/sell the final product? Do you see it directly to NGO’s or distribute it via health facilities?
19. Do you produce based on demand or a certain amount periodically?
20. How much do you supply for each NGO/Government.
21. How is price determined for your product?
22. How do you transport output/deliver to buyer?
23. What are the benefits of the chosen channel and the challenges?
24. How involved are International organization in the production and distribution of your products?
25. What specifications are required from NGO’s and buyers like UNICEF?
24. How do you ensure your products are in compliance with national and other quality and safety standards? What role do other companies (like Nutriset) play in meeting these standards?
25. Does the specification/requirements change over time and do you have innovations to new formulations that meet these requirements? Particularly regarding aflatoxin.

**Part 4. Interview questions for health facilities that administer RUTF**

1. Which section is responsible for the acquiring/ administration of RUTF in your facility?
2. Which types of RUTF do you use?
3. Where do you get your supply of RUTF? NGO? Ministry of health?

4. How is RUTF order placed in the hospital? Does the government/NGO supply a fixed amount or you request a specific number?
5. How is it transported? Your own transport or the supplier? Who pays for the transport cost?
6. Does the supply/Provision of RUTF match your demand? If not, by how much is the disparity?
7. How long does it take on average for orders to arrive?
8. Do orders arrive on time? How much do you order at a time?
9. How long does one delivery last?
10. Do you usually have enough RUTF in stock? How much is currently available in stock?
11. When do you place orders? When stock reach a certain level, periodically, based on demand or regularly?
12. In the last six month, how many persons have been returned because RUTF was not available?
13. Does RUTF ever expire while in stock? How many?
14. During emergencies, were your request for additional RUTF meet? How long did it take to get them?
15. Do persons or care takers of RUTF receivers ever complain of allergies, bad taste or dislike/unacceptability of the product?
16. Does your facility has any problem with missing product after delivery (from available stock)?
17. What are the major challenges in the order and supply of RUTF products in your facility?
18. What measures do you think will improve/solve these challenges?

**Part 5. Interview questions for UNICEF country office, WFP and Government recruiters**

1. Where do you get your supply of RUF and relief products? What percentage form each company? Local/International?
2. Are the companies able to meet demand?
3. What is the average time it takes from order to delivery?
3. Do you get supplies in the time frame that was previously agreed?
4. Do you have a contractual agreement? Has there been a britches of the contract? How was it handled (legally court, third party)?
4. When you place orders during emergencies are they able to adjust production and met demand?
5. What quality requirements do you have and where do/how do you inspect these quality standards are met? How strict are these standards in terms of compliance?
6. How are they transported to program areas? What is the average transport/delivery time and cost?
7. Compared to the international supply what are the advantages of local procurement?

## Part 6. Consent forms for Key informant interviews



UNIVERSITY OF SASKATCHEWAN  
College of Agriculture  
and Bioresources  
DEPARTMENT OF AGRICULTURAL  
AND RESOURCE ECONOMICS  
AGBIO.USASK.CA

### Consent Form (Key informant Interview)

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**You are invited to participate in a research study entitled: Role of informal institutions in the RUF supply chains in Ethiopia**

**Researcher:** Melat Adde, Graduate student, Agricultural and Resource Economics, University of Saskatchewan, Canada, +1 306-514-3601, [mla398@mail.usask.ca](mailto:mla398@mail.usask.ca)

**Supervisor:** Dr. Jill Hobbs, Agricultural and Resource Economics, +1 306 966-2445, [jill.hobbs@usask.ca](mailto:jill.hobbs@usask.ca)

**Purpose(s) and Objective(s) of the Research:**

- The purpose of the study is to examine the supply chain of ready-to-use food products in Ethiopia and identify bottlenecks and potential areas of improvement along the supply chain.

**Procedures:** (What you will be asked to do when you participate in the study):

- You will be asked to sit with the researcher to answer questions about the production, supply and delivery of ready-to-use food products.
- The researcher may record the discussion/interview with a voice recorder to better capture the issues discussed. You may request that the voice recorder be turned off at any time.
- This discussion might take about an hour and a half.
- Please feel free to ask any questions regarding the procedures and goals of the study or your role.

**Funded by:**

- This study is supported by the Global Institute for Food Security (GIFS)

**Potential Risks:**

- There are no known or anticipated risks to you by participating in this research.

**Potential Benefits:**

- The outcome of the study can be used to improve our understanding of the opportunities and challenges facing the development of supply chains for ready-to-use therapeutic food products in Ethiopia

**Confidentiality:**

- All the information we will collect from you will be kept strictly confidential. Although the data from this research project will be published and presented at conferences, the data will

be reported in aggregate form, or in case a direct quotation has be used, personally identifying information will be removed so that it will not be possible to identify individuals.

- You will also be given a chance to verify/modify the content of the discussion before it is reported.

**Storage of Data:**

- Consent forms and the questionnaire will be kept in a locked room with the student’s supervisor for about five years until findings are published and shared to relevant bodies. All electronic files will be stored in a password protected computer with the researcher.
- When the data are no longer required, it will be destroyed safely.

**Right to Withdraw:**

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time without explanation or penalty of any sort.
- Should you wish to withdraw, you can do so at any time and you will be asked to provide permission for reporting of the sections of the study they may have completed until the point of withdrawal.
- Your right to withdraw data from the study will apply until data have been pooled. After this point, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data”.

**Follow up:**

- To obtain results from the study, please contact the researcher.

**Questions or Concerns:**

- Contact the researcher(s) using the information at the top of page 1;
- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office [ethics.office@usask.ca](mailto:ethics.office@usask.ca) +1 (306) 966-2975 collect.

**Consent (Signed Consent)**

Your signature below indicates that you have read and understand the description provided; I have had an opportunity to ask questions and my/our questions have been answered. I consent to participate in the research project. A copy of this Consent Form has been given to me for my records.

_____	_____	_____
<i>Name of Participant</i>	<i>Signature</i>	<i>Date</i>
_____	_____	
<i>Researcher’s Signature</i>	<i>Date</i>	

*A copy of this consent will be left with you, and a copy will be taken by the researcher.*