

# **Foreign Investment, Organizational Innovation and Transformation in Food Supply Chains**

Evidence from the Ethiopian Barley Sector

**Delelegne Abera Tefera**

## Propositions

1. Foreign direct investment induces supply chain innovations and facilitates modernization in domestic food chains.  
(this thesis)
2. As domestic food chains are more inclusive than export-oriented food chains, upgrading domestic chains can contribute more to poverty reduction.  
(this thesis)
3. Resilient food systems are not only about efficient management of food production and distribution, but also about managing food waste.
4. Globalization is the only opportunity for smallholders in developing countries to get a decent price for their products.
5. For junior researchers, telling a good story is much harder than estimating a statistical model.
6. In the PhD trajectory, the “process” is key to instill capacities in the journey towards academic excellence.

Propositions belonging to the thesis, entitled

‘Foreign investment, organizational innovation and transformation in food supply chains:

Evidence from the Ethiopian barley sector ’

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Wageningen, December 11, 2017

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This research was conducted under the auspices of the Wageningen School of Social Sciences (WASS).

# **Foreign Investment, Organizational Innovation and Transformation in Food Supply Chains**

Evidence from the Ethiopian Barley Sector

**Delelegne Abera Tefera**

## **Thesis**

submitted in fulfilment of the requirements for the degree of doctor

at Wageningen University

by the authority of the Rector Magnificus,

Prof. Dr A.P.J. Mol,

in the presence of the

Thesis Committee appointed by the Academic Board

to be defended in public

on Monday 11 December 2017

at 11 a.m. in the Aula.

Delelegne Abera Tefera

Foreign Investment, Organizational Innovation and Transformation in Food Supply  
Chains: Evidence from the Ethiopian Barley Sector,  
230 pages.

PhD thesis, Wageningen University, Wageningen, the Netherlands (2017)

With references, with summary in English

ISBN: 978-94-6343-716-5

DOI: 10.18174/425833

*Dedicated to my families*



## Acknowledgments

I never did this work alone, many people have supported and contributed. It is my pleasure to acknowledge all those people who helped, taught, and inspired me for the successful completion of this PhD project. However, for convenience, only some of them are mentioned here and those who are not mentioned will always be in my heart.

First and foremost, I would like to express my deepest appreciation to my supervisory team: Prof. Dr Onno Omta, Dr. Jos Bijman, and Dr. Maja Slingerland. I thank you all for your unreserved support, diligent guidance and tireless mentoring throughout my PhD study. I am very much proud of what we have achieved together. Onno, I owe deep gratitude to you for giving me the opportunity to pursue my PhD at the Management Studies Group (MST). I really thank you for believed in me and financial accommodation even when my project has hard time of continuing. I am also grateful for your thoughtful guidance, critical comments, and warm encouragement. Above all you are a wonderful human being. Thank you Onno! I would like to express my cordial gratitude to Jos and Maja, with whom I worked most and discuss my research from concept development to the entire thesis.

Jos, I immensely thank you for the follow-up, inspiration, and seeking innovative ways to improve my work. You have always time to respond to my concerns, even during weekends, sabbaticals and holidays. I thank you very much for this devotion. Jos, I also appreciate your critical comments and suggestions to my papers. In our countless meetings and lively discussions, you always enlighten me with higher level theoretical abstraction and encourage me to look at the data through different lenses. Thanks for the dedication and make me a better researcher. I am also very grateful for coming with me to Ethiopia for the field observation trips in the remote areas of Arsi and Merawi. In the field, I saw your great international experience in the ways you communicate to farmers and co-operative managers through bridging the cultural gaps. Jos, beside the academic supervision, you are a wonderful friend and care a lot about me. I am highly grateful for having the opportunity to work with you and hope will continue our collaboration in the future. Thanks Jos! You are all-in-one!

I am highly indebted to Maja for her dedicated support and insightful inputs in the course of my PhD study. Maja, I hugely appreciate your critical comments and criticisms, which always helped me to be alert and sharp in my reasoning. You were also keen in reading

my papers, even no room for a minor spelling error. Your academic background and expertise has been instrumental for this PhD project to make it more integrative and multidisciplinary. I also thank you for coming with me to Ethiopia for the field visit in the remote areas of Ambo. Thank you for the productive discussions we had in refining the hypotheses, sampling design and survey questionnaire while you were in Ethiopia. Maja, at all stages in the course, I benefited from your unique mentoring style and constructive criticism.

I would like to take this opportunity to thank the thesis examining committee members; Prof. dr. R. Ruben, Prof. dr. M. D'Haese, Prof. dr. M. Hanisch, and Dr. V. Bitzer for the interest to review this dissertation and coming to Wageningen for my public defense. I genuinely thanks for your important and valuable contributions. I also thank my paranymphs Lavlu and Tariku for their support and friendship.

I am very grateful to all PhD colleagues and staff at Management Studies Group who made my stay in the group pleasant and memorable. Thank you Jacques, Domenico, Geoffrey, Valentina, Emiel, Kim, Herman, and Vincent. I appreciate our informal conversation and chat in several occasions. Special thanks go to Gerben for great collaboration in my papers and support in data analysis. I also want to thank Stefano for the cheerful conversations and inspiration. I was astonished when you reminded me that I started my PhD course with your lecture in Perugia (Italy) four years ago and finally meet in your circular economy lecture here in Wageningen. I would like to extend my cordial gratitude to MST PhD fellow Annemarie, Rob, Lavlu, Lisa, Silvia, Franco, Mmapatla, Waliou, Daniel A., Mercy, Daniel K., Gilde, Sebastian, August, Muhammedamin, Carlos, Fanny, Vivi, Katty, Francisco, and Sophia.

I would like to size this moment to thank the staff of the secretariat of MST: Ina, Liesbeth, Johnnatan, Marloes, Linette, and Anne for supporting me with essential travel arrangements, financial and administrative issues. You guys are the best and thanks a lot for the kindness and help. I also would like to extend my earnest gratitude to Wageningen School of Social Sciences (WASS) and the Liaison Office, for the great support I received in the process of my PhD journey.

The field work couldn't have been possible without the support of many people and organizations. Foremost, I would like to thank the many respondents who provided me

with data for this research. My sincere thanks go to the more than two hundred sixty farm households, who participated so patiently in the lengthy survey questionnaires. Thank you for welcoming us in your homes and answering the many questions. I interviewed more than 40 informants and value chain actors at different tiers of the Ethiopian malt barley value chain, who allocated their time and were keen to share valuable information about the processes, upgrading activities, network and structure of the chain. I interviewed co-operative managers, government officials, NGOs experts, company managers, and traders. I am very much grateful for your time and the information, and I hope you find your contribution in this dissertation. I also would like to extend sincere thanks to my field team, who provided me unreserved support during data collection. You guys were awesome!

My genuine thanks go to the IBM project partners in Ethiopia. I appreciate all the support from the project consortium consisting of Solagrow Plc, Terrafina microfinance (TMF), and SNV-Ethiopia (SNV). I want to thank the consortium and the Ministry of Foreign Affairs of the Netherlands for funding this PhD project. A special thanks goes to SNV-Ethiopia for providing all the necessary support including office in Addis Ababa during a one year field work. I would like to express my deepest appreciation for all the IBM-Ethiopia family in SNV. I am grateful particularly to Jan Vloet, Worku, Yetnayet, and Gemechis. I also want to thank Quirin, co-operative for change (C4C) project manager in SNV. I would like to thank Solagrow Plc staffs for all the support and organizing farmers during data collection. My special thanks go to Jan J. van de Haar for the interesting discussions on crop rotation scheme and how to study it. Jan, I really appreciate your whole-hearted approach to work with farmers. Development endeavour requires a different learning (communication) skills, I learn those skills from you during the many meetings and encounters with farmers.

I would like to thank all my fellow Ethiopian students whom I met in Wageningen over the last couple of years: Kebe, Sami, Mebre, Dave, Shime, Desu, Tarik, Beshir, Tade, Mohe B., Mohe H., Mikinay, Meski, Sol, Beyu, Eske, Meque, Abi, Afita, and Goytom. Thanks a lot for the times we spent together and drinks and traditional meals we had together. All the social, economic, and political issues that we discussed and all the laughter that we shared were refreshing and unforgettable. Thanks a lot guys for the companionship and sharing wonderful experiences.

Finally, I would like to express my heartfelt gratitude to my families: Emaye (mom), my brothers Tedy and Mule, my sisters Zufan and Selam. I am earnestly thankful for your moral support, the many blessings, and keeping me in your prayers. I am particularly grateful to my elder brother Tedy, for all the help and believing in me. Tedy, you always care about me and I thank you a lot. I am also grateful to your wife Selam and your adorable sons (my nephews) Anani and Babishu.

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Wageningen, November 2017



# Table of Contents

Chapter 1	1
<b>General Introduction</b>	
Chapter 2	23
<b>Foreign Direct Investment, Vertical Coordination and Modernization in Domestic Food Chains</b>	
Chapter 3	55
<b>Economic Impact of Contracts in Domestic Food Supply Chains</b>	
Chapter 4	85
<b>Co-operative Organizations in Ethiopia: Development and Economic Functions in a Changing Institutional Environment</b>	
Chapter 5	113
<b>Is there a Trade-off between Inclusion and Efficiency of Producer Organisations?</b>	
Chapter 6	141
<b>Quality Improvement in Food Supply Chains: Determinants of Farmer Performance</b>	
Chapter 7	165
<b>General Discussion and Conclusions</b>	
<b>Summary</b>	189
<b>References</b>	197



# Chapter 1

## General Introduction

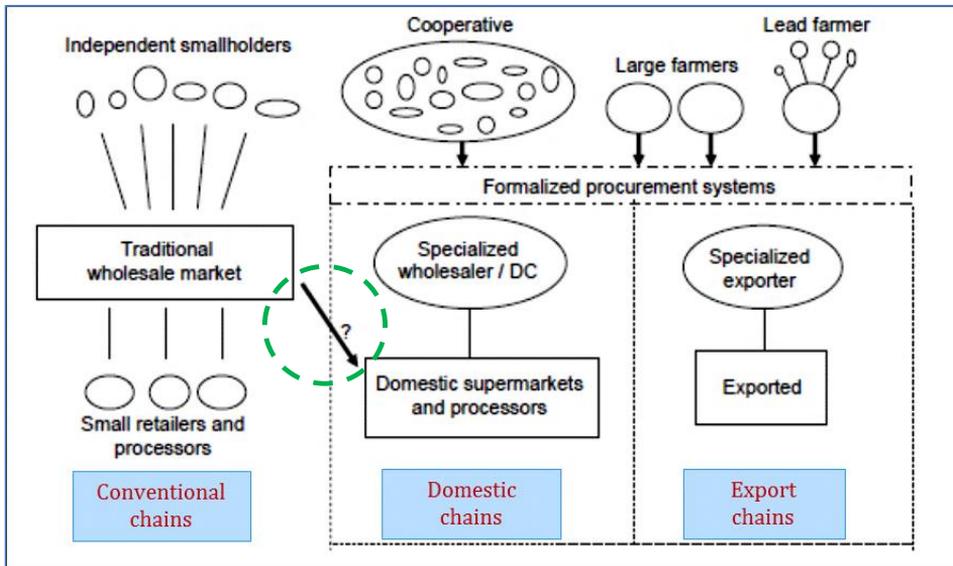
### **1. Modernisation of food supply chains and the need for organisational innovation**

Since mid-1980s, food value chains in emerging and developing economies have undergone a continual and fundamental transformation: increasing vertical coordination, growth of modern distribution channels (e.g. supermarkets), consolidation of retail markets, and increase in export orientation (Devaux et al., 2016; Maertens et al., 2012; Reardon et al., 2009; Reardon and Minten, 2011; Swinnen and Maertens, 2007). These studies show that the key drivers for the transformation are a combination of developments in demand and supply. Development in demand is characterized by rising income, rapid urbanization, and profound changes in consumption patterns. Whereas supply side drivers consist of increasing foreign direct investment (FDI), privatization, and technological change. The rapid growth in demand of modern food attracts multinational enterprises to invest in agriculture and food processing in emerging economies. The appearance of multinationals in the food value chains has been claimed to have a positive impact on economic development and reduction of poverty in the host countries (Dries and Swinnen, 2004; Gohou and Soumaré, 2012). The multinationals adopted modern supply chains for securing a large volume and consistent supply of high quality products. They come with new technologies that boost productivity and post-harvest management for product upgrading. Overall, it has been argued that the ongoing globalization supported the continued changes and modernisation in food value chains destined to export (Gómez and Ricketts, 2013; Maertens et al., 2012; Verhofstadt and Maertens, 2013).

On the other hand, recently there is a growing interest in transformation of domestic and staple food chains (McCullough et al., 2008; Minten et al., 2016; Reardon, 2015). Upgrading and process of modernisation in staple food chains are recognized to be strongly important as these chains have the potential to benefit a large number of smallholders contrary to the high-value export chains that are often exclusive. Upgrading domestic food chains is needed for a more efficient supply to fast growing urban markets

and to sustain access to affordable food for the rapidly growing urban consumers in emerging economies (Minten et al., 2013; Minten et al., 2016). As domestic food value chains are more inclusive than high-value export chains, upgrading these food value chains can contribute more to poverty reduction and food security (Maertens and Vande Velde, 2017). However, much remains to be understood about process of modernisation in domestic food value chains and its implications for economic development. This thesis aims to take us some way in this direction by studying various organisational innovations within the food chains and their economic impacts at micro level.

Processes of modernisation in food value chains (FVCs) vary in speed depending on the context at country level, regional level, and the types of products (McCullough et al., 2008). To paint an overview, we present a bird's eye view of the diversity of FVCs in the emerging economies. We followed McCullough et al. (2008) and Gómez and Ricketts (2013) to describe FVCs typology. FVCs are often characterized by the co-existence of modern chains and conventional chains (**Figure 1.1**). We highlight the main characteristics and actors involved in each typology. Conventional FVCs are characterized by smallholders selling farm products to traders and traditional wholesalers in regional and local markets. These chains are generally governed by spot market transactions and are common in rural areas. Modern FVCs are characterized by tighter coordination and vertical integration. These chains are largely driven by the expansion of modern retail enterprise in urban and pre-urban areas. Mostly these chains are dominated by multinational enterprises, large domestic processors, and wholesalers in export markets. Multinationals and processors in modern chains often coordinate the supply chain through contractual arrangements that feature predetermined product standards, volume requirements, and price levels. Based on **Figure 1.1**, modern chains take two forms: export oriented chains and domestic organized chains. In these chains, large processors and multinationals source farm products from farmer groups, lead farmers, and traders using formal or modern procurement systems. In some instances, there is a possibility that the conventional chains interact with the modern chains (broken circle in **Figure 1.1**).



**Figure 1.1.** Landscape of food value chains; Source: adapted from McCullough et al. (2008)

In sub-Saharan Africa (SSA), the transformation of food systems and the emergence of modern supply chains are a recent phenomenon. It started in the early 2000s with horticultural, flower, and dairy industry development (Maertens et al., 2012). In recent years, in addition to modernisation in export oriented products, major changes have also taken place in domestic staples food chains (FAO, 2013b; Minten et al., 2016; Verhofstadt and Maertens, 2013). For instance, formalization of food markets through the use of new market institutions such as commodity exchanges (Meijerink et al., 2014). Use of improved production technologies, leading to increased farm productivity, enhanced overall growth performance of the agriculture sector (Dorosh and Mellor, 2013; Haggblade, 2011; Wiggins, 2014). Despite this, food and nutrition security remains an issue and continues to affect the livelihood of smallholders and the rural poor in the region. Smallholders, the major producer of food in SSA face numerous challenges such as high production and transaction costs, climate variability, lack of access to technologies, and limited access to financial service to enter FVCs and access remunerative markets (Poulton et al., 2010).

## **2. Smallholders and access to modern value chains**

The majority of population in SSA live in rural areas. In this region, food production mainly depends on smallholder producers (HPLC, 2013). Smallholders account for 80 percent of food production (FAO, 2013b) and are major suppliers of food to urban populations. The transformation in food systems presents opportunities for smallholders to become integrated into more remunerative FVCs. Many studies have analysed the impacts of smallholders integration into modern chains and markets (Barrett, 2008; Barrett et al., 2012; FAO, 2013a; Fischer and Qaim, 2012; Kissoly et al., 2017; Verhofstadt and Maertens, 2013). These studies have optimistic views on smallholder participation in modern and domestic food chains. The studies show that linkages to modern supply chains and domestic food markets benefit smallholders through improvement in farm productivity and family income. However, responding to the opportunities can require substantial investment for meeting requirements such as larger volume and consistent supply of high quality products. Smallholders often lack productive resources, appropriate skills, technology, and basic infrastructure (e.g. all season asphalt road, storage facility...). In addition, strict quality requirements and proliferation of grades and standards makes it hard for smallholder producers to access those modern food chains and urban markets (Jayne et al., 2010; McCullough et al., 2008; Poulton et al., 2010).

In order to, therefore, benefit from process of modernisation of FVCs, smallholders need to find solutions to the constraints they experience both in upgrading their production and in accessing input and output markets. In addition, governments, development practitioners, and the private sector have recognized the market opportunity, as well as the need, to support smallholders to effectively participate in the modern food chains. Cognizant to this, organisational innovations are required to improve farm productivity and smallholder integration. A growing body of literature indicates the importance of producer organizations (POs), contract farming arrangements (CFAs), and partnerships to overcome the above noted smallholder challenges in linking them to the diversified FVCs (Bellemare, 2015; Devaux et al., 2016; Narrod et al., 2009; Shiferaw et al., 2011). Yet, there is a debate about which type of organisational innovation is most effective for integrating smallholders in the modern food chains and thereby providing better income opportunities for them. In particular, much remains to be understood about the mechanisms and functions of various organisational innovations in enhancing coordination and management of food value chains. This dissertation, therefore, aims to

contribute to agribusiness and development literature by studying the interaction of effectiveness and inclusiveness of these organisational innovations under the ongoing modernisation of food chains.

### **3. Organisational innovations and food supply chain management**

Tighter vertical ties are developing in food chains of emerging economies to comply with stringent quality requirements and standards. Tighter vertical coordination is a response to higher transaction costs in food chains with high quality standards. Transaction costs (TCs) are the costs of collecting information (e.g. on prices, supply, and demand), the cost of contracting (e.g. negotiating cost), and the cost of contract enforcement. All transactions involve TCs, however these costs may vary substantially depending on the type of transaction, and economic agents choose to coordinate their exchanges with governance structures that reduces TCs (Williamson, 1985). According to Bijman and Bitzer (2016) smallholders' TCs increase when they switch from generic products for traditional markets to speciality products for high-value markets. Producing for and supplying to modern chains involve higher costs of production and quality alignment. In addition, participation in more demanding markets requires smallholders to deliver regular supplies of produce of consistent quality and sufficient volume.

In connection with this, based on Devaux et al. (2016), two forms of mediation are commonly needed to reduce the high TCs and effectively connect smallholders to modern food supply chains: (a) those that provide basic infrastructure to facilitate smallholder linkages to markets, and (b) those that create or strengthen complementary institutions that reduce the high marketing risks and transaction costs. Development of basic infrastructure (e.g. all season roads, irrigation schemes, and telecommunication) is often left for the state. These kinds of institutions are crucial as they create an enabling environment for the well-functioning of food value chains. As to the second approach, NGOs and private sector are mostly involved in organising the complementary institutions that links smallholders to markets. This thesis focuses on the second type by studying the effectiveness of POs, CFAs, and partnerships in enhancing FVCs coordination and smallholders integration.

### *Quality alignment and effectiveness of contract farming arrangements*

Market access has been identified as one of the most important factors influencing the performance of the rural poor in developing countries. Access to more remunerative markets, such as those for products with higher value, is now considered as a major pathway to enhance and diversify the livelihoods of low-income rural households and thereby reduce poverty. Emphasis has been given to contract farming arrangements as an organisational innovation that can reduce transaction costs in coordinated food chains and solve market imperfections in linking smallholders to markets (FAO, 2013a; Swinnen and Maertens, 2007). The recent development in food systems has also witnessed a rapid expansion and use of CFAs (Jia and Bijman, 2014). For instance, supermarkets and processors use private quality standards and modern procurement systems which favor increased use of vertical coordination through contracting. CFAs can improve smallholders' access to modern inputs, credit, and ultimately benefit farm productivity and incomes. It facilitates coordination among actors and alignment of value chain activities to ensure that products of the right quantity and quality are produced and delivered at the right time and place. In addition, CFAs can reduce the risk faced by farmers as contract arrangements offer guaranteed market outlet.

There is a growing body of literature that documents the prevalence of CFA in diversifying food chains. For a general overview see for instance Minot and Sawyer (2016), Otsuka et al. (2016), Oya (2012), Wang et al. (2014b), and Bellemare (2015). These studies claim that CFAs promote smallholder integration into modern value chains and increase farm productivity and farmer livelihoods. Empirical studies on the impact of participation in CFA show that participating in a CFA improves the welfare of the farmers who have chosen to participate (Andersson et al., 2015; Barrett et al., 2012; Bellemare, 2012; Bolwig et al., 2009; Briones, 2015; Girma and Gardebroek, 2015; Wang et al., 2014a). They also found that through the adoption of new technology and the provision of better inputs, CFAs positively influence production efficiency.

Yet, there are concerns about the inclusion of resource poor smallholders in CFAs. As many of the studies focus on high-value products mostly fruits and vegetables that are destined for export markets and supermarket retail in urban markets the issue of product quality is crucial. Meeting stringent quality requirements is difficult for resource poor

farmers and hence CFA participation is more likely for resource-endowed farms. Contractors such as multinational companies often eschew contracting with poor farmers due to the high transaction costs involved (Barrett et al., 2012).

Another development with regard to CFA is its utilization in upgrading of domestic (staple) food chains in emerging economies. In many developing countries, the growing domestic demand for quality products necessitates upgrading of staple food chains (Minten et al., 2013; Minten et al., 2016). Upgrading domestic food chains has the potential to benefit a large number of smallholders; as opposed to high-value export chains that are often exclusive and more limited in terms of the number of farmers involved. In addition, the modernisation of domestic food chains is crucial for a more efficient supply to fast growing urban markets and to sustain access to affordable food for urban consumers (Minten et al., 2013). It has also been argued that the development of domestic food chains can more contribute to poverty reduction and food security than the development of high-value export chains (Maertens and Vande Velde, 2017). However, empirical evidence on CFA in domestic food chains is restricted, and our study contributes to filling this knowledge gap.

#### *Partnerships and supply chain coordination*

Modernisation in food chains needs closer coordination among actors for alignments of quality improving activities. Partnerships as organisational innovation play a crucial role in promoting inclusive growth, empower smallholders, and organise efficient value chains (Bitzer and Bijman, 2014; Van Dijk and Trienekens, 2012). It is often argued that partnerships help smallholder farmers to access high-value markets through integrating different types of support to them in acquiring the capabilities and resources to improve quality (Bitzer and Bijman, 2014; Royer et al., 2016). Partnerships emerged in the late 1990s as institutional arrangements to address rural development challenges such as promoting capacity building and market access for smallholders (Kolk et al., 2008). Both traditional FVCs and modern FVCs have been experiencing a considerable proliferation of partnerships. Royer et al. (2017) highlight that the most common type of partnerships in these FVCs is the public-private partnership (PPP) also known as multi-stakeholder partnerships (Devaux et al., 2016). This is a partnership that involves a combination of public, private sector, and NGO partners. Partners or actors in the PPPs bring different

(complementary) qualities, each contributing resources and sharing in the investment risks (Clancy and Narayanaswamy, 2016).

Literature on partnerships indicates that PPPs in agricultural value chains primarily focus on promoting innovation and realization of value chain development through facilitating capacity building supports, market access, and risk sharing (FAO, 2016). For instance, PPPs enhance the integration of smallholders in the FVCs through facilitating access to modern inputs, technical assistance, and credit (Bitzer and Bijman, 2014; Bitzer et al., 2013; Van Wijk and Kwakkenbos, 2012). In addition, it can assist farmers in applying good agricultural practices, enhance production efficiency, raise product quality, and overcome adoption constraints to new technology (Narrod et al., 2009; Wijk and Kwakkenbos, 2012). Public-private partnership has also advantages for the private agribusiness/processor, for example increasing availability of raw material supplies (FAO, 2016). In order to optimize and realize these mutual benefits partnerships should be based on reciprocity, trust and sharing of different values, knowledge and practices (Van Dijk, 2012). Van Dijk (2012) has proposed that all partnerships have some common basic characteristics, while each partnerships has specific characteristics which can be measured empirically (Table 1.1). The success or failure of a given partnerships depends on the different factors listed in **Table 1.1** (column 2) and effective combination of them.

**Table 1.1.** Characteristics and determinants of partnership performance

Basic characteristics	Determinants of partnership performance
Common objective	Level of equality or hierarchy
Some legal or informal arrangement	Level of trust
Joint activity	Ownership
Shared resources	Expectations
Sharing of risks	Commitment
	Complementarity
	Resources put in place
	Actual risks and their distribution

Source: Adapted from Van Dijk (2012)

Despite the general acceptance of the potential role of partnerships in FVCs, it has also been faced with criticism from both development practitioners and academia (Andersen and Jensen, 2017). First, a lack of trust between public and private parties or between producers and buyers may complicate the development of long-term business relations (Van Dijk, 2012). PPPs initiatives are often criticized for the lack of transparency in selecting private partners (FAO, 2016). Second, partnerships run the risk of excluding

smallholder farmers, market linkages can only be maintained when sufficient quantities and quality are guaranteed. Thus, private partners may prefer to work exclusively with larger farmers to reduce transaction costs and maintain consistent supply. Finally, in some cases the weak capacity and motivation of public partners due to lack of the necessary skills in executing their partnership roles poses critical problems for PPPs with multiple stakeholders (FAO, 2016).

#### *Inclusiveness and effectiveness of producer organizations*

Connected to the modernisation of food value chains there is a renewed interest in producer organizations to enhance the bargaining power of smallholders in the increasingly coordinated chain (Bijman et al., 2016; Markelova et al., 2009; World Bank, 2008). POs can support smallholders access to markets, reduce transaction costs, and thereby improve farmers' income and productivity.

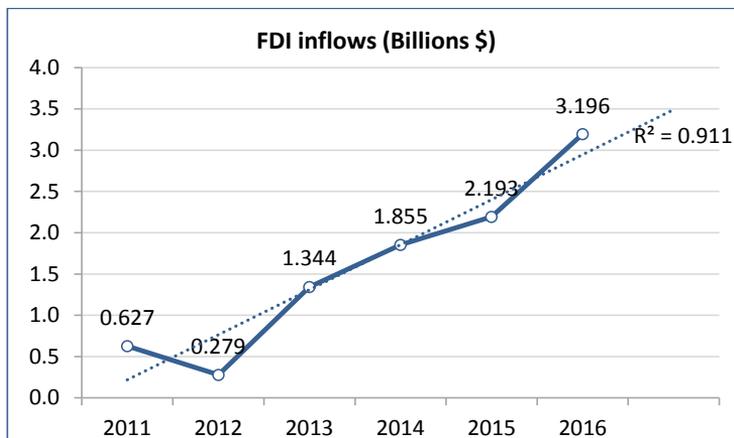
There is an increasing body of literature showing that POs facilitate smallholder market access and integration in modern value chains (Moustier et al., 2010; Trebbin, 2014). However, empirical evidence with regard to inclusivity of this organizations is more scarce (Bijman et al., 2016). According to Bernard and Spielman (2009) the concept of inclusiveness of POs encompasses multiple dimensions. First, it relates to the open or closed character of the PO, i.e. can all producers become members or does the PO hold strict entry requirement. Second, it relates to the benefits that all individuals in a community, irrespective of their membership status, may experience from the activities of the PO. Third, inclusiveness relates to the extent to which participatory decision-making is conducted within the PO. Fourth, are women and youth sufficiently represented in the PO? Thus, inclusiveness of a PO should be measured along all four dimensions. The authors found that the poorest of the poor Ethiopian farmers tend to be excluded from membership in marketing cooperatives. Studies in Kenya (Fischer and Qaim, 2012) and China (Ito et al., 2012) also conclude that the poorest are excluded from membership of a PO. In addition, some studies claim that there is a middle-class effect, which means that the poorest and the largest farmers are least likely to participate (Bernard and Spielman, 2009; Verhofstadt and Maertens, 2014a).

Several empirical studies investigated the direct impact of participation in POs and reported positive outcomes (Chagwiza et al., 2016; Fischer and Qaim, 2012; Ito et al.,

2012; Ma and Abdulai, 2016a; Verhofstadt and Maertens, 2014b; Wollni and Zeller, 2007). These studies have measured the impact of being a member of a PO on a number of different performance indicators such as total production, yield, prices, income, and profit. As smallholders face high transaction costs in accessing markets for inputs, technical assistance and credit, POs may solve the transaction costs problems by collective purchasing or by providing the services that are otherwise not available. For example, PO membership is found to increase the likelihood of adoption of improved varieties in Kenya (Shiferaw et al., 2009). PO membership in Ethiopia increases the adoption of mineral fertilizers, leading to improved farm productivity (Abebaw and Haile, 2013; Francesconi and Heerink, 2010). Fischer and Qaim (2012) also found that POs can function as important catalyst for innovation adoption and upgrading of production systems through promoting efficient information flows. A similar result is reported by Yang et al. (2014), showing that POs facilitated innovation intermediation in China. Yet, the trade-off between inclusion and effectiveness have rarely been analysed in the setting of modern chains and dynamic food markets, exceptions are Lutz and Tadesse (2017) and Bernard and Spielman (2009).

#### **4. FDI and economic development in Ethiopia**

Ethiopia is the second populous country in Africa next to Nigeria. Over the last two decades, Ethiopia has promoted a market economy often characterized by fast growth, trade liberalization, privatization, improvement in structural transformation and infrastructure development (Dorosh and Thurlow, 2014). This has facilitated the involvement of private and foreign companies in many sectors. As a result, foreign direct investment (FDI) inflows increased, which has implications for the growth of national economy and structural transformation. Manufacturing and agriculture (particularly horticulture) are the sectors that attract most FDI. The contribution of FDI to the national GDP is also increased in the recent years. **Figure 1.2** shows FDI inflows in Ethiopia for the past six years.



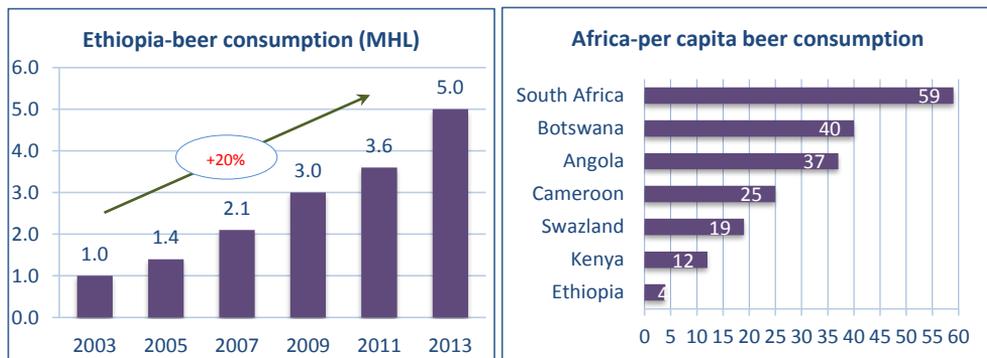
**Figure 1.2.** FDI inflows – Ethiopia (2011-2016); Source: UNCTAD (2017)

In Ethiopia, economic development is heavily dependent on the performance of the agriculture sector (Dorosh and Mellor, 2013). The sector provides livelihood to more than 80% of the population, accounts about 40% of GDP, 90% of total exports and about 65% of raw materials for domestic industries (FDRE, 2016). It provides significant linkages, both backward and forward linkages with other non-farm sectors, and, hence growth in the agricultural sector can contribute to the economic development of the country. Cognizant to this, Ethiopian government has launched the Agriculture Development Led-Industrialization (ADLI) strategy to accelerate economic transformation (Teshome, 2006). This policy focused on the development and dissemination of agricultural technologies through public sector research, extension and education services (Spielman et al., 2011).

Cereal crops account for the largest share of agricultural GDP. For the purpose of this study the barley sub-sector in Ethiopia was chosen, because the production and trading of barley is an important livelihood strategy for more than 4 million rural producers. Barley (*Hordeum vulgare L*) is one of the main cereal crops that are grown in the highlands of Ethiopia. In terms of area and value, barley is the fifth most important core crop after teff, maize, wheat, and sorghum (CSA, 2015). Ethiopia is a major producer and consumer of barley in Africa (Rashid et al., 2015). Overall, two types of barley are grown: food barley for home consumption and malting barley for commercial purposes (beer brewing). Malting barley has recently experienced growing demand in the national markets due to the fast growing brewery industry. The organization and structure of malt

barley chains allow sufficient variation in marketing channels, which is crucial for the design of this study. The malt barley value chain is characterized by modernisation and increased vertical coordination, which is driven by foreign brewery companies and processors. Modern chains exist in parallel with the conventional (traditional) chains. It thus serves as a typical example for the rise of modern FVCs in emerging economies and the induced changes in market conditions. Given the recent dynamism in the value chain, malt barley becomes the new priority crop in the political economy of Ethiopia and has gaining increased public attention.

Driven by urbanization and economic growth, Ethiopian beer consumption is rapidly growing at annual rate of 20% (Figure 1.3a). Yet, per capita consumption is still low compared to other African countries (Figure 1.3b). This indicates that Ethiopian beer market is still young and has high potential, given the ongoing population growth. Looking into the huge market opportunities and privatization of the brewery industry, a number of multinational companies (Heineken, Diageo, Bavaria) have entered the Ethiopian market since 2011.



**Figure 1.3a.** Beer consumption in Ethiopia;  
Source: ATA (2013) and Marcos (2015)

**Figure 1.3b.** Per capita consumption in liters (2011);  
Source: <https://www.slideshare.net/cadeler/beer-industry>

This recent appearance of foreign companies in the brewery industry has increased FDI inflows and raises the national beer production. This has a direct implication on the demand for malt. Nationally, there are two malt factories, with joint capacity of 52,000 tons per year, only 40 percent of the rapidly growing malt demand. Hence, breweries are forced to import 60% of their malt requirements with a value of about US\$40 million

(Rashid et al., 2015). Given the country's balance of payment situation, i.e. falling foreign currency reserves, this is a pressing issue for the state. In addition, improving productivity and commercialization of barley have food security implications (Rashid et al., 2015).

The government of Ethiopia is keen to expand domestic malt barley production, in order to reduce the use of foreign currency and to link smallholders to higher value markets so as to increase farm income and food security. To this end, the government has developed a strategy to improve the enabling environment and promote inclusive barley value chain development (ATA, 2015). Consequently, the foreign companies entered the market and started sourcing of malt barley from smallholders. The companies use different collaborative models to link smallholders in their supply chains and to ensure inclusive value chain development. They have used POs and lead farmers as main suppliers. As a result of this, the malt barley value chain is undergoing fundamental changes. The modern chains, driven by the beer multinationals, exist in parallel to conventional chains, which are driven by traders. The modern chains are characterized by increased vertical coordination, diffusion of technologies, high quality requirements and standards, and reliance on contract farming arrangements. Yet, the formation and functioning of the collaborative models and their implications for enhancing coordination within the chains and for smallholders diversified livelihoods have not been empirically examined. In our study we aim to increase understanding of how multinational companies organize and maintain efficient supply chains in sourcing from smallholders. This is important as the knowledge and experience could be transferred in other value chains in the same country or other developing countries.

## **5. Objectives and research questions**

This thesis is part of larger development project called "Innovative business models (IBM) on high-value crops in a farmers' based crop rotation in Ethiopia". IBM-Ethiopia is a public-private partnership project co-funded by the Ministry of Foreign Affairs of the Netherlands under the Facility for Sustainable Entrepreneurship and Food Security (FDOV). The IBM-Ethiopia consortium consists of Solagrow Plc, Terrafina microfinance (TMF), SNV-Ethiopia (SNV), Wageningen University and Research (WUR), and the Ministry of Foreign Affairs of the Netherlands. The goal of the project is to design and implement innovative business models which enable the transformation of smallholder

agriculture. In a concerted intervention, the project aims to increase food production and income security of smallholder farmers through organisational innovations and improved crop technology. It uses a group-based approach to address multi-faceted smallholder problems both on input side (production) and output side (marketing) of the farms. The project includes: setting up of producer groups (PGs), providing improved seeds and credit, coaching and training, establishing market linkages and providing contract facilitation. Smallholders are organized into PGs and these PGs are then supported with both production and marketing assistance. Organizing small farms into PGs helps them to gain access to capital, inputs, farming technology, and bargaining power, thus enabling them to link up with high-value markets.

The main focus of this dissertation is to improve our understanding on how organisational innovations facilitate effective alignment of supply chain activities and foster inclusion of smallholders. In particular, it seeks to gain better insights on the effectiveness and inclusiveness of POs, CFAs, and PPPs under the ongoing modernisation of food value chains. The improved insights can benefit both local suppliers and businesses. For businesses, building efficient supply chains is crucial to source products that meet required standards. Specifically, sourcing from smallholders is challenging, as it takes much effort to obtain the required quality, volume and reliability of supply. This dissertation therefore aims to highlight how companies build resilient supply chains and manage reliable sourcing of products from smallholders. In addition, poverty and food insecurity are among the major problems faced by rural producers in Ethiopia. Previous empirical studies show that POs and CFAs facilitate smallholder access to technologies, new managerial skills, and modern supply chains thereby improving farmer income and food security (see e.g. Verhofstadt & Maertens, 2014b; Barrett et al., 2012; Fischer & Qaim, 2012). The organisational innovations considered in this thesis – POs, CFAs, and PPPs - are all important in improving food production, crop yields, product quality, farm income and ultimately food security. It is therefore the intention of this thesis to analyse the impact of organisational innovations on the economic performance of farmers in Ethiopia. To achieve the objectives the following five research questions (RQs) are formulated:

1. *What are the different sourcing strategies of foreign brewery companies and how does it affect quality and reliable supply?*

Driven by a demographic shift and rapidly growing markets, multinational enterprises have been investing in food systems of developing and emerging economies. They are involved in coordination and organization of food supply chains, thereby modernizing those chains. Many studies have been conducted to examine the impacts of this foreign direct investment on economic growth at macro level. However, evidence on the role of multinational investments is scant at meso and micro level. In addition, the new development paradigm *from - aid - to - trade* also changes the engagement of public and private sector stakeholders in the development process, which needs research attention. Thus, in chapter two we address these research gaps by exploring the process of multinational brewery companies sourcing malt barley from smallholders, thereby contributing to smallholder livelihood and rural development. The chapter also seeks to provide better insights in the processes of setting up modern supply chain arrangements that allow smallholder farmers to sell to more rewarding markets.

*2. How do contract farming arrangements improve crop production, yield, product quality, and farm income within the domestic food supply chains?*

Chapter three focuses on one organisational innovation, the contract farming arrangement. Many scholars studied the increasing prevalence of CFAs in the changing food systems of developing and emerging economies. Most of these studies claim that CFAs promote smallholder linkages to high-value markets and increase farm income. Yet, there is also evidence that suggests that participating in CFAs has a negative association with farm income. Furthermore, most studies focused on high-value products (e.g. vegetables, flowers), traditional cash crops (e.g. coffee, tea and cocoa), and industrial commodity (e.g. rubber and cotton) destined to export markets. It is also claimed that export-oriented chains are often exclusive of resource poor farmers. Empirical evidence is scarce with regard to the impact of CFAs in domestic (staples) food chains in developing countries in general and Africa in particular. Thus, chapter three aims to quantitatively analyze the economic impacts of CFA within a domestic food chain.

*3. How has farmer collective action developed over time and how has it adjusted to a changing institutional and market conditions?*

Recent studies on modernisation of food chains in emerging economies focus on vertical coordination processes. But horizontal coordination is equally important to link-up smallholders in modern food chains. More research is needed on horizontal coordination and how farmer collective action institutions such as cooperative organizations have adjusted to the dynamic market conditions. Tighter coordination in food value chains demands alignment of chain activities among actors which leads to changes in the strategies and functions of cooperative organizations. However, this transformation in cooperative functions is not a linear one, and is different for different countries. Ethiopia is one of the African countries where co-operative development is in spotlights. Chapter four investigates development of co-operative organizations and transformation in their diversity of functions given the ongoing change in food markets.

*4. What factors determine smallholder participation in producer organizations? Is there a trade-off between inclusion and business performance of producer organizations?*

In developing countries, smallholder commercialization is frequently considered as a key development strategy to improve productivity of agriculture thereby reinforces economic growth. However, smallholders face institutional constraints to access remunerative markets and meet the requirements of those markets (quality, safety, and volume). There is growing evidence indicating that POs serve as institutional solution to facilitate smallholder linkages to markets. Policy makers, agricultural research institutes, and development organizations in Africa are now promoting POs as one of the rural development strategies to improve smallholders competitiveness by linking them to modern chains. It is often claimed that POs facilitate market access for smallholders and thereby improve their income and livelihoods. However, the economic performance of POs may come at the expense of inclusiveness. Thus, there is debates among academics and development practitioners about inclusiveness versus efficiency of POs. Chapter five, therefore, studies this issue by analysing the inclusiveness and business performance of POs in rural Ethiopia.

*5. Which factors influence farmer performance for improving quality at the upstream part of the food value chains?*

One of the key issues in the emerging modern food chains is food quality. Consumer concerns for food safety and diversification of diets lead to increased demand for higher quality food. To respond to this growing demand and to access high-value markets, smallholders need to meet the high quality requirements. But quality improvement involves innovation, risk taking, and investments, which could be challenging for less resource-endowed farmers. Complying with those quality requirements is challenging for smallholders given their lack of appropriate managerial practices, the use of traditional production technology, and the presences of institutional barriers. Despite this, product quality upgrading is important for smallholders to receive higher prices and obtain better margins. Thus, in chapter six, we investigate the opportunities and constraints for product quality upgrading at the upstream part of the Ethiopian malt barley value chain. The chapter also analyses the factors affecting quality improvement by smallholder farmers.

## **6. Research design and data**

This sub-section gives an overview of the different methodological approaches adopted to answer the five research questions outlined above. The main research design used is quantitative, gathering primary data through a survey. Cross-sectional data is collected at one point in time. The lack of longitudinal data affects the capacity to capture the direction of causality and to reach strong conclusions. This thesis has attempted to overcome these limitations by combining quantitative and qualitative approaches in data collection and analysis. Careful design of questionnaire, sampling and data collection were carried out. Data were collected from the Arsi highlands of Oromia, Ethiopia in 2015. The survey consists of detailed and specific modules to collect rich data on various aspects of farm households in the study area.

A qualitative approach is used to collect relevant qualitative data along the value chain. Various qualitative data collection methods consisting of focus group discussion, key informant interview, and participant observation were employed. The author was directly involved in the field study and based in the SNV-Ethiopia office for a whole year to carry out the field work. The summary of methods and data sources is shown in **Table 1.2**. In **Figure 1.4**, we showed location of the research area consisting of the Arsi highlands. We

also show the surveyed villages (= *kebeles*<sup>1</sup>) based on the type of value chains they are participated and the district (= *woreda*).

**Table 1.2.** Research design and data collection

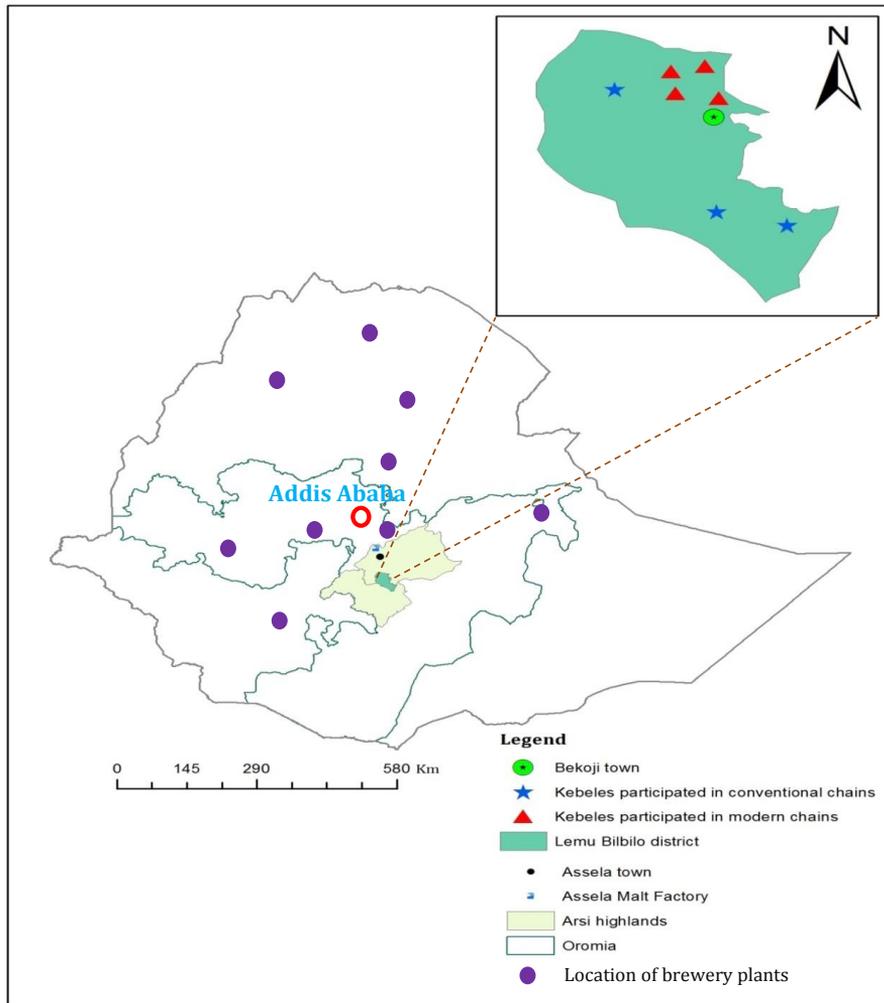
RQs	Research design	Data collection	Data sources
RQ1	Mixed method	Semi-structured interviews Focus group discussions Cross-sectional survey	PO leaders, union staffs, agricultural experts, supply chain managers, companies field experts, traders, farmers and NGOs experts
RQ2	Quantitative	Cross-sectional survey	Contract & non-contract farmers
RQ3	Qualitative	Semi-structured interviews Document reviews Field observations	Managers of PO, Government officials, NGOs experts, and farmers
RQ4	Mixed method	Cross-sectional survey Focus group discussions Semi-structured interviews	PO members, Non-members, and PO leaders
RQ5	Quantitative	Cross-sectional survey	Contract farmers, PO farmers, and independent farmers

To address RQ1, which aims to explore the role of FDI at micro level, a qualitative research approach was used. Specifically, an in-depth case study approach was employed. To gather the relevant data, different data collection methods included semi-structured interviews, and focus group discussions, in combination with field observations and a literature review. Following in-depth interviews, a survey was conducted among malt barley farmers. RQ2 focuses on the economic impact of CFA within the domestic stable food chains. To address this research topic a cross-sectional research design was employed. The survey was conducted with contract and non-contract farmers using face-to-face interviews.

RQ3 focuses on the development and functions of POs in Ethiopia. First, an extensive literature review was conducted to paint the development of POs in Ethiopia. Second, expert interviews and field observations were conducted to triangulate the findings of the literature review. RQ4 builds on the findings of research topic 3. It probes whether there is a trade-off between efficiency and inclusiveness of rural POs. A combination of qualitative and quantitative methods was used to answer the research question. In addition to a survey, focus group discussions and in-depth interviews were conducted to

<sup>1</sup> Note: kebele is the smallest administrative unit in Ethiopia. Based on the latest Cooperative Development Strategies in Ethiopia, One PO should exist in each kebele. Thus, in the seven kebeles we studied seven POs, four of them linked to modern chains and the other three not (**Figure 1.4**).

generate primary data. RQ5 explores the factors influencing smallholder decisions to improve quality. To address this topic, a quantitative approach was employed. A survey was conducted among contract farmers, PO farmers, and independent farmers to generate primary data.



**Figure 1.4.** Location of brewery plants in Ethiopia and research area

## 7. Structure of the dissertation

Together with the introduction and synthesis chapters, the dissertation consists of seven chapters. **Chapter 1** introduces this dissertation. It presents the conceptual framework and data which are used for the different analyses in the succeeding chapters. Chapters 2

through 6 answer the five research questions outlined in sub-section 5. The research questions are interrelated and complementary. However, each chapter consists of a stand-alone academic paper, with its own specific contributions to the agribusiness and development literature. The relations between the chapters are shown in **Figure 1.5**.

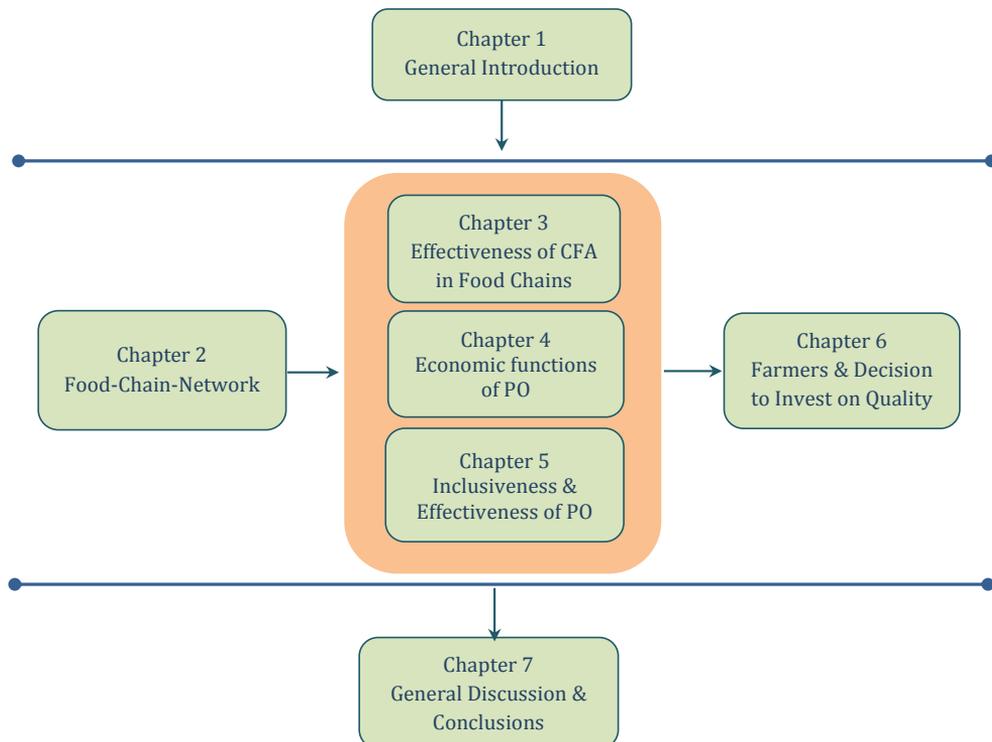
**Chapter 2** empirically studies how FDI facilitates supply chain innovation and induces modernisation in domestic food chains. Conceptual approaches including transaction cost economics, supply chain management, and value chain upgrading are employed to analyse and discuss the findings. This chapter shows that foreign companies managed to build efficient supply chains by involving NGOs and POs (public-private partnerships) for organizing the provision of improved inputs, technical assistance, and logistics. It also quantitatively analyzed farmers access to the new supply chains and the results show that farmers participation is determined by socioeconomic factors and farm characteristics.

**Chapter 3** provides empirical evidence on the implications of CFA within a staple food value chains. It employed a rigorous econometric analysis to disentangle the impacts of CFA. The analyses show that CFA has a robust positive impact on production, intensification, commercialization and ultimately increase farm income. This chapter also shows that household education, access to services, distance to markets, and off-farm income determine smallholder participation in a CFA.

**Chapter 4** focuses on POs development and diversity of functions they provide for commercialisation to smallholders. This chapter studied the factors that influence a shift in economic functions from provision of inputs to commercialization of farm products. Transaction cost economics is used as a main theoretical lens to organize the data and discuss the findings. The chapter paints the comprehensive picture of POs development and changes in economic functions in the background of the tightly coordinated value chains.

**Chapter 5** builds on the findings of chapter four and analyses whether there is a trade-off between efficiency and inclusiveness of POs. The chapter argues that, in the light of the ongoing change in food systems, POs are in the process of transforming into market oriented entities and become more business focus. However, governments and

development practitioners want POs to be all-inclusive. This chapter employed a rigorous econometric approach (e.g. propensity-score matching) to examine the efficiency and inclusiveness of POs. The analyses reveal that PO membership has a robust positive impact on farm productivity and farmer income. But this positive performance comes at the expense of inclusiveness.



**Figure 1.5.** Structure of the dissertation

**Chapter 6** presents empirical evidence on the factors affecting quality improvement at farm level. Smallholders' decision to enhance product quality is affected by several factors and this chapter utilize econometric analysis (e.g. ordered logistic model) to identify the key factors. The analyses show that a combination of push and pull factors affect smallholder performance for quality upgrading. The chapter develops a conceptual framework for better understanding of quality upgrading in the upstream part of food value chains.

Finally, **chapter 7** provides synthesis of main findings and discuss how the main results are related to key debates in the literature. It sets out policy implications of the findings for the rural-urban food supply chains and its sustainability. It also provides policy implications on how to support POs and their interaction with CFAs for increased food production and smallholder commercialization in Ethiopia. Eventually, it outlines potential future areas of research.

## Chapter 2

# Foreign Direct Investment, Vertical Coordination and Modernization in Domestic Food Chains

**Publication information:** Tefera D.A., Bijman J., Slingerland M.A, and Omta O. Foreign direct investment and the restructuring of supply chains: Evidence from the Ethiopian barley sector. *It has been submitted to a Journal*

## Chapter 2

# Foreign Direct Investment, Vertical Coordination and Modernization in Domestic Food Chains

### Abstract

Foreign enterprises have been facilitating modernization in the food systems of developing countries. The purpose of this chapter is to understand the process of supply chain restructuring induced by foreign investments. The chapter seeks to examine how foreign breweries in Ethiopia have set up new sourcing strategies for malt barley, by directly sourcing from smallholders. Also, it explores determinants of farmer participation in these new supply chains. The study is based on two complementary methods: a case study and a survey. The case study is used to explore the changes in malt barley supply chains. A survey was conducted among 258 farms. This data was analyzed using a probit regression model. We find that driven by rising income, per capita beer consumption in Ethiopia has rapidly increased over the past decade, thus attracting investments by multinational brewery companies. The local sourcing strategies of these foreign companies have led to the restructuring of malt barley supply chains. This is one of the first studies to provide in-depth insights into processes of how foreign investment facilitates supply chain restructuring and product upgrading in domestic agrifood supply chains in a developing country context. We also show that six factors determine farmer participation in modern supply chains: farmer characteristics of innovativeness, education, age, and off-farm employment and farm characteristics of size and distance to markets. The findings can be used by brewers and malting companies as well as NGOs and producer organisation in improving the effectiveness and efficiency of malt barley supply chains, particularly in developing countries.

**Key words:** Foreign investment; supply chain management; vertical coordination; local suppliers; malt barley; sub-Saharan Africa; Ethiopia

## **1. Introduction**

Food system transformation in sub-Saharan Africa (SSA) is characterized by increased value chain coordination and modernization of food processing and distribution (Haggblade, 2011; Briones, 2015). Changing consumer demand, rapid urbanization, the rise of supermarkets and ongoing globalization have led to restructuring of food chains, particularly towards more coordination among value chain actors (Reardon et al., 2009; Verhofstadt and Maertens, 2013).

Foreign direct investment (FDI) has supported the modernization of food systems, by bringing new technology, knowledge and skills, and financial assets to the host countries (Sjauw-Koen-Fa et al., 2016). In SSA, multinational companies have increasingly been investing in agriculture and food processing (Gui-Diby and Renard, 2015). FDI inflows are claimed to have a positive impact on economic growth and reduction of poverty (Gohou and Soumare, 2012). This macro-level effect varies across regions, and has a more pronounced impact in resource poor East Africa than in North and South Africa.

Most studies focus on the impact of FDI inflows at sectoral and macro level. Evidence on the role of multinational investments is scant at meso and micro level. This chapter aims to fill this gap by exploring the process of multinational brewery companies sourcing malt barley from smallholders, thereby contributing to smallholder livelihood and rural development. The chapter seeks to provide better insights in the processes of setting up modern value chain arrangements that allow smallholder farmers to sell to more rewarding markets.

In SSA, food production mainly depends on smallholder producers (HPLE, 2013). To be competitive and to link-up with modern markets, smallholders need the farm management and technology that allows them to produce according to the quality and uniformity requirements of supermarkets, multinational companies and export traders (Reardon et al., 2009). Multinational companies increasingly use vertical coordination to organize their supply chains and source from smallholders. Vertical coordination arrangements ensure access to improved technology, credit and modern inputs (Dries et al., 2009; Roy and Thorat, 2008). The provision of such supportive services improve supplier-buyer relations and farmer investments (Dries et al., 2014).

While in most of the value chain literature the focus is on export and high-value products, such as vegetables, coffee, flowers, fruits and cocoa, interest in food crops is growing. For example, Minten et al. (2016) have shown the transformation in a value chain for a staple food (teff), driven by the dynamics in urban markets. Nevertheless, research on how multinational companies engage in coordinating and organizing value chain activities for food security crops is scant.

One of the key questions for companies engaging in value chain coordination is to decide whether to work with individual farmers (often in a contract farming arrangement), with middlemen or with producer organizations (POs). Governments, donors and NGOs are increasingly promoting POs, considering them to be institutional solutions to reduce transaction costs (Latynskiy and Berger, 2016). Many studies have shown that POs are able to improve smallholder market positions through improving bargaining power and economies of scale, as well as by facilitating access to good quality inputs and market information, and by reducing marketing risks (for an overview, see Shiferaw et al., 2011).

However, most POs have been established to provide farming inputs and may have difficulties in strengthening their sales function (Bernard et al., 2008). In addition, POs have organizational weaknesses that may hinder their effectiveness in value chain coordination (Bijman et al., 2011). Moreover, they may not be as inclusive as many NGOs and donors would like them to be (Bernard et al., 2009). In addition to exploring the process of malt barley sourcing by foreign brewery companies and the implications for smallholder farmers, the chapter also seeks to contribute to the ongoing debate on the strengths and weaknesses of POs in value chain coordination.

The chapter presents a case study of the Ethiopian malt barley sector. Over the last two decades, Ethiopia has promoted a market economy and has facilitated the involvement of (foreign) private companies in many sectors, including the brewery industry. Several multinational breweries, such as Heineken, Diageo, Castel Group and Bavaria, have been investing in the Ethiopian brewery industry and have started local sourcing of malt barley. This has led to a restructuring of the malt barley value chains. As far as we are aware, this is the first publication with a detailed analysis of how FDI induce supply chain innovations in malt barley chains.

The chapter shows that foreign breweries implement higher levels of vertical coordination in the malt barley value chains, thereby allowing for economic upgrading with positive livelihood implications for farmers. In local sourcing of malt barley, multinational breweries have invested in new sourcing structures that provide improved inputs, better pricing, quality control and enhanced communication. This has led to higher quality and productivity in the malt barley chain. Findings also show that farmers benefit from the upgrading process through increased farm income. The chapter also contributes to the ongoing debate on POs role in value chain coordination by providing evidence that POs facilitate horizontal and vertical coordination through engaging in contract negotiation, inputs distribution, quality control and product aggregation.

The remainder of this chapter is organized as follows. Section 2 presents the theoretical framework, which mainly consists of transaction cost economics and supply chain management, leading to the guiding research questions. Section 3 describes the methods used and the data collected. Section 4 presents the results on the process of malt barley sourcing and their implications for smallholders. Section 5 discusses the findings, while section 6 concludes and provides several forward implications.

## **2. Theoretical framework**

In exploring the sourcing structures in the malt barley value chain in Ethiopia, we used several (partly overlapping) theoretical approaches. These approaches are the lenses through which we have looked at the real life phenomena. Transaction cost economics (TCE) has been used to understand the organizational arrangements in the value chain. Supply Chain Management (SCM) has been used to understand the decisions taken by the foreign companies in setting up their sourcing structures. Economic upgrading has been used to understand both the structure and the dynamics of the chain. Finally, collective action theory has been used to understand the strengths and weaknesses of producer organizations, particularly as they contribute to improving the efficiency of the supply chain.

### **2.1 Transaction cost economics**

Modern food chains are characterized by strong vertical coordination (Dries et al., 2009). Vertical coordination has been defined as the synchronization of successive stages in food chains (Swinnen and Maertens, 2007). The demand for higher quality and safety in

consumer-driven markets necessitates effective coordination among producers, traders, processors and distributors. Particularly when smallholders are the producers, vertical coordination arrangements include the provision of improved inputs, credit, technical assistance and transport (Bijman and Bitzer, 2016).

The theoretical perspective most often invoked to explain processes of vertical coordination is Transaction Cost Economics (TCE). Vertical coordination arrangements can be explained by the need to reduce transaction costs, such as information costs, contracting costs, and monitoring costs (North, 1990), as well as transaction risks (Williamson, 1985). Value chains with high quality requirements demand higher levels of information exchange and more quality monitoring. For the farmer, high quality requirements pose high transactional risks, as she needs to invest in specific assets, is faced with higher risks of rejection and has fewer sales options for the specific product. For the buyer, transaction costs are also higher, due to the necessary alignment between sourcing, processing and marketing activities. Also reputations may be at stake. This leads to both farmers and buyers setting up governance structures that provide them with the necessary safeguards (Royer et al., 2016). Therefore, higher levels of vertical coordination are likely to be organized through contract farming arrangements, and higher levels of quality are likely to lead to stricter contracts (Goodhue, 2011).

## **2.2 Supply chain management**

Supply Chain Management (SCM) emerged in the logistic literature of the 1980s with the main emphasis on optimizing logistics and inventory management along the supply chain (Chen and Paulraj, 2004). SCM practices focus on information exchange, supplier partnerships and product quality management (Trienekens, 2011). In the organizational branch of SCM, special attention is given to trust and commitment in supplier-buyer relationships (Anastasiadis & Poole, 2015). Effective collaboration among chain partners at each tier is crucial for facilitating the performance and sustainability of the whole supply chain (Barratt, 2004). By investing in information sharing, communication and trust building, processors (buyers) can gain commitment from their suppliers.

In sourcing from smallholders, food processors implement SCM practices such as information sharing, quality improvement, quality control and organizing logistics, in order to ensure a reliable supply. In addition to these more 'technical' elements of SCM,

buyers may also invest in social relations. Building efficient supply chains requires consideration of various factors such as trust and relationships among partners, collaboration with chain supporters and understanding the institutional environment (Scholten and Schilder, 2015). Multinational companies involved in local sourcing bring along improved technologies, skills and finance (Dries et al., 2014). They use modern supply chain strategies when sourcing from smallholder producers, leading to reduced transaction costs and a more reliable supply.

### **2.3 Value chain development / upgrading**

While SCM emanates from the idea of optimizing the supplies of the focal firm, reducing its costs and hence improving the competitiveness of the firm itself, value chain development takes the perspective of the small and medium-sized enterprises at the upstream part of the chain (UNIDO, 2009). Particularly, value chain development is a tool often used by governments and national and international development agencies to support the integration of individual producers and processors into value chains that provide better income opportunities. A major element of value chain development is upgrading, here understood as the development of competences and skills among smallholders that allows them to participate in more remunerative local and global value chains (Giuliani, 2005). Upgrading can thus be understood as the development of the capabilities needed for quality improvement, as higher quality products allow the smallholder to access modern value chains.

While the global value chain literature (e.g. Gereffi and Lee, 2016; Milberg and Winkler, 2011) has identified two types of upgrading – social and economic upgrading – we are particularly interested in economic upgrading. Pietrobelli and Rabellotti (2006: 1) defined economic upgrading as “the ability of producers to make better products, to make products more efficiently, or to move into more skilled activities”. Economic upgrading entails the acquisition of knowledge and the development of skills with the purpose of moving to higher value-adding activities that generate increased economic benefits (Gereffi and Lee, 2016).

According to Giuliani et al. (2005), economic upgrading includes four elements: (a) process upgrading: increasing the efficiency of production by introducing process

innovations; (b) product upgrading: moving into products with improved quality; (c) functional upgrading: acquiring new chain functions; (d) inter-chain upgrading: using functional competences in a new chain. Furthermore, Bolwig et al. (2010) highlighted delivering of larger volumes and complying with standards as additional upgrading dimensions. Upgrading capabilities are often facilitated by means of combined attention to product and process innovation (Trienekens and Van Dijk, 2012; Wijk and Kwakkenbos, 2012). For instance, concurrent provision of technical assistance, modern inputs and market information enhances the possibilities for smallholders to participate in modern value chains.

## **2.4 Producer Organizations**

Smallholders engaged in higher-value food chains face high transaction costs because they are likely to produce products specific for one buyer, thus leading to increased dependency, particularly in an institutional environment that may not protect their interests (Poulton et al., 2010). Buyers also face high transaction costs in contracting with multiple small farmers (Barrett et al., 2012). In this case, farmer groups or producer organizations (POs) may be a suitable institution to strengthen the bargaining position of the farmers, and at the same time reduce the information and coordination costs for the buyer (Bijman et al., 2016). In addition, POs may facilitate the distribution of inputs, technical assistance, and financial support from government and NGOs (Shiferaw et al., 2011). They may also provide credit by supplying inputs on loan, to be paid back when the harvest has been sold. A growing number of studies show how POs link smallholders to modern value chains (Markelova et al., 2009; Kaganzi et al., 2009; Shiferaw et al., 2011; Fischer & Qaim, 2012). Thus, POs may be attractive to both farmers and their buyers, and act as facilitators in coordination and upgrading processes in value chains.

Based on the assertions in our theoretical framework, we developed guiding questions for exploring how foreign brewers engage in coordinating malt barley value chain activities: (1) What factors determine the setting up of new sourcing strategies by foreign brewers?; (2) How does the provision of improved technology by means of the new sourcing strategies influence malt barley productivity and quality?; (3) Which factors influence local suppliers (farmers) participation in companies supply chains?; (4) What are the

strengths and weaknesses of POs in value chain coordination?; (5) What is the role of NGOs in mediating supply chain relationships?

### **3. Methods and data**

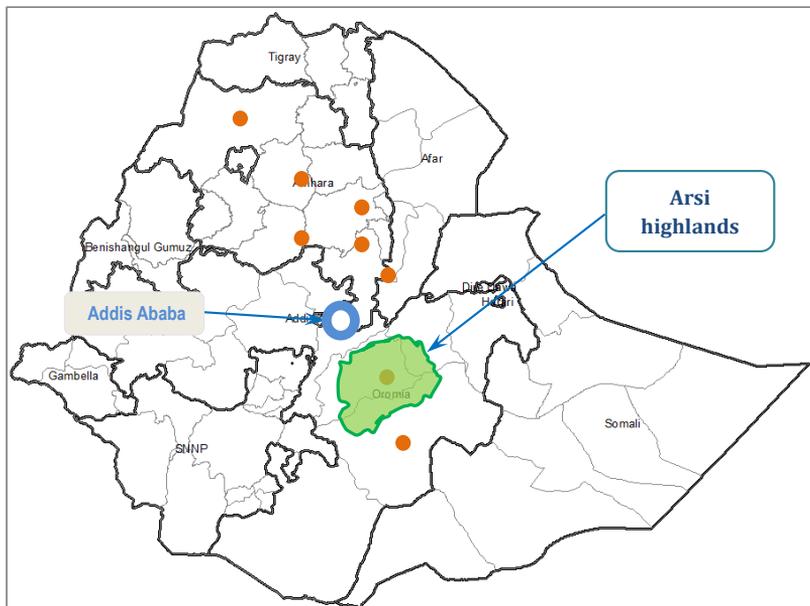
We used a combination of qualitative and quantitative approaches to address the research questions. A qualitative, inductive research approach is used to examine the processes of how the foreign brewers modernize the malt barley value chain. Case study design allows obtaining in-depth information about a particular event based on a variety of data sources (Yin, 2009). According to Eisenhardt and Graebner (2007), case study design is important to inductively build concepts based on cases and logical arguments. The strength of such an approach is its ability to generate new insights by focusing on using specific events or phenomena (Eisenhardt, 1989).

Different criteria might be used to examine and explore the rigor in case study research. According to Gibbert et al. (2008) four main criteria should be used: internal validity, construct validity, external validity, and reliability. Internal validity concerns the causal relationships between variables and results. In this study we developed and applied a multidisciplinary theoretical framework to strengthen internal validity. Construct validity describes the extent to which the study investigates what it intends to investigate (Yin, 2009). We used triangulation of data sources and data collection methods to improve construct validity of the study. External validity concerns generalizability of the results. In order to improve the external validity of our study, we selected diverse cases (conventional and modern sourcing structures), and we discussed the case specific outcomes within the broader institutional environment. Lastly, reliability deals with representativeness and absence of random error (Gibbert et al., 2008) which we considered in selecting the cases and the respondents.

In addition, value chain research often uses in-depth interview approach to generate information at each stage (Minten et al., 2016; Lowitt et al., 2015). For describing the malt barley value chain, we used the value chain analysis (VCA) method, which encompasses the identification and description of actors and their network structures, the core processes or functions, and the main supporting actors in the external environment (Trienekens, 2011). A quantitative approach was also followed to gather primary data

from upstream actors. A cross-sectional survey was conducted among 258 farm households.

The research was carried out in the main barley-belt of Ethiopia, the Arsi highlands (Figure 2.1). About 53% of national barley production is in the Oromia Region, the majority of which is concentrated in the Arsi highlands (CSA, 2015). In addition to barley, the Arsi highlands are also known for durum and soft wheat production. We purposively selected the Lemu Bilbilo district to carry out the case study, for three reasons. First, Lemu Bilbilo has a high production of malt barley; second, it has seen the appearance of foreign breweries in local sourcing of malt barley; and third, it already had multiple forms of processor-smallholder linkages in the value chain. To obtain a complete picture of local production and transaction of malt barley, interviews were also held in the nearby districts Tiyo, Digelu tijo, and Shashemene. District barley markets such as Bekoji, Sagura and Shashemene were visited and observations took place on price discovery processes, trading practices, market facilities and storage systems. The field study was carried out in January-May, 2015.



**Figure 2.1.** Research area (green) and location of barley production zones (small circles)

We conducted three in-depth case studies of malt barley supply chains. The following aspects were explored within each case study: the organization of the sourcing structures; the communication processes within the chain; the upgrading activities; the performance of the different sourcing structures; and the impact on the smallholder livelihoods. Here we want to emphasize that we did not aim at any rigorous impact assessment, but rather focused on explaining the processes of value chain coordination and upgrading linked to foreign direct investment.

We followed a multistep process in collecting primary and secondary data. First, 18 key-informant interviews were conducted at national level (in Addis Ababa) using conversational interview formats. The interviews focused on the developments in the barley sector connected to the fast growing brewery industry and the government’s new barley sector development strategy. With a strategic interest in transforming the barley sector, the Ethiopian government has developed an integrated national barley development strategy. The government promotes investments in the barley sector for supplying the fast-growing malt demand and reducing rural poverty by means of commercialization. In the second stage, in-depth interviews were held with key chain actors along the value chain at local level (Table 2.1).

**Table 2.1.** Respondents and key topics of interviews

Respondents: Value chain actors and their supporters	Key topics explored in the interview	Number of interviews (n = 47)
POs (multipurpose)	Main services, relationships with union, and arrangement with processors	7
PO (seed)	Key services, malt barley seed supply, relationship with union, and links with processors	1
Union (Galema farmer cooperative union)	Inputs distribution, marketing functions, coordination with POs, and arrangement with processors	3
Seed providers (seed enterprises)	Malt barley seed source, improved seed production, and seed dissemination to farmers	3
Financial service providers (MFIs)	Value chain financing, client management, requirements for loans, and group lending	3
Traders, local collectors, and brokers	Trade arrangements, malt barley price formation, market information, transactions coordination, and challenges	8
Processors (AMF, Heineken, and Diageo)	Local sourcing, communication interface, value chain management, quality incentive alignment, design of sourcing structures, and performance of sourcing structures	10
Government (Agricultural Research Institute and woreda bureau of agriculture )	Extension service, improved seed supply, and production related challenges	7
NGOs (SNV, Technoserve, Hundee, Self-help Africa)	Target groups within the value chain, types of assistance, and collaboration with breweries	5

We can summarize the processes of data collection as follows:

- a) *Document analysis*: Given the interest and scope of the study, information was obtained from government policy documents, project documents, consultant reports, field mission reports, and peer reviewed articles. Different websites and organization databases were also used. For instance, FAO and the Ethiopian Central Statistical Agency (CSA) databases were used to obtain data on the production of barley at national level.
- b) *Value chain actors and key-informant interviews*: To better understand the processes on how the appearance of multinational breweries has brought dynamism in the sector, in-depth interviews were conducted with key informants and actors along the malt barley value chain. Semi-structured questionnaires consisting of open-ended questions were used to guide the in-depth interviews. We conducted a total of 47 interviews with value chain actors (Table 2.1). On average, the interviews took about 50 minutes and were mostly conducted in situ (i.e., in offices, local village, and on farmer's field).
- c) *Focus group discussions (FGDs)*: FGDs were conducted among smallholders and PO leaders. Eight separate FGDs (each comprising of 3-5 participants) were held with PO leaders operating in both modern and conventional chains. Checklists were used to guide the FGDs. FGD participants were asked for their opinion on key issues including access to modern inputs (fertilizer, improved seeds, and pesticides), good agricultural practices, quality improvement activities, and marketing arrangements.

Following the in-depth case study, a survey was conducted among 258 malt barley farmers. A multi-stage sampling procedure was used for the selection of a targeted sample. First, four POs linked to modern chains were selected from four different villages in the Lemu Bilbilo district. From this group, we randomly selected a total of 110 households. Second, a total of 148 farmers selling only through conventional chains were randomly selected from three other villages in the district. These farmers could incidentally be PO-members, which are not linked to modern chains. Lists of farmers were obtained from the POs and village chair persons respectively. Data were collected with face-to face interviews using structured questionnaire. The survey was administered by trained enumerators with close supervision by the researcher. To determine the probability of farmers participation in the companies coordinated supply chains (i.e.

modern chains), we used probit regression model. The dependent variable is a binary variable that equals 1 if a malt barley farmer participates in modern chains and 0 otherwise. Several covariates including age, education, innovativeness, off-farm employment, family available labor, farm size, livestock ownership, access to mobile phone, extension contact, and distance to markets were used. The choice of these covariates is based on theoretical consideration and field observations during the in-depth case study.

## **4. Findings and analysis**

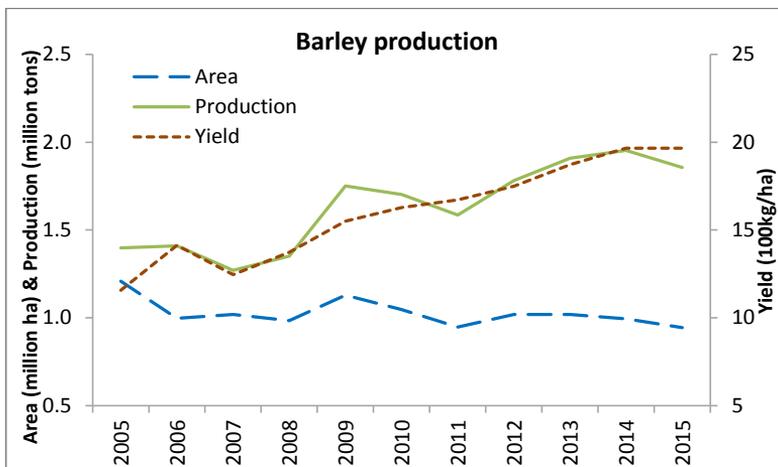
### **4.1 Malt barley and brewing industry in Ethiopia**

The purpose of this section is to show how the changes in the malt barley and brewing industry are driven by foreign breweries. The resulting dynamism is shown by the increasing diversity in chain structures and in the improvement of coordination of transactions.

#### *The malt barley sub-sector*

In Ethiopia, cereal crops account for the largest share of agricultural gross domestic product (GDP). Barley (*Hordeum vulgare L*) is one of the main cereal crops that are grown in the highlands of Ethiopia. In terms of area and value, barley is the fifth most important cereal crop after maize, teff, sorghum and wheat (CSA, 2015). Between 2005 and 2015, barley production has grown from about 1.4 million tons to almost 1.9 million tons (Figure 2.2). Despite this growth, the average yield of 1.6 t/ha is significantly lower than the yield in Kenya (3.3 ton/ha) or in developed countries (6 ton/ha) (Rashid et al., 2015). The low productivity is mainly the result of the restricted use of modern inputs such as fertilizers, pesticides and improved seeds.

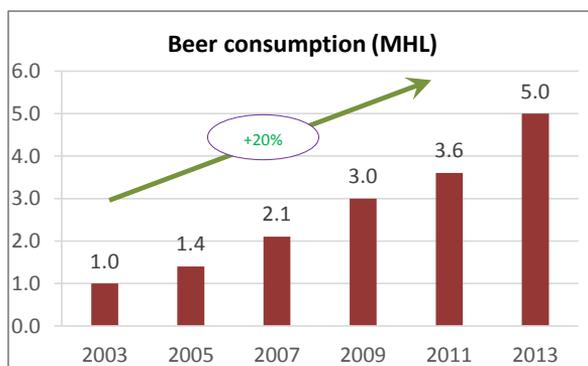
In Ethiopia, barley is a typical smallholder crop, which is currently grown by more than 4 million smallholders. Generally, two types of barley are grown: food barley and malt barley. However, the Central Statistical Agency (CSA) does not distinguish between these two types of barley. CSA data indicate that the major share of barley production is used for household consumption.



**Figure 2.2.** Production of barley in Ethiopia (2005-2015);  
 (Source: Authors' compilation based on data from FAOSTAT and CSA)

*Brewery industry and foreign investment*

Driven by urbanization and increases in per capita income, Ethiopian beer consumption is rapidly growing by about 20% annually (Assefa et al., 2014). Figure 2.3 shows the positive trend in beer consumption for the past decade. Recent estimates indicate that per capita consumption has increased from 4 liters in the past to a new record of 10 liters by the end of 2015. Yet, this figure is still low compared to other East-African countries such as Kenya and Tanzania. This indicates that the Ethiopian beer market is still young and has high potential, given the ongoing population growth. National beer production capacity has grown from 4 million hectoliters (MHL) in 2010 to 8.6 MHL in 2015.



**Figure 2.3.** Beer consumption in Ethiopia; Source: ATA (2013)

Seven brewing companies are producing beer of different brands for the fast-growing domestic market (Table 2.2). Following the privatization of the brewery industry, a number of multinational breweries (Heineken, Diageo, Bavaria) have entered the Ethiopian market. Saint-George, the oldest brewery in the country has the largest market share followed by the new arrival Heineken. Almost all breweries except Dashen brewery are now fully or partly owned by foreign companies. This recent appearance of foreign breweries in the Ethiopian brewery industry is triggered by a young and growing population, a policy of privatization, and steady economic growth.

**Table 2.2.** Breweries, brands, production capacities and malt requirements in Ethiopia (2015)

Brewery company	Ownership	Beer brands	Annual production capacity (MHL)		Market Share (%)	Malt demand <sup>b</sup> (1000 tons)
			Actual	Planned		
BGI	Castle Group <sup>a</sup>	St. George, Bati, Castle and Amber	3.00	-	35	36
Heineken	Heinekena	Harar, Hakim stout, Hara sofi, Bedele and Walia	2.50	-	28	33
Meta-Abo	Diageo <sup>a</sup>	Meta, Zemen and Malta Guinness	1.00	0.70	11.6	13
Dashen Habesha	TIRET Group Bavariaa (partly)	Dashen Royal Habesha Cold Gold	0.90 0.65	2.00 -	10.5 7.55	30 8.5
Raya	Castle Groupa (partly)	Raya	0.60	-	6.90	5.1
Zebidar	Unibraa (partly)	Skol	-	0.35	-	4.5
<b>Total</b>			<b>8.65</b>	<b>3.05</b>	<b>100</b>	<b>130.1</b>

Source: Authors' compilation based on secondary sources; a = foreign brewery company; b = adapted from Biftu et al. (2016), showing demand for 2016

With the increase in beer production, also the demand for malt has grown. Until 2013, all malt was produced by the Assela Malt Factory (AMF), the only malting factory in the country and located in our study region. In 2012 a new malting company was established in the north of the country, Gonder Malt Factory (GMF). AMF continues to be a state-owned enterprise while GMF is a subsidiary of the private Dashen brewery. AMF is the largest malt factory in the country, accounting for 70% of domestic malt supply. The joint capacity of the two malting factories is about 52 thousand tons per year, which accounts for only 40% of the estimated malt demand of 130,100 tons (Table 2). As a result, breweries are importing about 60% of their malt demand.

The government is keen to support domestic malt barley production, in order to reduce the use of foreign currency (which are scarce) and to link smallholders to higher value

markets so as to increase family income and food security. It has developed a five-year barley value chain development strategy (ATA, 2015). This strategy provides the institutional framework to enhance coordination and the technology transfer in malt barley value chains, with the aim of supporting both productivity per hectare and total production (interview at ATA). This government strategy also aims to improve input supply, logistic facilities and smallholder commercialization. Despite the high political priority given to barley, several respondents told us that implementation of the strategy at local level is slow and limited.

#### **4.2 Supply chain restructuring in the barley sector**

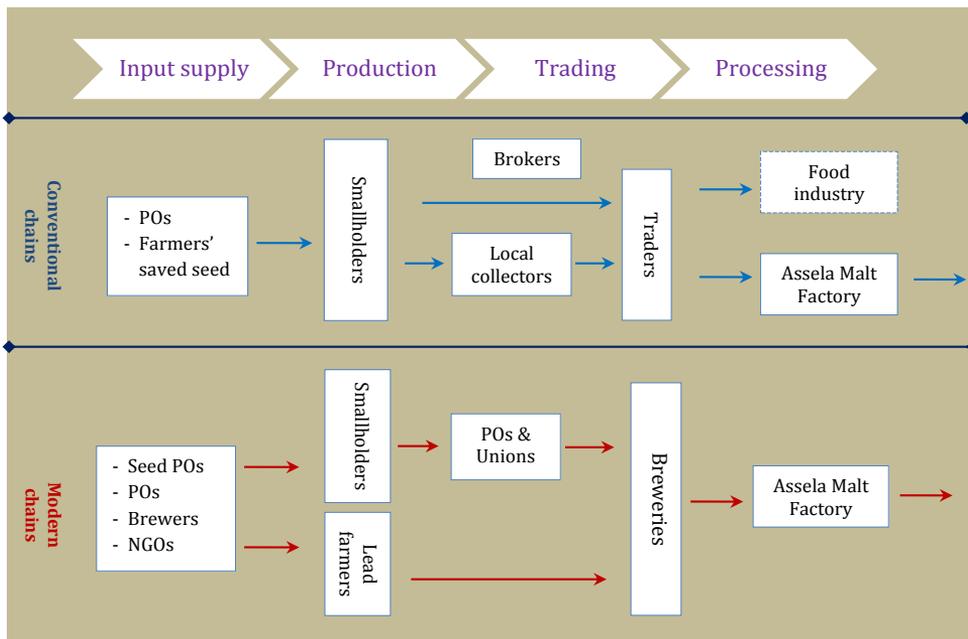
In the Arsi highlands, some 400,000 farmers grew food and malt barley on about 150,800 hectares of land in the 2014/15 production season (CSA, 2015). In the FGDs, we learned that for farmers, barley is the king of grains (“Gebese ye ehile nigus”), due to its suitability for preparing various traditional dishes. The total barley production is estimated at 4 million quintals. The largest share of production (64%) is used for household consumption, while the commercialization of barley remains low, with only 14% (CSA, 2015). The other 22% is used for seed (19%) and other uses (3%).

The value chain of malt barley comprises of five processes: input supply, production, trading, processing barley into malt, and brewing beer. Our description, however, focuses on the first four stages, from supplying inputs to malt production, using the three key elements of value chain analysis: processes, key actors and their network structures, and the value chain supporters (Trienekens, 2011).

We identified the co-existence of two dominant chain structures, the conventional and the modern chain (Figure 2.4). The essential difference between the two chain structures lies in the involvement of the breweries in every stage of the modern chain structure. The conventional chain includes POs (particularly for input distribution), smallholder producers, local collectors, brokers and traders in the Bekoji market. The Bekoji market is the main malt barley market in the study area. In this chain structure, traders are dominant, as the grains pass through many intermediaries. Traders differentiate malt barley quality on the basis of easily observable characteristics such as size, colour and foreign matter. Communication interfaces are not well developed and little information flows upstream. In addition, collaboration among actors is limited leading to weak chain

integration (Watabaji et al., 2016). External support, such as financial and extension services, is not well organized.

The modern chain, on the other hand, is processor-driven and characterized by vertical coordination between smallholders and barley processors (Figure 2.4). This chain contains fewer intermediaries and better collaboration among actors. The modern chain structure has existed since 2013, when foreign breweries started new sourcing strategies, using POs, unions and lead farmers as their main suppliers. Foreign breweries are now investing in communication interfaces that facilitate coordination, and information flows within the value chain. Breweries are involved in local sourcing to ensure consistent local supply as well as to show their corporate social responsibility (interview with experts).



**Figure 2.4.** Structure of conventional and modern malt barley chains in the Arsi highlands. (Source: Developed by the authors)

In the conventional chain, traders are the main coordinators and have strong bargaining power. Traders handle about 52% of the total malt barley transaction in the Arsi highlands (Alemu et al., 2015). They purchase from smallholders and local collectors

through spot market transactions. AMF is the dominant buyer of malt barley in the conventional chain. Institutional buyers and flour factories also purchase malt barley from brokers. The conventional chain is not well coordinated, and farmers lack access to modern inputs and market information, while the quality of malt barley is low. Farmers face high transaction costs and have low bargaining power. Unions do some output marketing but the coordination between unions and POs is limited. However, the service of POs in supplying basic inputs and technical assistance is well acknowledged by farmers (source: FGDs).

In the modern chain, breweries are the main coordinators, particularly by setting requirements for quality, quantity, and delivery time. Breweries have set up sourcing strategies which involves POs, unions, and lead farmers to purchase malt barley from smallholders. Contract agreements are used to arrange the vertical coordination between breweries and smallholders. Contracts facilitate smallholder upgrading capabilities by providing them access to modern inputs and technical assistance. Smallholders' engagement in upgrading activities helped them to produce higher quality and to achieve higher yields. POs and unions are directly involved in supporting vertical coordination between farmers and breweries. They serve as an organizational link to facilitate contract negotiation, modern inputs distribution and malt barley aggregation. Overall, the role of foreign breweries in orchestrating upgrading activities has stimulated malt barley production and commercialization in the region. One key informant in Bekoji observed how sourcing by the foreign breweries has influenced malt barley value chain:

“I think the current situation is encouraging for malt barley, its market demand increased and foreign companies come to local markets to buy malt barley. For instance, once the breweries started the purchasing of malt barley locally, the base price increased from 750 birr/100kg to 850 birr/100kg in the region. This motivates malt barley farmers to grow more and to supply to markets. (...) The breweries also introduced new malt barley varieties which is important for barley producers as the existing varieties are low in productivity”.

### **4.3 Comparing sourcing structures**

Sourcing structures are institutional arrangements that processors use to purchase malt barley. In this section, we compare the conventional chain structure (dominated by

traders) to the modern chain structure, and within the modern structure we compare the supply chains of two foreign-owned breweries.

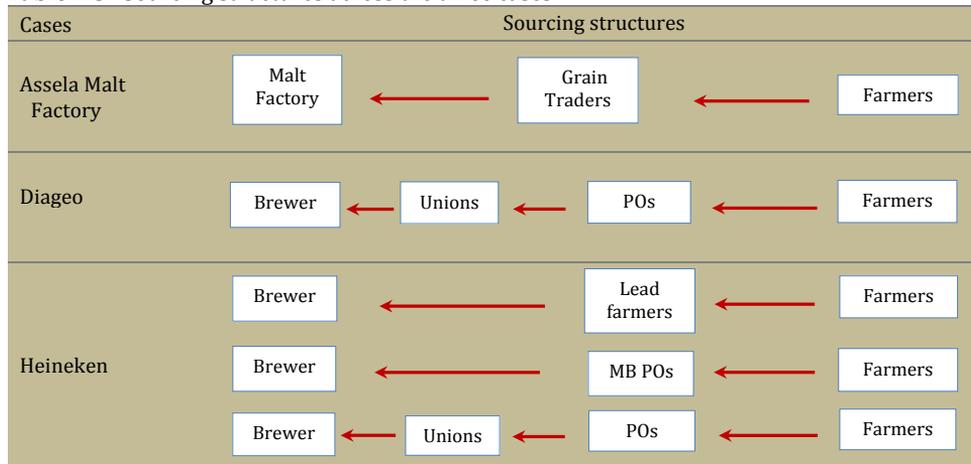
Diageo Plc, a British drinks company, acquired Ethiopian Meta-Abo brewery in early 2012. After the acquisition, Diageo expanded the capacity of the Meta-Abo brewery and added new brands of lager beer to its portfolio. In 2013, Diageo was the first brewery to set up a new sourcing structure to purchase malt barley. Its goal is to source 100% of its malt barley locally in 2017. For this reason, the company developed a public-private partnership with the local government, several unions and an NGO. The company purchases all its locally produced malt barley from unions and POs (Table 2.3). Diageo has contracted Technoserve, an American NGO, to provide coaching and technical assistance to farmers on a small group basis in demo plots. The training mainly focuses on agronomic practices (proper application of fertilizer and pesticides) and post-harvest handling. Technoserve hired field experts who work with POs and farmers at village level. The NGO also hired business advisors to supervise the field experts, and to facilitate coordination with POs and unions. Technoserve collaborates with local government agencies to select unions and POs to be included in Diageo's supply chain.

The Dutch company Heineken is the world's third brewery group next to the SABMiller and AB InBev. Heineken has been investing in the Ethiopian brewery industry since 2011, by the acquisition of the Harar and Bedele breweries. Heineken also constructed a new brewery in Addis Ababa in 2012. The beer from this new plant is marketed under the new brand of Walia. Heineken has started local sourcing of malt barley in 2014. To set up its supply chains the company initiated and implemented a 4-year malt barley project, a public-private partnership with the Dutch and Ethiopian governments. The aim of this multipartite project is to improve the supply of modern malt barley seed varieties and to develop structures to sustainably source malt barley from smallholders.

Unlike Diageo, Heineken focuses on multiple sourcing structures (Table 2.3): lead farmers, unions and new malt barley POs (MB POs). In setting up its supply chains, the company collaborates with a local NGO, Hundee, which organizes farmers and provides trainings. Hundee technicians are directly involved in the selection of lead farmers and the establishment of the new malt barley POs.

To sum up, while AMF usually purchases malt barley from traders, Diageo and Heineken have set up four different sourcing structures. These breweries always collaborate with NGOs for farmer selection, training, organization of farmer groups and facilitation in product aggregation. While the breweries are engaged in malt barley sourcing, the malting process itself is still carried out by AMF.

**Table 2.3.** Sourcing structures across the three cases



Note: arrows indicate flow of products; Source: authors' design based on field study

We have described and analyzed the differences across the cases using two dimensions: (a) characteristics of sourcing structures, and (b) the relative importance and the performance of sourcing structures. Sourcing structures are described on the basis of their design and key partners involved. We use three indicators to assess the performance of the sourcing structures: (a) supply performance; (b) performance on quality; and (c) productivity improvement.

#### *Chain coordination*

The three cases are different in the types of intermediary used in organizing malt barley supply. The two breweries have written contracts with suppliers, and use NGOs as key intermediaries to organize the supply chain. AMF, however, does not do any chain coordination; it only has supply management staff to purchase malt barley from traders.

The three cases are also different in terms of the ways sourcing structures are organized. Heineken uses a lead farmer model. The lead farmers are better-off farmers selected by Heineken's field team. Each lead farmer serves as a nucleus farm and has organized 30-

50 fellow farmers around him. As we saw in Table 2.3, Heineken also organized farmers into new Malt Barley POs. The company set up 16 new dedicated POs with 100-150 farmers each. In addition, the company also used two unions for sourcing malt barley. Heineken contracts with specialized seed POs for the multiplication and production of improved malt barley seeds. Diageo is fully committed to work with existing unions and the affiliated POs. The company has engaged five multipurpose unions and 38 POs. The Ethiopian government supports the union-based sourcing structures and often forces foreign breweries to work with existing unions (source: interview with Diageo and Heineken).

### *Supply performance*

How do the different sourcing structures perform in delivering the targeted quantity of malt barley? Focusing on the individual cases, the results on the supply performance of the sourcing structures are mixed. For instance, the lead farmer model of Heineken performed well (Table 2.4). While the union-based sourcing structure performed well in the case of Diageo, it did not do so for Heineken.

The low supply performance of union and new malt barley PO in the Heineken case could be explained by a number of factors. From the FGDs and interviews we learned that the coordination between unions and POs was weak, with little support from Hundee; there was side-selling due to the low premium price offered by Heineken; and there were problems related to logistics.

**Table 2.4.** Supply performance of the sourcing structures (2015)

Companies	Suppliers	Targeted quantity (‘000 qt)	Actual supply (‘000 qt)	Supply performance (%)
Diageo	Union	60.00	54.97	92
	Union	8.74	4.58	52
Heineken	MB POs	24.79	12.21	49
	Lead farmers	16.76	33.81	202
Total		110.29	105.57	96

Source: Field study & Alemu et al. (2015); Note: qt = quintal =100kg; MB POs = New malt barley POs

### *Performance on quality*

Malt barley is a specialty product and it requires a proper production and handling process. The main factors affecting the malting quality of barley include the variety used, the agronomic practice and the post-harvest handling (interview: Kulumsa Agricultural

Research). In the Arsi highlands, the well-known malt barley varieties are Holker, Sabini and Beka. Two newly introduced varieties are Grace and Traveler. The main attributes of high quality malt barley varieties are high germination rate, good grain size, colour, low moisture and low protein content. Table 2.5 presents the quality attributes of malt barley as observed in the case studies. Breweries and malt factories use these quality criteria when purchasing malt barley.

In the three cases, we observed a mixed performance of the sourcing structures in terms of quality. In the case of Diageo, it was reported that unions supplied a high quality (Grade A) with a low rejection level. In the Heineken case, the union-based sourcing structures were performing poorly, the new malt barley POs performed well, while the lead farmers delivered medium quality.

**Table 2.5.** Quality standards and assessment of malt barley

Quality criteria	Standard <sup>a</sup>	Description	Measurement method
Varietal purity	> 94%	Genetic varietal purity is crucial for high grade	Visual inspection
Germination	> 96%	High germination rate is required for high grade	Laboratory analysis
Protein content	9 -11%	Low protein content is required for high grade	Laboratory analysis
Moisture content	≤ 13.5%	Sufficient moisture is required for high grade	Visual inspection
Grain size (small)	≤ 15%	Low level of small sized grain is required for high grade	Visual inspection
Foreign matter	≤ 4%	Cleanness and absence of impurities is required	Visual inspection

Source: Based on field study; a = the AMF contract is the industry standard

Problems of mixed variety, impurities, and producers paying little attention to quality are reported as key quality challenges in the value chain. In addition, there is no national grading system for malt barley. Processors use private standards above the AMF industry standard, which differ across companies. Also the strictness of applying the standards differs, particularly in times of high demand. The latter may negatively affect farmers' commitment and loyalty in the sourcing structures.

#### *Performance on productivity*

Processors provide various types of services, including the technologies that improve smallholders' productivity and their capability to produce better quality. Table 2.6 compares the two modern cases in terms of technology supply, upgrading activities, and transaction attributes. In the conventional (AMF) chain, input supply is underdeveloped and shortage of improved seeds often constrains malt barley production (FGDs and

interviews). Heineken introduced two new high-yielding certified malt barley varieties, namely *Grace* and *Traveler*, to address problems of low quality seed. The company partnered with a regional agriculture research institute for adaptability trials. The two varieties have good adaptability and high productivity performance<sup>2</sup> (interview: Kulumsa agriculture research). The varieties also have good brewing quality. Heineken multiplied the seeds and supplied them to farmers within all its sourcing structures. Diageo uses Holker, a well-known traditional malt barley variety. By providing technical assistance, better farm management, and post-harvest activities, farmers in the Diageo sourcing structure have been able to increase productivity as well.

#### *Impact and perceived benefits of economic upgrading*

Both Diageo and Heineken support farmers to upgrade their malt barley production. However, the intensity and degree of implementation of these activities vary across the cases. Table 2.6 presents the results on the dimensions of economic upgrading and processors' choice of arranging it. By receiving modern inputs and specialized technical assistance, smallholders have been able to engage in process upgrading, leading to an increase in malt barley productivity. In addition, farmers are more aware of quality and they have shifted to supplying a better quality product. Both brewery cases are performing well as far as product upgrading is concerned. In the conventional chain, however, we do not see any upgrading.

Moreover, malt barley supplied to processors must comply with the standards for brewing quality. Processors often check quality during transactions, for instance in the warehouses of POs and lead farmers. Farmers who supplied malt barley that meets the required quality, received a price premium ranging from 10 to 20 percent of the base price of 850 birr/100 kg. This directly impacts farm family income. Farmers in the malt barley chain have not achieved any functional or inter-chain upgrading. The use of vertical coordination in sourcing malt barley from smallholders is in an early phase of development.

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<sup>2</sup> Data from Kulumsa agriculture research shows that these two varieties have about 20 percent higher productivity than other malt barley varieties (Sabini, Holker, and Beka). Our own farmers' survey shows that the farms in modern chains have higher malt barley productivity (21.7qt/ha) than farms in the conventional chain (18.8qt/ha). This is significant at 1% level of significance.

We did not carry out a rigorous impact assessment, but we qualitatively evaluated the impact of FDI in the malt barley value chain. Smallholders derived benefits from the vertical coordination arrangements, notably being able to produce higher quality, to obtain higher productivity, and to access improved barley varieties. Guaranteed markets and higher prices are also important for smallholders. Farmers were satisfied with the services that their POs provided under the new arrangements, and they showed more commitment to their POs.

**Table 2.6.** Cross-case comparison in upgrading and transaction attributes

	Diageo	Heineken
<b><i>Provision of technology</i></b>		
Fertilizers	++	++
Pesticides	++	++
Improved/new seeds	+	++
Technical assistance	++	+
<b><i>Upgrading elements</i></b>		
Process upgrading	++	++
Product upgrading	++	++
<b><i>Transaction attributes</i></b>		
Main supplier	Unions	Lead-farmers, MB-POs, Unions
Price setting	Fixed price for a year	Fixed price for each transaction
Price premium (Grade-A)	20%	10%
Commission to union	18 birr/qt	12 birr/qt
Logistics arrangement	By company	By company

Note: Based on experts' opinion and detailed interviews; + means moderate, ++ means high or appropriate

In addition, PO leaders are positive about the training they received from the NGOs, including training on business planning, record keeping and reporting, group management, and credit-related issues. PO leaders also indicated that the new arrangements helped them to improve the coordination with unions. For unions, the new arrangements strengthened their financial base (through receiving higher commissions) and extended the services provided.

In sum, as a result of the appearance of foreign breweries, new supply chain structures for malt barley have developed. The modern supply chain is characterized by vertical coordination and better chain integration. Breweries provide improved technology and quality-based price premiums which encourage smallholders to engage in upgrading activities. Intermediaries such as POs are key organizational links to facilitate contract negotiations, to distribute inputs and to aggregate products. NGOs also play a crucial role

in training and organizing farmers. The conventional structure is driven by traders and is weakly coordinated.

We have identified three new sourcing structures within the modern chain. First, lead farmers receive malt barley seeds from the brewery, and deliver their malt barley grain directly to the brewery. Second, smallholders are organized in newly established malt barley POs that arrange the purchase of improved inputs, collect malt barley from member producers and supply this barley to the brewery. Third, smallholders are organized in conventional POs, which are members of a multipurpose union that supplies the barley to the breweries. These sourcing structures differ in supply performance and the coordination of upgrading activities.

#### 4.4 Regression results

In Table 2.7, we present summary statistics for farmers participating in modern and conventional chains. Modern chain farmers are, on average, more educated and innovative than their counterparts. On average, 81% of modern chain farmers own a mobile phone as opposed to 62% of farmers in conventional chain. In addition, farmers in the two chains are significantly different in access to extension services, access to savings, and PO membership. The mean distance to the market was lower among the modern chain farmers.

**Table 2.7.** Suppliers characteristics by supply chains

Variables	Full sample (N=258)	Modern chain (N=110)	Conventional chain (N= 148)
<b>Human capital</b>			
Household age (years)	44.32	44.55	44.16
Households education (years)	5.14	5.96***	4.54
Family available labor(number)	3.87	3.81	3.91
Innovativeness <sup>a</sup>	3.30	4.06***	2.73
Off-farm employment(0-1)	0.20	0.17	0.23
<b>Malt barley cultivation</b>			
Farm size (ha)	2.75	2.70	2.79
Total livestock (TLU) <sup>b</sup>	11.09	14.45	8.59
Malt barley cultivated area(ha)	0.74	0.79	0.69
Barley farming experience (years)	20.29	20.69	20.00
<b>Access to services</b>			
Access to mobile phone (0-1)	0.70	0.81***	0.62
Savings (0-1)	0.59	0.74***	0.48
Access to public extension (0-1)	0.53	0.67***	0.42
Distance to markets(km)	7.93	5.59***	9.67
PO membership (0-1)	0.72	1.00***	0.52

Source: Field survey, 2015; \*\*\* P < 0.01; Note: a = innovativeness measures, on a Likert scale (1-5); b = tropical livestock unit to describe livestock numbers of various species as a single unit.

### *Determinants of participation in modern supply chain*

In order to explore which farmers join modern supply chains, we used a probit regression model. A summary of the results are presented in Table 2.8. In the analysis we used ten explanatory variables, out of which six are significant.

Household head age, level of education, and innovativeness are important determining factors for participation in companies supply chains but family available labor, livestock and mobile ownership are not. The results can be summarized as follows. (a) Farmers with better human capital (age, education, and innovative attitude) are more likely to join modern supply chains. (b) Large farm size and high off-farm employment are negatively influencing the likelihood of farmers participation in modern supply chains. (c) Farmers who are located near district markets (i.e., having access to good roads) are more likely to participate in modern supply chains.

**Table 2.8.** Determinants of participation in modern supply chains

Variables	Coefficient	Marginal effects
Household age	0.096*** (0.021)	0.034
Family available labor	-0.043 (0.084)	-0.015
Household education	0.122*** (0.043)	0.039
Off-farm employment	-0.673** (0.333)	-0.205
Innovativeness	1.526*** (0.202)	0.532
Farm size	-0.158** (0.075)	-0.055
Access to mobile	0.415 (0.329)	0.137
Extension contact	0.343 (0.253)	0.118
Total livestock	0.000 (0.006)	0.000
Distance to market	-0.224*** (0.049)	-0.078
Constant	-8.376*** (1.485)	
<i>Summary statistics</i>		
Pseudo R <sup>2</sup> = 0.6183	Percentage of correct prediction = 88.98%	
Model $\chi^2$ = 214.19***	Number of observations = 254	

Note: figures in parentheses are standard errors; \*\*\* P < 0.01, \*\* P < 0.05

## **5. Discussion**

The Ethiopian brewery industry is expanding rapidly due to foreign breweries entering the market. However, national malting capacity is too low (only 40 percent) to

accommodate the fast-growing demand for malt. The Ethiopian government promotes private investments in local sourcing of malt barley, in order to reduce the use of foreign currency and to link smallholders to higher value markets so as to increase family income. Foreign brewers in other African countries also have been sourcing raw materials from local producers to economize on expensive malt imports (Wijk and Kwakkenbos, 2012). The arrival of foreign breweries in malt barley sourcing brings dynamism in the value chain, including the increasing diversity in chain structures and the improvement of coordination of transactions.

The performance of sourcing structures differs in the supply of the required quantity and quality of malt barley. The key difference is between the conventional chains and the modern chains, with the latter being coordinated by the foreign-owned breweries. In the modern chain, the breweries take up the role of chain coordinator, by providing (improved) seeds, by arranging logistics and by hiring NGOs to provide technical assistance to farmers.

Within the modern chain structures, we found differences between Heineken and Diageo. While Diageo only works with existing unions and POs, Heineken also purchases malt barley from newly established dedicated malt barley POs and from lead farmers. Particularly the latter performed extremely well in supplying the agreed quantity and quality. Although we do not have detailed information on how lead farmers coordinate the barley supply, it could be related to the high commission fee they obtained from the brewery. The social capital in the community may play a role as well, as it prevents farmers from side selling. On the contrary, the dedicated malt barley POs supplied less due to side selling. These POs were not satisfied with the price Heineken paid and decided to supply only to pay back seed deliveries. In addition, the complex relationship between POs and unions poses a challenge for timely aggregation of malt barley from member producers. PO leaders complained about the unfair benefit distribution between PO and union.

To establish vertical coordination in malt barley chains, multi-stakeholder partnerships have been set up including local and international NGOs, regional agriculture research institutes, local microfinance institutions, regional seed enterprises, local governments and local farmer organizations. Breweries have been acting as *de facto* (if not *de iure*)

coordinator in these partnerships. Within these partnerships, agreements have been made on developing and supplying improved seeds, training of farmers, providing extension services, and building capacity within POs. Gebreeyesus (2015) has shown that strong public-private partnerships played a pivotal role in the development of the Ethiopian flower industry. Studies from other African countries also show that public-private partnerships are instrumental in facilitating smallholder-agribusiness linkages in (export-oriented) food value chains (Narrod et al., 2009; Bijman and Bitzer, 2016). Our case study provides further evidence of the claim by Wijk and Kwakkenbos (2012) that beer multinationals often use public-private partnerships to locally source raw materials (e.g., sorghum), thereby contributing to rural development.

We have used both a value chain approach and a supply chain management perspective to understand the changes in the malt barley value chain. Supply chain management encourages better supplier partnership, communication and coordination in the chain (Coronado et al., 2015). In Ethiopia, foreign breweries undertake various supply chain activities to foster enhanced coordination and economic upgrading. In line with findings from other African countries (Wijk and Kwakkenbos, 2012), we found that foreign-owned breweries have been able to achieve upgrading in malt barley chains. Also Felgenhauer and Wolter (2009) found that, in South Africa, the SABMiller brewery company managed to increase yield and quality by providing improved technology to smallholders. These findings are corroborated by recent studies on the modernization in African food chains (Verhofstadt and Maertens, 2013), as well as on the transformation of Ethiopian food chains (Minten et al., 2016).

Our finding that breweries use different sourcing structures may question these differences. While it was not our objective to explore why Heineken uses three sourcing structures while Diageo uses only one, our interviews and field observations provide some speculative answers. First, competition for quality and volume may be an incentive to experimenting with different arrangements. Second, existing local institutions may push them into particular partnerships. Third, experience in other countries can lead to particular preferences. Both Heineken and Diageo have experience in local sourcing of raw materials (e.g., sorghum) in other African countries (notably, Nigeria, Tanzania, Rwanda, Ghana, and Sierra Leone).

While supply chain management takes the focal company as starting point (in our study this is the brewery), the value chain approach usually starts with the smallholder farmer and seeks to strengthen her livelihood. Thus, NGOs and governments working on value chain development seek to link smallholders with remunerative markets by providing inputs, credit, technical assistance and market information, often through public-private partnerships. Our case studies show that engaging smallholders in modern value chains by provision of modern inputs and assistance can improve their livelihoods via effect on productivity and farm income. These findings are in line with other literature on the impact of value chain development (e.g., Lie et al., 2012; Mohan, 2016; Rutherford et al., 2016).

Many studies have shown the relevance of contract farming in promoting smallholders' integration in modern chains (Barrett et al., 2012; Oya, 2012; Alemu et al., 2016) due to its positive impact on smallholder income and productivity. However, it has also been claimed that contract farming arrangements exclude the poor in favour of better-off farmers (Poulton et al., 2010). We found that contract arrangements are used for improving coordination between farmers and their buyers, for improving malt barley quality, and for organizing farmers in groups. Our results show that smallholders are not excluded from contract arrangements.

Producer organizations are essential actors in most of the sourcing structures that we have explored. These POs can be primary cooperatives, mainly working on village level, or cooperative unions, mainly working on district level. A growing number of studies have evaluated the role of POs in improving smallholder access to markets (Bernard et al., 2008; Fischer & Qaim, 2012; Verhofstadt & Maertens, 2014; Bijman et al., 2016). These studies show that POs are instrumental in enhancing bargaining power, accessing improved technologies and reducing transaction costs. Our results show that POs facilitate contract negotiation, modern inputs distribution and product aggregation. Zylberberg (2013) has shown that intermediaries are crucial in ensuring effective coordination and processor-smallholder linkages. Our result shows that POs serve as an effective organizational link mediating malt barley transactions between a small number of processors and a large number of smallholder farmers.

Barley is one of the most important food security crops in the highlands of Ethiopia. It is produced by more than 4 million smallholder farmers. Higher production of malt barley

may have implications for the production of food barley. Some studies claim that cash crop production comes at the expense of food crop production, as cash crops compete for scarce resources (particularly land) and may replace food crops, thus raising the price of food (e.g. Anderman et al., 2014). Others have argued that cash crops have synergetic effects on other farming activities and food production (Govereh and Jayne 2003; Negash and Swinnen, 2013; Riera and Swinnen, 2016). The skills farmers acquired in cash crop schemes can be used for food crop production. In addition, the family income obtained from the high price for high-value crops can be used to buy inputs for food crop production.

We expect positive implications of brewery-coordinated sourcing structures on the food security at household level, via two pathways. First, when smallholders receive a higher malt barley price, they are able to purchase fertilizers and better seeds for food crop production. Most farmers produce malt barley, food barley and other crops including wheat, peas, beans and vegetables. Land use competition among these crops was not raised as a problem in the FGDs. Second, the specialized technical assistance and cropping technology that smallholders acquired in the new sourcing structures can be easily used in food barley production. This would improve food barley productivity and hence increased food supply.

## **6. Conclusion**

A rapidly growing population and the changing food consumption patterns have led multinational food companies to increase investments in sub-Saharan Africa. Governments have been attracting FDI because foreign companies bring new technology, better organisation and financial assets. This has a positive impact on economic growth and reduction of poverty at macro level (Gohou and Soumare, 2012). However, evidence on the role of FDI in the agrifood sector at micro level is scant.

Literature on the modernization and vertical coordination of supply chains has mainly focused on export crops and high-value products (e.g. Andersson et al., 2015; Maertens and Swinnen, 2009). The objective of this chapter was to explore how foreign investment influences the structure of supply to the domestic food industry. It used the Ethiopian malt barley value chain as an illustrative case. Ethiopia has both a high population growth and

a high beer consumption growth, which makes it an attractive market for investment by foreign breweries. Many multinational breweries, such as Castle Group, Heineken, Diageo and Bavaria, have been investing in the Ethiopian brewery industry and have restructured domestic malt barley supply chains.

We show that FDI has led to the modernization in the malt barley chain, particularly to increased vertical coordination between farmers and brewers. The contracting arrangements include the provision of improved barley seeds, technical assistance and price premiums for high product quality. The actual execution of the support programs is delegated to POs and NGOs as intermediaries trusted by all parties, including local authorities. An important conclusion is that these brewery-coordinated multi-stakeholder arrangements provide both enabling factors (inputs, knowledge, and organizational support) and inducing factors (market access, quality premiums). This assures the breweries of a consistent supply of good quality malt barley. Another conclusion is that the foreign breweries understand that providing inputs, technical assistance and logistic arrangements is crucial for earning the trust of the smallholders.

Our result also shows that POs are an integral part of the sourcing structures in the modern chain. This can be partly explained by the pressure of the Ethiopian government to work with POs. However, breweries have also learned that POs can perform important functions in the supply chain, organizing the horizontal coordination that reduces the transaction costs of dealing with a large number of smallholder farmers. As the same time, these POs help farmers to strengthen their bargaining position vis-à-vis the large brewery companies.

Despite the progress made, there are challenges to be addressed in the malt barley value chains of Ethiopia. While POs and unions provide the institutional link between smallholder and breweries, they face internal governance problems and external challenges (Tefera et al., 2016a). As in many other African countries, POs are confronted with low member commitment (often leading to side selling) and heavy state interference (Bijman et al., 2016). However, the partnership with the brewery company may be an opportunity for the POs to become more independent and to operate like farmer-owned

businesses instead of state agencies. How this would change the relationship between (local) POs and the (regional) union is an empirical question still to be answered.

While the Ethiopian government has been supporting inclusive value chain development, by facilitating multi-stakeholder coalitions that can provide smallholders with credit, technical assistance, improved inputs and market information, there is still a need for improvement of public infrastructure. In addition, the efficient functioning of the malt barley market is currently undermined by a lack of unified quality standards. Introducing industry-wide minimum quality standards would lead to a more competitive and efficient market, which would favour barley producers. Finally, as the main malting factory is still state-owned, the setting up of additional private (or public-private) malting factories would improve the flexibility and competitiveness in the malt barley industry.

The results of this study were based on a limited number of cases, which poses a limitation on the rigor of the analysis and generalizability. While our case study shows how the foreign-owned breweries induce upgrading and hence change malt barley supply chains, several research questions remain unanswered. Also, as the phenomena we have studied are very recent, we cannot draw conclusions on the resilience and sustainability of the sourcing structures as yet. Longitudinal research on the dynamics in the different malt barley chains may provide further insights on structure and impact.

More generally, in the realm of the new donor approach of working with private industry, the role of NGOs in supporting development processes asks for further study. What is the new role of NGOs in the private sector dominated by new development policies? What does this mean for the internal organization and the external legitimacy of the NGOs? And, from a practical point of view, what new skills do the NGOs need to become valuable supply chain coordinators?

## Chapter 3

### **Economic impact of contracts in domestic food supply chains**

**Publication information:** Tefera D.A., Bijman J., Slingerland M.A., Van der Velde G., Omta O. Economic impact of contracts in domestic food chains: The case of malt barley in Ethiopia. *It has been submitted to a journal*

## Chapter 3

### **Economic impact of contracts in domestic food supply chains**

#### **Abstract**

Foreign direct investment facilitates modernization of domestic food chains through increased use of vertical coordination in emerging economies. In this chapter we examine the impact of contract farming arrangement (CFA) among malt barley producers in Ethiopia. We employ OLS regressions and propensity score matching techniques to analyze the impact of CFA participation on production, commercialization and prices, and malt barley incomes, and income from other crops using cross-sectional survey data. We find that CFA has positive impacts on malt barley production, intensification, commercialization, quality improvement and higher farm-gate prices, ultimately increased net income, and spillovers on productivity of other crops. Our findings imply that the introduction of CFA by multinationals can induce modernization and upgrading of domestic grain chains. To reduce the import bill and meet the rapidly growing domestic malt barley demand, promoting CFA might be an effective strategy to optimize production and productivity. While many studies investigated the impact of CFA in export supply chains, few studies exist on CFA within a domestic grain supply chains. Our study contributes to understanding of the role of CFA in modernization of domestic and staples food chains in emerging economies.

**Key words:** Contracts, Foreign investment, domestic food chains, smallholder, Sub-Saharan Africa, Ethiopia

## **1. Introduction**

Smallholder agriculture remains important for economic development in sub-Saharan Africa (SSA) and produces about 80 percent of the food consumed in the region (FAO, 2013b). In recent years, food systems in this region witnessed major changes and rapid structural transformation. The increase in urbanization, rising incomes, industrialization, a burgeoning middle class, and globalization have led to the emergence of modern supply chains, including modern food retail (Maertens and Swinnen, 2012; Minten et al., 2016; Reardon et al., 2009; Verhofstadt and Maertens, 2013). These developments have resulted in changes in the food production process, increasing vertical coordination, and dominance of food processors (Swinnen and Maertens, 2007).

Increased vertical coordination and modernization in the food chains present tremendous market opportunities for smallholders (Dries et al., 2009; McCullough et al., 2008; Verhofstadt and Maertens, 2013). However, smallholder access to modern chains and the gains they could derive from it is limited due to several constraints. Smallholders are unable to comply with the stringent standards (safety, quality and reliability) and technical requirements. They often are constrained by the lack of access to improved technology, low access to productive resources, low bargaining power, and high transaction costs (Poulton et al., 2010). Moreover, agricultural productivity is low in SSA which exacerbates smallholders market participation and food security challenges (FAO, 2013b).

As a strategy for inclusive development, emphasis has been given to contract farming as a possible solution to raising productivity and engaging smallholders in modern chains (FAO, 2013a). The recent development in food systems has witnessed a rapid expansion of contract farming (Jia and Bijman, 2014). For instance, supermarkets and processors use private quality standards and modern procurement systems which favour increased use of vertical coordination through contracting. Many scholars studied the increasing prevalence of contract farming arrangements (CFAs) in the changing food systems (Bellemare, 2015; Bijman, 2008; Minot and Sawyer, 2016; Oya, 2012; Wang et al., 2014b). Most of these studies claim that CFAs promote smallholder linkages to high-value markets and increase farm income. Yet, there is also evidence that suggests that participating in a CFA has a negative association with farm income (Michelson et al., 2012; Narayanan,

2014; Wendimu et al., 2016).

In addition, most studies have focused on supply chains of high-value products (e.g. vegetables), traditional cash crops (e.g. coffee, tea, cocoa) and industrial commodities (e.g. cotton, palm oil, and rubber) destined to international markets (Minot and Sawyer, 2016; Otsuka et al., 2016). The empirical evidence on the impact of CFAs in domestic food chains is sparse, with the exception of Maertens and Vande Velde (2017). In this chapter, we seek to fill the knowledge gap on domestic food chains by studying the implications of CFAs for the economic performance of smallholders in the malt barley sector in Ethiopia. Understanding the role of CFAs in the malt barley sector is particularly relevant because the country aims at expansion of the domestic malt barley production to cut the import bill for malt barley and to increase smallholder commercialization. The paper also discusses how foreign direct investment in developing countries - in Africa in particular - affects modernization of domestic food chains.

The overarching objective of this chapter is to analyze the impact of CFAs on production, commercialization and prices, and farmer income, within a domestic grain supply chain. In particular, we seek to address the following research questions: (i) What factors determine farmers' participation in malt barley CFAs? (ii) How do CFAs improve production, crop yield, product quality, and commercialization and prices in malt barley supply chains? and (iii) How do CFAs improve smallholder farm family income in the malt barley value chains? The study is based on cross-sectional survey data and uses parametric (OLS) and non-parametric (propensity score matching) methods to analyze the impact of CFA.

The rest of the chapter is organized as follows. The next section provides a short review of the literature on CFAs in emerging economies. In section 3 we present a brief account of the Ethiopian malt barley chain and describe the process of vertical coordination. Section 4 describes the methods including data collection and econometric models. Section 5 presents the empirical results. Section 6 discusses and puts the results into perspective. Section 7 concludes and provide policy implications.

## **2. A review of the literature**

Various empirical studies investigated the prevalence and effectiveness of CFAs in the food chains of emerging economies. We present a short review of these studies using the following perspectives: (a) the prevalence or growth in the use of CFAs, (b) which farmer participate in CFAs; (c) the welfare impacts of CFAs; and (d) the organization of the contract and the role of intermediaries. Applying New Institutional Economics, it is often argued that a CFA, as an institutional innovation, can reduce transaction costs and solve market failure problems (Kirsten et al., 2009).

The recent development in food systems of emerging economies has witnessed a rapid expansion and use of contract farming (Jia and Bijman, 2014). The expansion of high-value products, improvement in food processing, consolidation in retail markets, and increased demand for quality and food safety often cause the expansion of CFAs (Minot and Sawyer, 2016; Otsuka et al., 2016). Contract farming can be defined as “agricultural production carried out according to an agreement between farmers and a buyer which places conditions on the production and marketing of the commodity” (Minot, 1986 pp.2). Agreements are made in advance and often on the volume, quality, time of delivery, use of inputs, and the price that will be offered.

In studying the welfare implications of CFAs, it is crucial to understand which factors determine smallholders' decision to enter in a CFA. Participation in a CFA depends on a number of demographic and socio-economic factors. For instance, demographic factor such as age, gender and education, and economic factors including family labor, farm size, farmer experience and asset ownership are often used in empirical studies. Several studies conclude that the farmer's level of education has a negative effect on the likelihood of participation in a CFA (Maertens and Vande Velde, 2017; Miyata et al., 2009; Simmons et al., 2005; Wainaina et al., 2014), whereas others find a positive effect (Mishra et al., 2016). There are also studies that show that education does not determine CFA participation (Bellemare, 2012; Girma and Gardebroek, 2015). Many studies conclude that the farmer's age has a negative effect on participation in a CFA (Bellemare, 2012; Maertens and Vande Velde, 2017; Simmons et al., 2005), implying that younger farmers are more likely to join a CFA.

Several empirical studies have found that farm size positively determines farmers' participation in CFAs (Bellemare, 2012; Mishra et al., 2016), whereas other studies conclude that farm size is not an important determinant of CFA participation (Maertens and Vande Velde, 2017; Miyata et al., 2009; Wainaina et al., 2014). Thus, the empirical evidence on the effect of farm size is not conclusive (Minot and Sawyer, 2016; Otsuka et al., 2016). Access to public institutions such as extension services (Girma and Gardebroek, 2015) and credit (Ma and Abdulai, 2016b; Simmons et al., 2005) determines farmers' likelihood of participation in CFAs. Ownership of a mobile phone has also been found to affect CFA participation (Kumar et al., 2016; Mishra et al., 2016). Finally, distance to market has a positive and significant effect on CFA participation (Kumar et al., 2016; Maertens and Vande Velde, 2017), but Wainaina et al. (2014) found a negative effect.

There are numerous empirical studies on the impact of CFAs (Andersson et al., 2015; Barrett et al., 2012; Bellemare, 2012; Bolwig et al., 2009; Briones, 2015; Girma and Gardebroek, 2015; Mishra et al., 2016; Simmons et al., 2005; Wang et al., 2014a). These studies show that participating in a CFA improves the income of farmers who have chosen to participate. There is also empirical evidence on effects other than income. For example, Maertens et al. (2012) show the implications of CFAs for gender, Dedehouanou et al. (2013) show the impact of CFAs on subjective well-being in Senegal, and Minten et al. (2009) document implications of CFAs for food security and technology adoption in Madagascar. Yet, most of these studies focused on high-value products, industrial crops (e.g. cotton, palm oil), traditional cash crops, and seeds production. With the exception of Maertens and Vande Velde (2017), there are no rigorous empirical studies on the impact of CFAs in domestic grain and food value chains. Maertens and Vande Velde (2017) have studied the impact of CFAs in the Beninese rice sector, and document positive effects of CFAs on intensification of rice production, commercialization of rice, and household income.

A recent discussion in CFA literature is the role of intermediaries such as producer organizations (POs) and NGOs (Briones, 2015; Roy and Thorat, 2008; Royer et al., 2017). POs can reduce transaction costs of contracting with a large number of dispersedly-located small farms. POs can facilitate the supply of inputs to contracted farmers and improve their bargaining power as well. Contracts are often made between a processor

and the PO; a farmer must first be a member of the PO before she can enter the CFA. In such arrangements, POs ensure the quantity, quality and timely delivery of products. However, some authors have argued that POs become selective when achieving this business objective, and resource-poor farmers may be left out of membership (Bernard and Spielman, 2009; Bijman et al., 2016).

Several empirical studies in export-oriented chains found a positive effect of CFAs on the income and productivity of the contracted farmer. Minot and Sawyer (2016) conclude from their review of the literature that income effects of CFAs ranges between 25 and 75%. However, the literature falls short when it comes to CFAs in domestic grain and staple food chains. Our study seeks to fill this knowledge gap by analysing the economic impact of CFAs in the malt barley sector in Ethiopia.

Our study is particularly relevant with respect to the literature on CFAs in Ethiopia, where the development and impact of CFAs are a mixed story. First, CFAs are in the inception stage in Ethiopia. There are only a few recent studies (Abebe et al., 2013; Girma and Gardebroek, 2015), which show that CFAs improve farmer income in export-oriented chains. Second, there is also recent evidence against CFAs, as Wendimu et al. (2016) show that participation in CFAs significantly reduces farm income and asset stocks of farmers in the Ethiopian sugarcane industry.

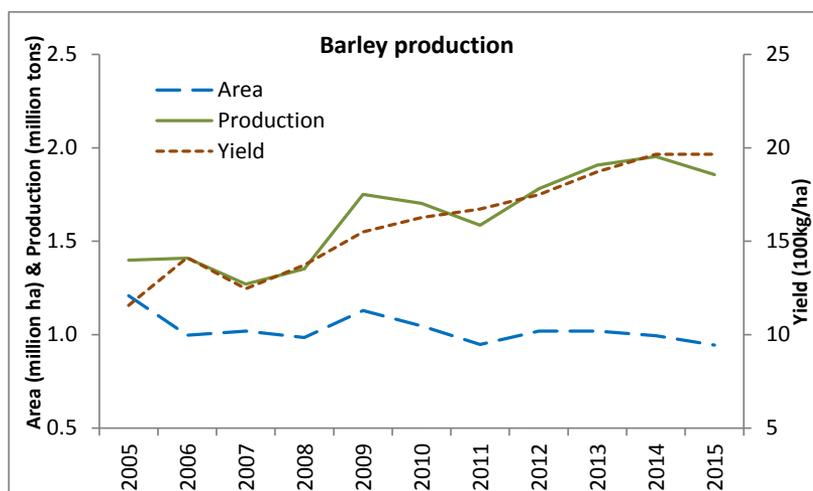
We hypothesize that CFAs assure markets for smallholder barley producers and potentially lead to improvement in farm income and productivity. We expect that farmers with contracts earn a higher income than farmers without contracts, because the buyer (brewery) introduces improved technology (e.g. improved seeds), provides key inputs and technical assistance, and facilitates logistics and coordination in the supply chain. In return buyers demand higher quality and they are willing to pay a higher price for that quality.

### **3. Background**

#### **3.1 The Ethiopian malt barely sector**

In Ethiopia, the major share of agricultural gross domestic product is contributed by the production of cereal crops. Barley (*Hordeum vulgarre L*) is one of the main cereal crops

largely grown in the highlands. It is primarily produced in Arsi highlands, North and South Gonder, and North Shewa. Ethiopia is the largest producer and consumer of barley in the African continent (Rashid et al., 2015). Barley is a smallholder crop and currently more than 4 million smallholders produce barley and derive their livelihood from the barley value chain (CSA, 2015). Nationally, two types of barley are grown: food barley and malt barley. The larger share is food barley. Between 2005 and 2015, barley production has grown from about 1.4 million tons to almost 1.9 million tons (Figure 3.1). Despite this growth, the average yield of 1.6 t/ha is significantly lower than the yield in Kenya (3.3 ton/ha) or in developed countries (6 ton/ha) (Rashid et al., 2015). The primary reason for the low productivity is the lack of access to technologies, limited usage of modern inputs, and traditional production practices. In addition, coordination failure and high transaction costs constrain malt barley commercialization (Watabaji et al., 2016b).



**Figure 3.1.** Production of barley in Ethiopia (2005-2015)

(Source: Authors' compilation based on data from FAOSTAT and CSA)

In the past five years, driven by rising income and increased urbanization, per capita beer consumption in Ethiopia has grown rapidly at an annual rate of 19 percent (ATA, 2015). This promising beer market has attracted foreign direct investment (FDI). Since 2011, several beer multinationals, including Heineken, Diageo, and Bavaria, have been investing in the Ethiopian beer industry. These breweries invest both in beer brewing and in local sourcing of malt barley. Consequently, national annual beer production is increasing rapidly at a rate of 26 percent (ATA, 2015). The fast growth in beer production has led to

an increasing demand for malt, which could not be satisfied by the Assela Malt Factory (AMF), which was the only malt factory until 2013. This publicly-owned malt production plant has an annual capacity of 36 thousand tons of malt and an annual demand of 50 thousand tons of malt barley grain.

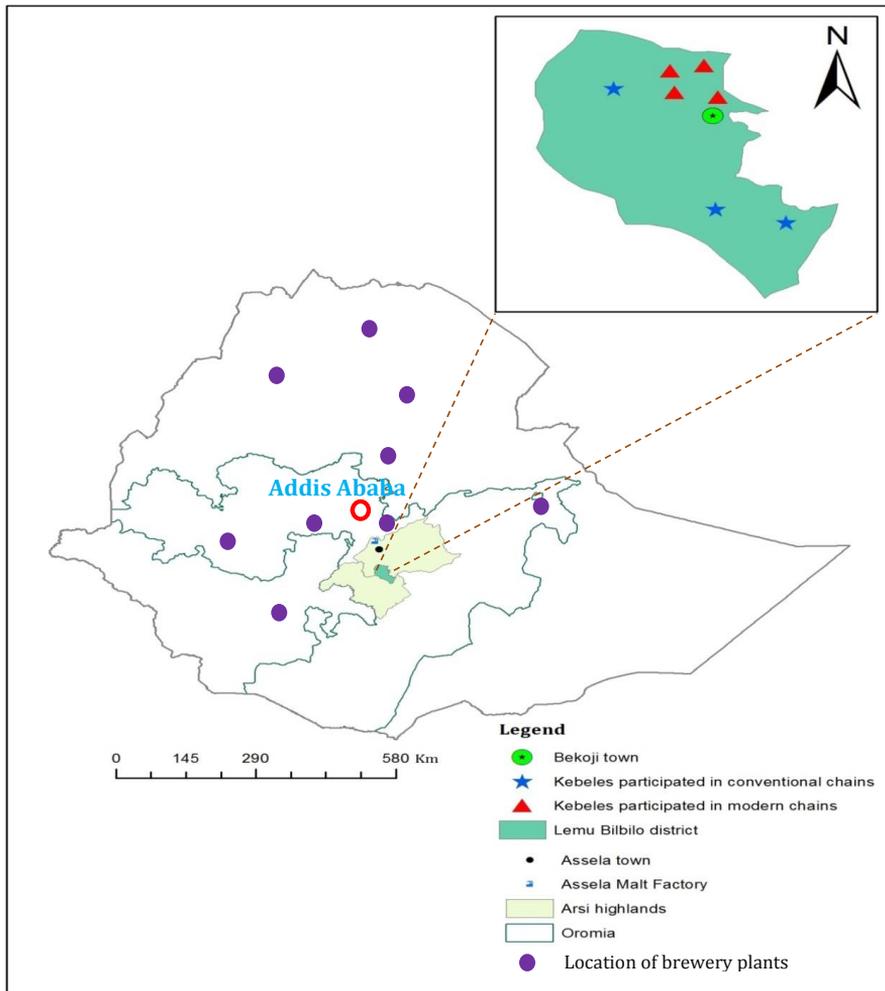
In 2013, a new processing plant, the Gonder Malt Factory (GMF), started operating. The joint capacity of the two malting factories is now 52,000 tons per year, which is still only 40 percent of the domestic demand of 130,400 tons. Hence, breweries are forced to import 60% of their malt requirements with a value of about US\$40 million (Rashid et al., 2015). Given the country's balance of payment situation, importing large volumes of malt is undesirable. Furthermore, improving productivity and commercialization of barley can have positive food security implications for millions of poor farmers (Rashid et al., 2015). The government, therefore, has launched a national plan to increase the production and commercialization of barley.

### **3.2 Foreign investment and emergence of CFAs in malt barley sector**

In this sub-section we discuss how beer multinationals organize their supply chains to source malt barley from smallholders in Ethiopia. Since 2013 malting factories and breweries have started sourcing of malt barley from smallholders using contract farming schemes. The appearance of foreign breweries in the barley chain has increased the annual demand for barley, on average at a rate of 15-20 percent (ATA, 2015). This has affected the malt barley sector by generating new market opportunities for smallholders, reducing price volatility, ensuring reliable supply chains, and cutting the import bill thus saving foreign currency for the government.

Heineken, Diageo, and AMF are engaged in the local sourcing of malt barley directly from smallholders in the Arsi highlands of Oromia, Ethiopia (Figure 3.2). We have identified two types of malt barley supply chain structures: the conventional and the modern chain. The co-existence of the conventional and modern chains has led to important changes in barley production and marketing. The conventional chain starts from smallholders selling malt barley to local traders and retailers. Transactions are governed by market prices negotiated at the spot. AMF is the dominant aggregator of malt barley from local traders. The modern chain, however, is driven by brewery companies and characterized by vertical coordination. In this chain, a strict requirement for quality and quantity is

arranged together with price premiums. Written contracts are used to safeguard these requirements. The modern chain structure is characterized by fewer intermediaries, better chain management (control of quality and quantity), and technology transfers.



**Figure 3.2.** Location of brewery plants in Ethiopia and research area

The foreign companies have organized local sourcing through public-private-partnerships (PPPs) consisting of four partners: brewery, non-government organization (NGO), PO, and government. For contracting with smallholders, foreign breweries have subcontracted NGOs (e.g., Technoserve, F&S, and Hundee) to select and organize farmers, select POs, facilitate input supply and provide technical assistance. POs play an

intermediary role through distributing modern inputs, arranging logistics, and aggregating malt barley from farmers. As part of the contractual agreement, breweries provide improved seeds, fertilizers and pesticides on pre-financing basis to smallholders. In return farmers deliver malt barley that fulfils the quality requirements of the companies. The companies pay quality-based price premiums.

## **4. Methodology**

### **4.1 Data collection**

Data were collected from the main barley-belt of Ethiopia, Arsi highlands (Figure 3.2). The Arsi highlands consist of many districts that are known for the production of barley. Among these, the district of our study, Lemu Bilbilo, is in the top three. We purposively selected Lemu Bilbilo district for three reasons: it has a high production of malt barley; it has seen the appearance of foreign breweries in the local sourcing of malt barley; and it already has multiple cases of CFAs between barley processors and farmers.

To investigate the economic impacts of CFAs in malt barley sector, we used original survey data. We conducted the survey on a total of 262 farm households in different kebeles (= villages) of Lemu Bilbilo woreda. The survey was carried out from April to May 2015, but the field study started in January. A multi-stage sampling procedure was used for the selection of a targeted sample. First, four POs with contract arrangements were selected from four different villages in the district (Figure 3.2). From this group, we randomly selected a total of 110 households. Second, a total of 152 non-contract farmers were randomly selected from three other villages in the district. These farmers could incidentally be PO-members without contract arrangements. Lists of contract and non-contract farmers were obtained from the POs and village chair persons respectively. However, in the final analysis only 258 households were used, as four questionnaires from the non-contract group were incomplete.

A structured questionnaire was prepared and carefully administered to gather household-level primary data. Well-trained enumerators were used to collect the data through face-to-face interview. Data were collected on household demographic characteristics, sources of livelihoods, conditions of food security, off-farm employment,

asset ownership, types and quantities of crops produced, sale of crops and output prices, household access to credit, markets and extension services, membership in irrigation associations and POs. Moreover, the data collected included information on types and volume of input used in malt barley production, input supply arrangements, costs of inputs (hired labor, fertilizers, pesticides and improved seeds), quality improvement practices, quality grading and post-harvest issues, malt barley prices, market outlets, and overall production and marketing challenges in the value chain.

In addition, semi-structured interviews were conducted with key informants, consisting of PO leaders, kebele heads, agricultural experts in Kulumsa research institutes, Galema union management staff, field experts and project coordinators of breweries, and head of AMF raw material supplies department, to get an in-depth understanding of contract arrangement, supply chain management, and the price negotiation process. The semi-structured interviews also helped to access information on eligibility criteria for participation in the contractual arrangements and to identify non-contract farmers.

#### **4.2 Econometric approach**

To examine the economic impact of participation in breweries CFAs, we start with a comparative analysis of contract and non-contract farmers using a series of t-tests. Then we use different techniques to measure the average impact of CFA participation. First, we apply ordinary least squares (OLS) regression, which is used in related studies (Girma and Gardebroek, 2015; Maertens and Vande Velde, 2017; Wang et al., 2014a). We estimate regression models of the following type:

$$Y_i = \alpha_i + \beta P_i + \gamma X_i + \varepsilon_i \quad (1)$$

Where  $Y_i$  measures the outcome of household  $i$ ,  $X_i$  a vector of control variables,  $P_i$  is the dummy variable for participation in CFA, and  $\varepsilon$  is the error term.  $\alpha$ ,  $\beta$  and  $\gamma$  are parameters to be estimated. We use the following nine outcome indicators and estimate the model separately for each indicator: 1) total malt barley production, measured in quintal or 100kg; 2) malt barley yield, measured in quintal per hectare; 3) malt barley selling price, measured in Ethiopian birr (ETB) per quintal; 4) cost of inputs for malt barley production, measured in ETB per hectare; 5) share of malt barley sold, measured in percentage (i.e., malt barley sold to produced ratio, calculated as malt barley sold / malt barley produced); 6) gross income from malt barley production, measured in ETB per hectare (i.e., malt

barley revenue, calculated as malt barley produced X malt barley price); 7) net income from malt barley production, measured in ETB per hectare (i.e., this is net malt barley income, calculated as the difference between gross income and malt barley-related variable costs); 8) product quality; measured in a scale (i.e., farmers stated quality on a 3-point Likert scale; ranging from 1 = low and 3= high); and 9) gross income from other crops, measured in ETB per hectare (i.e. revenue from other crops, calculated as other crops produced X selling prices). These are all continuous variables, and hence linear regression and OLS are used (Maertens and Vande Velde, 2017).

Our main variable of interest ( $P_i$ ) is a dichotomous variable for participation in a brewery CFA. Participation in a CFA is likely not randomly distributed among malt barley farmers; hence we include a large set of observable farm and farmer characteristics,  $X_i$ . The vector  $X_i$  includes various covariates selected based on theory and previous studies (see section 2). We include the following covariates: age and education of the household head, family available labor, number of people in the household, land and livestock ownership, malt barley cultivated area, farming experience, proportion of off-farm income (as proxy for off-farm employment), distance to markets, mobile phone ownership, credit received from microfinance, and extension contact. We provide a detailed description of these variables in Table 3.1.

Second, we apply propensity score matching (PSM) to control potential selection bias and estimate an average treatment effect of CFA participation (Rosenbaum and Rubin, 1983). PSM reduces the selection bias through employing counterfactuals that control all other factors but treatment. The essential mechanism of PSM is to find comparison groups (non-contracted farmers) that are similar to the treated in all relevant pre-treatment characteristics. First, a logit model is estimated with the binary treatment variable (CFA status of the farmer) as selection variable, conditional on the baseline characteristics of both the treatment (contracted) and the comparison group (non-contracted). From this, propensity scores, i.e., the conditional probability of assignment to a treatment given their baseline characteristics, are predicted. In the logit model, we used the above mentioned covariates. Second, two balanced groups are created based on their estimated propensity scores for final comparison.

Following Caliendo and Kopeinig (2008), let  $W_i$  be a binary treatment variable that equals one if a farmer participates in a CFA, and zero otherwise. The potential outcomes of the CFA are represented by  $(W_i)$  for each household  $i$ . The average treatment effect on the treated (ATT) is expressed as:

$$\tau_{ATT} = E(\tau | W = 1) = E[Y(1) | W = 1] - E[Y(0) | W = 1] \quad (2)$$

Where  $E[Y(1) | W = 1]$  is the expected outcome value for contracted farmers;  $E[Y(0) | W = 1]$  is the expected outcome value for contracted farmers if they had not been contracted.  $E[Y(0) | W = 1]$  is the counterfactual and not-observed, as we need a proper substitute to estimate ATT. In this case, PSM helps to construct the counterfactual from the non-contracted farmers. In doing so we invoke the conditional independence assumption (CIA) and the common support assumption to control the selection bias problem (Caliendo and Kopeinig, 2008). The non-confoundedness assumption (i.e., CIA) ensures that selection into treatment is only based on observable covariates, which is a strong assumption. We address this assumption using the bounding approach (Rosenbaum, 2002). The common support condition ensures that farmers with similar observable covariates have a positive probability of being both participant and non-participant (Caliendo and Kopeinig, 2008). We check this assumption using balancing properties and a density distribution histogram. If CIA holds and there is overlap between contract and non-contract groups, the PSM estimator for  $\tau_{ATT}$  is given as:

$$\tau_{ATT}^{PSM} = E_{p(x)|W=1}\{E[Y(1) | W = 1, p(x)] - E[Y(0) | W = 0, p(x)]\} \quad (3)$$

Where  $p(x)$  is the predicted propensity score from the logit model. We used different methods to match similar contract and non-contract farmers. We apply nearest neighbor matching (NNM), radius matching (RM), and kernel-based matching (KBM) as the main ATT estimation methods (Becker and Ichino, 2002; Caliendo and Kopeinig, 2008). In the NNM, each treated farmer is matched with a comparable farmer that has the closest propensity score. But in case of KBM, a treated farmer is matched with a weighted average of all controls, using weights that are inversely proportional to the distance between the propensity scores of treated and control groups. This indicates that KBM uses more

information. In the RM, information is used only from the nearest neighbor within the caliper distance.

The PSM method is usually built on a strong assumption that observable characteristics determine selection to treatment and control groups (i.e. CIA). Thus, matching estimators are often prone to selection bias. We used the inverse-probability-weighted-regression-adjustment estimator (IPWRA) to further check the robustness of treatment effect estimates. IPWRA provides efficient estimates by allowing the modelling of both the outcome and the treatment equations (StataCorp, 2017). This allows us to control for selection bias at both the treatment and outcome stages. Thus, the IPWRA estimator has the double-robust property, which means that only one of the two models is correctly specified to consistently estimate the impact (Bang and Robins, 2005; StataCorp, 2017). One could say that regression adjustment (RA) concentrates on outcomes and inverse probability weight (IPW) focuses more on treatment in calculating treatment effects. IPWRA estimators use probability weights to obtain outcome regression parameters and the adjusted outcome regression parameters are used to compute averages of treatment-level predicted outcomes. The IPWRA method is recently used by Kebebe and Shibru (2017) in the evaluation of livelihood interventions in Ethiopia.

## **5. Empirical results**

This section presents the findings of the study in three parts. First, we present the results on how contract farms are different from non-contract farms, based on comparative statistics. Then, we present the results on the determinants of farmers' participation in CFAs. Finally, we present the results of propensity score matching for examining the impact of CFAs.

### **5.1 Comparison of contract and non-contract farmers**

#### *Farm characteristics*

In Table 3.1, we present summary statistics for contract and non-contract farmers. Contract farmers are, on average, more educated than non-contract farmers. Contract and non-contract farmers are also significantly different in access to a mobile phone, access to extension services, access to savings, access to credit, and PO membership. In addition, the mean distance to the market was lower among the contract farmers. All contract

farmers are member of a PO; which reflects the fact that organizing themselves in groups is a precondition for engaging in the CFA.

**Table 3.1.** Characteristics of contract and non-contract malt barley farmers

Variables	Description	Full sample	Contract	Non-contract	Diff.
<b>Socioeconomic characteristics</b>					
Age	Household head (HH) age in years	44.32	44.55	44.16	0.39
Family size	Number of people in the household	6.35	6.21	6.45	-0.24
Family active labor	Family members 15-65 years age	3.87	3.81	3.91	-0.1
Education	HH education level in years	5.14	5.96	4.54	1.42***
Off-farm income	HH share of off-farm income (%)	4.51	3.18	5.51	-2.32*
Innovativeness	HH innovativeness in farm business <sup>a</sup>	3.30	4.06	2.73	1.33***
Entrepreneurship	HH entrepreneurial skills <sup>a</sup>	3.13	3.77	2.66	1.10***
Mobile ownership	HH mobile phone ownership(0-1)	0.70	0.81	0.62	0.19***
<b>Malt barley cultivation</b>					
Farm size	HH landholding size in hectare	2.75	2.70	2.79	-0.09
Malt barley area	MB cultivated area in hectare	0.74	0.79	0.69	0.10
Experience	MB farming experience in years	20.29	20.69	20.0	0.69
Total livestock	Total livestock ownership in TLU <sup>b</sup>	11.09	14.45	8.59	5.85
<b>Access to public institutions</b>					
Savings	HH saving in last 12 months(0-1)	0.59	0.74	0.48	0.25***
Extension contact	HH access to extension service(0-1)	0.53	0.67	0.42	0.24***
Access to credit	HH credit from Microfinance(0-1)	0.14	0.20	0.09	0.10***
Distance to market	Distance to market(km) (1way walk)	7.93	5.59	9.67	-4.08***
<b>Access to collective institution</b>					
Iddir member	HH membership to Iddir in year	19.37	19.81	19.04	0.77
PO membership	HH membership to POs(0-1)	0.72	1.00	0.52	0.47***
Debo member	HH membership to Debo in year	20.09	20.62	19.66	0.96
<b>Outcome indicators</b>					
Total production	HH MB production in quintal	14.17	17.10	11.99	5.10***
Yield	Malt barley yield (qt/ha)	20.03	21.67	18.80	2.87***
Price	Malt barley selling price (ETB/qt)	906	1013	829	184***
Share sold	Malt barley sold to produced ratio	0.59	0.71	0.51	0.21***
Cost	Cost of MB production (ETB/ha)	4442	4803	3994	809***
Product quality	HH stated MB quality (scale1-3)	2.39	2.80	2.08	0.71***
Gross income	Malt barley gross income (ETB/ha)	18346	22177	15576	6601***
Net income	Malt barley net income (ETB/ha)	13604	15532	10990	4542***
Other crop income	Income from food crops (ETB/ha)	9952	13653	7202	6452***
N		258	110	148	258

Source: Field survey, 2015; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10; note: a = Likert scale variables with 5 scales; b = tropical livestock unit to describe livestock numbers of various species as a single unit.

### *Economics of malt barley production*

Production is one of the core processes in malt barley supply chains. Smallholders use various inputs to produce malt barley. The main inputs include fertilizers, pesticides and improved seeds. Farmers have access to improved seeds from buyers (i.e., breweries) and other sources. Another input category is labor, whereby farmers mostly use family labor

and some additional hired labor during the peak farming season. Table 3.1 presents the mean comparison of the various outcome indicators. On average, contract farmers produce more malt barley (17qt) than the non-contract farmers (12qt). The average yield is also 15% higher than non-contract farmers. Contract farmers receive a 22% higher average price and commercialize on average 21% point more of their malt barley production than non-contract farmers. In addition, contract farmers have a 20% higher average cost of production per ha than non-contract farmers. Finally, farmers participating in CFAs obtain on average 42% and 41% higher malt barley gross income and net incomes per ha respectively than those who do not participate.

## **5.2 Factors determining CFA participation**

A farmer's decision to participate in a CFA could be conditioned by demographic variables, socio-economic characteristics, and access to productive assets. We used a logit model to estimate the parameters. Specific variables were selected based on theory and previous empirical research. We used 13 covariates to determine the likelihood of farmers' participation in CFAs (Table 3.2). From the selected covariates six were significant in influencing a farmer's decision to enter a CFA. These are education level, off-farm income, distance to markets, having a mobile telephone, access to public extension service, and receiving microfinance credit. All these covariates positively affect the probability of farmers' participation in CFAs except off-farm income and distance to markets.

The results show that education of the household head has a positive and significant influence on participation of CFA. This is because education facilitates managerial capacity, farmers' ability to make informed decision, and compliance with quality requirements. Having a mobile phone increased farmers' likelihood to participate in a CFA by enhancing access to information and effective communication. Farmers having received credit from rural microfinance institutes are more likely to participate in a CFA. Results further show that access to government extension systems is positively correlated to CFA participation, while off-farm income is negatively correlated. Our results also show that distance to markets negatively influences the likelihood of CFA participation. This is plausible as companies prefer farms near the road or market centre for logistic reasons and reduction of transaction costs in monitoring and provision of technical assistance.

**Table 3.2.** Determinants of farmers' decision to participate in CFA

CFA Participation	Coefficient	Std. Error	z	P >  z
Age	-0.006	0.036	-0.18	0.855
Family size	-0.004	0.116	-0.04	0.968
Family active labor	-0.086	0.182	-0.48	0.634
Education	0.144	0.058	2.48	0.013**
Farm size	0.008	0.110	0.07	0.942
Malt barley area	0.331	0.313	1.06	0.290
Farming experience	0.051	0.033	1.51	0.130
Total livestock	0.006	0.013	0.47	0.638
Share of off-farm income	-0.041	0.019	-2.16	0.031**
Distance to markets	-0.392	0.067	-5.82	0.000***
Mobile ownership	1.287	0.441	2.91	0.004***
Credit received from microfinance	1.283	0.499	2.57	0.010***
Extension contact	1.179	0.347	3.40	0.001***
_cons	-0.589	1.352	-0.44	0.663
<i>Summary statistics</i>				
Pseudo R <sup>2</sup> = 0.359	Percentage of correct prediction = 77.95%			
Model $\chi^2$ = 124.65***	Number of observations = 254			
Log likelihood = -110.883				

Source: Field survey, 2015; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10

Finally, variables representing access to productive assets such as available family labor, farm size, malt barley area and total livestock, did not affect farmers' decisions to participate in CFAs. This implies that small or large farms can participate in the contract regardless the size of their productive assets. Though not included in the model, membership to a PO is a pre-requisite to breweries' CFAs. Based on the pseudo-R<sup>2</sup> (0.359), which is high and significant at 1% level, the covariates clearly explained the participation probability. In addition, the model indicates that 78% of the sample observations are correctly predicted.

### 5.3 Impact of smallholder participation in CFA

#### *Estimating propensity scores*

We estimated the propensity scores for the contract and non-contract farmers using the logit model. The magnitude of the propensity score ranges between 0 and 1; the higher the score, the more likely that the farmer would participate in CFA. The predicted propensity scores for contract farmers range from 0.030 to 0.990 with a mean of 0.660 and from 0.001 to 0.926 for non-contract farmers with a mean of 0.246. Based on these predicted propensity scores, we test the common support assumption. Thus, using the rules of minima-maxima (Caliendo and Kopeinig, 2008), the common support assumption is satisfied in the region of 0.030 – 0.926. The common support region is also examined using the density distribution for the two groups of treated (contract) and untreated (non-contract) (Figure A1 in Appendix A: line graphs and histogram). The overlap in the

distribution of the propensity scores for contract and non-contract farmers is also visually checked: the result suggests that there is a high chance of obtaining good matches.

#### *Estimating contract effects (ATT)*

We then estimate the average treatment effects on the treated (ATT), which is the mean impact that participation in CFA has on malt barley farmers along a number of outcome variables. The result for PSM estimates (NNM, KBM and RM) are presented in Table 3.3. We also included the summary of results from OLS and the naive t-test. We found positive and significant impact of participation in CFAs on all the selected outcome indicators. We find that results are quite robust, with the same signs and significance levels and comparable point estimates among the different matching algorithms. The results from the OLS regression analysis and PSM are also comparable, indicating the robustness of our results. The full regression results are presented in Table A4 in Appendix A.

#### *(a) Malt barley production*

We find that CFAs result in a significantly larger malt barley production (Table 3.3). Participation in a CFA increases production with about 5 quintals, which is an increase of 36% compared with the average malt barley production in Arsi highlands. This could be associated with improved access to modern inputs and technical assistance. Though not significant, malt barley cultivated area is also expanded by 0.10, which is 14% of the average malt barley area in the research area.

#### *(b) Malt barley yield, quality and intensification*

We find that CFAs lead to using more inputs per ha in malt barley production, which is evidenced by a higher variable cost per ha (Table 3.3) and higher quantity of fertilizers (Table A1 in Appendix A). We also find that CFAs lead to larger malt barley yields and higher quality. On average, a CFA increases input costs with about 828 ETB per ha, which is an increase of 19% compared with the average input costs per ha in the research area. Yields are found to increase with 2.54 quintal per ha or 13% in comparison with the average yield in the Arsi highlands, as a result of participation in CFA. The results also show that CFAs increase the quality of malt barley grown by contract farmers by an average of 31% as compared to the sample average. Higher yield, quality, and variable costs of production would lead to higher malt barley net income.

(c) *Malt barley commercialization*

Our results reveal that participation in a CFA positively influences smallholders' commercialization in the malt barley sector. We find that participation in a CFA leads to an increase in the share of produced malt barley that is commercialized and a higher farm-gate price. The share of malt barley that is commercialized is significantly higher for those with contract, on average 17% points. The price is significantly higher for those with a contract, on average 197 ETB per quintal. CFA increases the average price farmer receive for their malt barley with 22% compared with the sample average in the study area. The effect on farm-gate prices is most likely associated with improved quality.

**Table 3.3.** Average estimated effects of participation in CFAs

Outcome indicators	Naive t-test	OLS	PSM			Critical level of hidden bias ( $\Gamma$ )
			NNM	KBM	RM	
Production	5.1*** (1.38)	2.84*** (0.900)	5.37** (2.42)	5.09** (2.63)	5.47** (2.52)	1.6 – 1.7
	2.86*** (0.8)	2.30** (0.991)	2.40* (1.45)	2.38* (1.38)	2.76** (1.33)	1.4 – 1.5
Yield	184*** (10)	190*** (11.61)	206*** (22.72)	198*** (23)	207*** (22)	3.0 – 3.1
	0.21*** (0.033)	0.14*** (0.04)	0.17** (0.072)	0.16** (0.067)	0.16** (0.065)	2.4 – 2.5
Share sold	809*** (71)	799*** (96)	839*** (101)	845*** (143)	850*** (135)	3.0 – 3.1
	6601*** (785)	6265*** (995)	7350*** (1358)	7101*** (1342)	7223*** (1306)	3.0 – 3.1
Gross income	4542*** (1027)	3577*** (1416)	3864* (2062)	5004** (2505)	4502** (2046)	2.8 – 2.9
	0.71*** (06)	0.63*** (0.082)	0.78*** (09)	0.78*** (12)	0.78*** (11)	3.0 – 3.1
Product quality	6452*** (1615)	5603*** (2047)	6974** (2932)	7168** (2688)	6534** (2602)	1.5 – 1.6

Source: Field survey, 2015; Standard errors in parentheses; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10

(d) *Income*

We find that participation in a CFA has a positive effects on farm family income. We find that a CFA leads to a higher malt barley gross income and net income, on average 6908 and 4298 ETB per ha respectively. These are crucial effects, which implies that participation in a CFA increases malt barley gross income and net income by 38% and 31% respectively in comparison with the sample average. Our results also reveal that CFA participation leads to increase in other crops gross income, on average 6546 ETB per ha. This implies that participation in a CFA increases farmer's income from other crops production with 66% compared with the sample average. This could be associated with technical and managerial spillover effects of the CFA on the farm in general. Thus, there

may be significant spillover from CFAs on the production of other food crops such as food barley and wheat, farmer's major staple in research area, probably due to modern inputs usage.

#### *Robustness and assessing matching quality*

For examining the quality of the matching process we conducted two tests. First, on the observable factors, the credibility of the PSM procedure is evaluated using the covariates balancing test (Tables A2 and A3 in Appendix A). Using pseudo-R<sup>2</sup> values we assessed the extent of systematic differences in covariates between contract and non-contract farmers after matching. Our result show that the pseudo-R<sup>2</sup> reduced from 0.241 before matching to a range of 0.07-0.08 after matching (Table A3 in Appendix A). This fairly low value indicates that after matching there was no systematic difference in the distribution of covariates between the two groups. The chi-square test for Pseudo-R<sup>2</sup> is also insignificant after matching. Thus, the matching process is successful regarding balancing distribution of covariates between contract and non-contract farmers.

Second, we assessed the sensitivity of ATT estimates to unobserved heterogeneity or hidden bias. In the PSM technique, selection to treatment is only based on observed characteristics, and it does not control for hidden bias due to unobserved factors (Caliendo and Kopeinig, 2008). Heterogeneity may arise when contract and non-contract farmers differ on unobserved variables that simultaneously influence assignment to treatment and the outcome variable. We checked this using the bounding approach (Rosenbaum, 2002). This method relies on the sensitivity parameter gamma (log-odds ratio) that determines how strong an unobservable variable must be to influence the selection process so as to bias the results (DiPrete and Gangl, 2004). Following DiPrete and Gangl (2004) and Girma and Gardebroek (2015), we consider various critical gamma value levels. We reported the results of rbound-tests in Table 3.3 last column. It indicates that the estimates of ATT are robust to hidden bias due to unobserved factors, even to the extent that would triple ( $\Gamma = 3$ ) log odds of differential assignment to treatment. For the outcome indicators production, yield and other crops income, the critical level of gamma at which we would have to question our positive causal inference is between 1.6 and 1.7, 1.4 and 1.5, and 1.5 and 1.6 respectively (Table 3.3).

Finally, we also assess the robustness of NNM, KBM, and RM results by comparing to the results of a doubly robust inverse-probability-weighted-regression-adjustment (IPWRA)

estimator. The results for IPWRA estimator are presented in Table 3.4. The IPWRA approach produces almost similar results as the estimates in Table 3.3.

**Table 3.4.** ATT using Inverse-Probability-Weighted Regression Adjustment (IPWRA)

Outcome indicators	Mean outcome		Difference (ATT)	% change
	Contract	Non-contract		
Total production	14.52	12.57	4.29*** (1.25)	34.12
Yield	19.41	18.75	3.34*** (0.98)	17.81
Price	993	822	208*** (22.7)	25.36
Share sold	0.66	0.52	0.18*** (0.06)	34.61
Cost	4702	3920	946*** (84)	24.13
Gross income	19604	15312	7743*** (696)	53.56
Net income	13009	10755	4829*** (1317)	45.01
Product quality	2.5	2.07	0.83*** (0.099)	40.09
Other crops income	11809	7575	4811** (2112)	63.51

Source: Field survey, 2015; Standard errors in parentheses; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10

## 6. Discussion

The literature on CFAs in emerging economies shows a debate on whether CFAs improve smallholders' income and production efficiency. Several empirical studies document a positive impact of CFAs, focusing on high value chains (Abebe et al., 2013; Andersson et al., 2015; Bolwig et al., 2009; Kariuki and Loy, 2016; Roy and Thorat, 2008; Wang et al., 2014a). There is, however, also evidence that CFAs have negative income effects (Narayanan, 2014; Wendimu et al., 2016). In addition, CFAs are criticized for favoring large-sized farms at the expense of smallholders. It is claimed that CFA excludes the participation of resource-poor farmers (Otsuka et al., 2016; Weatherspoon and Reardon, 2003).

On the effectiveness of CFA, the results of our study are in agreement with earlier findings about the positive impact of CFA on farmers' income. Our findings demonstrates that CFA participation has a positive impact on our performance indicators: malt barley production, yield, intensification, quality, share sold, farm gate price, malt barley income and other crops income. Contract farmers achieved better performance in all of these indicators. For example, a CFA increases malt barley production with 36%, yield with 13%,

input costs with 19%, farm-gate prices with 22%, and net income with 31% compared with sample average. Our result is consistent with CFA literature both in high-value chains and domestic food chains (Maertens and Vande Velde, 2017; Mishra et al., 2016; Wang et al., 2014a). This strong positive outcome is attributed to the improved technologies, technical assistance, and coordination introduced in the malt barley supply chain.

Foreign breweries introduced quality-based pricing and the use of a grading system in the chain, which resulted in quality improvement. For instance, CFA increases the farm gate prices that farmer receive with 22% compared with the sample average. Our finding is in line with the result from Maertens and Vande Velde (2017) that rice contract farming in Benin increases farm-gate prices with 11% and from Miyata et al. (2009) that vegetable contract farming for supermarket in China increases farm-gate prices with 8%. Foreign breweries are investing in the supply chain to ensure reliable local supply and consistent malt barley quality e.g. by coordinating supply chain activities in different stages of the chain with the support of NGOs and POs. This has brought dynamism in malt barley production and distribution processes, and has led to more coordinated chains. By investing in local sourcing of malt barley, breweries can reduce the high cost of import, manage price volatility, and show their corporate social responsibility.

On the determinants of CFA participation, our findings show mixed evidence. Contrary to the results of Wainaina et al. (2014), we have found a positive relationship between household education and the likelihood of participation in CFA. Similar positive effects of education on CFA participation have been reported for ginger farmers in Nepal (Kumar et al., 2016) and avocado farmers in Kenya (Mwambi et al., 2016). Education as indicator of human capital enables households to understand information and take decisions on modern technologies and quality issues. It may also lead to more entrepreneurship and increased aspiration about the future of households' farming business. However, Girma and Gardebroek (2015) and Miyata et al. (2009) have reported that education has no significant effect and a negative effect on CFA participation in Ethiopia and China, respectively.

Our results also revealed that having a mobile phone, access to credit and access to public extension services are positively related with participation of CFAs. With regard to a mobile phone, similar results have been reported by Mishra et al. (2016) and Kumar et al. (2016). Our result is also in line with the findings reported by Ma and Abdulai (2016b)

and Mwambi et al. (2016), who show a positive relationship between access to credit and CFA participation. However, Wainaina et al. (2014) report that access to credit has no significant effect on participation. In addition, Kariuki and Loy (2016) and Girma and Gardebreek (2015) have been reporting that extension services positively and significantly influence CFA participation. Contrary to this, Wainaina et al. (2014) have reported that access to extension services is negatively related with CFA participation.

The positive association between access to credit and CFA participation could be explained by farmers who are able to access credit, tending to invest in the production of malt barley that meets the buyer's quality requirements, which can then earn them premium prices. Extension service as an important determinant could be explained by households who have better extension contacts, being in a better position to access useful information regarding benefits of modern agricultural technologies and marketing schemes, including CFAs.

Furthermore, we find that distance to the markets and off-farm income negatively relate with CFA participation. Similar results have been reported by Miyata et al. (2009) for apple farmers in China, Wainaina et al. (2014) for poultry farmers in Kenya, and Mwambi et al. (2016) for avocado farmers in Kenya. The pattern observed could be explained by breweries preferring to work with nearby farmers for reasons of logistics, monitoring, provision of technical assistance and farm visits. Thus, a larger distance to the main road (or market) increases the transaction cost of sourcing malt barley from smallholders. Contrary to this, Maertens and Vande Velde (2017) have reported a positive effect of distance to market on the likelihood of farmers' participation in rice CFA in Benin. Our results also show that off-farm income negatively influence the likelihood of participation in CFAs. This may be explained by smallholders specialized in farming (less off-farm activities) being more likely to join in CFAs. However, Azumah et al. (2016) and Wainaina et al. (2014) report that the likelihood of CFA participation increases with off-farm income. They argue that farmers' access to finance from off-farm activities improves their ability to buy basic inputs and increases the probability of CFA participation.

## **7. Conclusion**

The chapter is an original contribution to the few empirical studies analysing the impact of CFAs within domestic (staple) food chains using robust econometric methods, with

correction of selection biases. The paper examined the factors that influence farmers' decision to participate in a CFA, as well as the impact of CFA participation on intensification of production, commercialization and prices, and farmer income in malt barley chains of Ethiopia. The study utilized cross-sectional survey data of malt barley farmers collected from the Arsi highlands of Ethiopia.

We show that foreign direct investment has led to the modernization in the malt barley chain, particularly to increased vertical coordination between farmers and breweries. An important conclusion is that these brewery-coordinated multi-stakeholder arrangements provide both enabling factors (inputs, knowledge, and organizational support) and inducing factors (market access, quality premiums). This assures the breweries of a consistent supply of good quality malt barley. Another conclusion is that the foreign breweries understand that providing inputs, technical assistance and logistic arrangements is crucial for earning the trust of the smallholders.

Our empirical findings demonstrate the positive impacts of CFAs on all selected outcome indicators. We find that CFAs result in intensification of malt barley production, increased commercialization of malt barley, higher farm-gate prices, increased net malt barley income, and higher income from other crops. Our estimated results are robust, consistent across different matching methods and OLS regression. Our findings imply that CFA in a value chain context lead to higher smallholder farm income. In addition, promoting CFAs and its interlinkage with POs might be an effective way to increase smallholder commercialization, intensification of barley production, and quality improvement in the value chain. Previous studies on the impact of CFAs mainly focused on high-value and export oriented chains, while studies on domestic and staple food chains are few. Our study, thus, contributes to the agribusiness and development literature through providing empirical evidence on CFAs in domestic food chains.

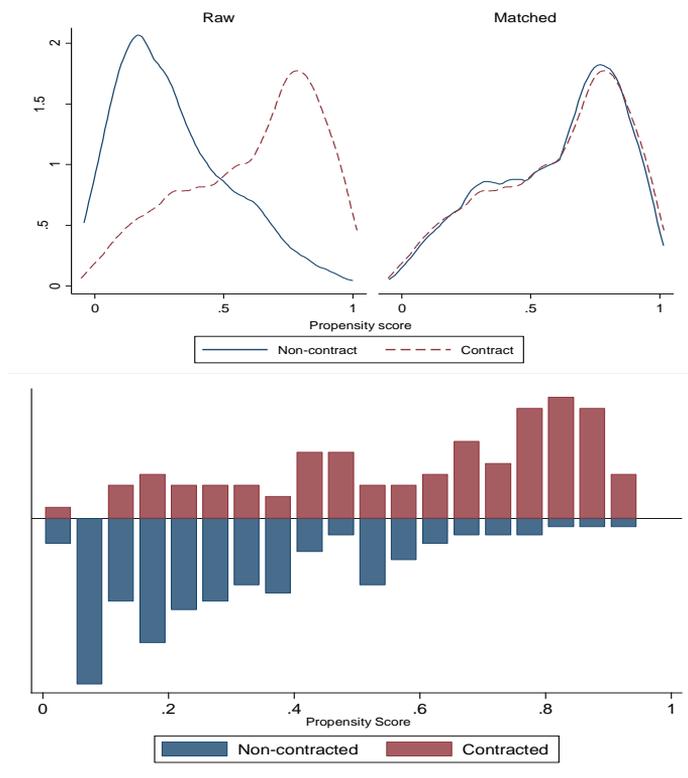
Consistent with literature our results reveal that contracting in domestic and local food chains can be beneficial for smallholder producers. This seems against the expectations, as expressed Maertens and Vande Velde (2017), that contracting in domestic food chains is feasible due to contract-enforcement problems that stem from a low value of produce and a large number of buyers in the chain. Three arguments could be forwarded why CFA works in barley value chains: First, low side-selling could be related to a high premium

price of 22% that contract farmers received. Second, involvement of a PO may have a positive impact on the sustainability of the CFA. Third, linked to the new development paradigm - *from aid- to- trade* – the role of NGOs has changed towards subcontracting supply chain activities.

The findings have several important implications for policymakers and stakeholders involved in the transformation and development of food systems. The study contributes empirical evidence on how multinationals influence upgrading of food chains and smallholder commercialization in rural Africa. It also indicates that supporting CFAs in the malt barley chains is an effective way to contribute to reaching the government aim of expansion and intensification of malt barley production and quality upgrading. Public support on capacity building of POs also helps for smallholder linkages to modern chains and the smooth functioning of contract arrangements. This could help to extend benefits of the brewery supply chain model to a larger share of poor farmers in different regions of Ethiopia. Another major constraint for the expansion of contract production is the poor condition of the physical infrastructure such as the lack of all-season roads. The brewery companies only have contracts with POs close to the woreda towns (within a 6km radius). Thus, the government should invest in building infrastructure so that farmers in remote areas can be included.

Our findings encourage further research on the following issues. First, it would be worthwhile to conduct similar analyses with a larger sample size in different regions of the same country and in other countries in East Africa. Second, further research is required in the impact of CFAs on food security, using longitudinal data. Third, it would be worthwhile to carry out a within-country comparison of impact of CFAs in staples food chains and export-oriented chains. In particular, the research should focus on contract attributes (organization) in the two distinct chain structures and the implications on key actors including smallholders.

## Appendix A



**Figure A1.** Propensity score distribution and common support (before and after matching)

**Table A1.** Effect of CFA on intensification

Indicators of intensity	Contract	Non-contract	t-stat	Sig.
Improved seeds (0-1)	1.0	0.39	13.2	***
Quantity of fertilize-DAP(qt)	2.6	1.6	4.24	***
Quantity of fertilizer-NPS(qt)	1.96	1.65	1.09	
Quantity of fertilizer-Urea(qt)	0.48	0.45	0.41	
Cost of seed (ETB/ ha)	1245	799	44.62	***
Cost of fertilizer (ETB/ha)	1307	1280	5.94	***
Cost of weeding (ETB/ha)	620	380	12.75	***
Cost of harvesting(ETB/ha)	709	571	4.04	***
Total variable costs (ETB/ha)	4803	3994	11.33	***

Source: field survey, 2015; \*\*\* significant at 1% level

**Table A2.** *t*-tests for equality of means for each variable before and after the match

Variable	Sample	Mean		% bias	% reduction (bias)	t-test p>  t
		Contract	Non-contract			
Age head	Unmatched	44.39	43.692	6.1		0.667
	Matched	44.39	43.107	11.1	- 83.0	0.473
Family size	Unmatched	6	6.359	-14.3		0.318
	Matched	6	5.747	10.0	29.7	0.463
Working labor	Unmatched	3.59	3.837	-13.7		0.340
	Matched	3.59	3.447	8.0	42.0	0.550
Education head	Unmatched	5.79	4.837	23.9		0.057
	Matched	5.79	6.117	-10.7	60.2	0.446
Farm size	Unmatched	2.64	2.859	-9.5		0.514
	Matched	2.64	2.802	-7.0	26.1	0.607
Malt barley area	Unmatched	0.75	0.735	1.9		0.898
	Matched	0.75	0.648	15.1	- 711.3	0.297
Farming experience	Unmatched	22.99	21.650	11.1		0.432
	Matched	22.99	22.047	7.8	29.7	0.620
Total livestock	Unmatched	9.06	8.849	2.4		0.868
	Matched	9.06	8.674	4.4	- 82.9	0.768
Off-farm income	Unmatched	3.24	5.299	-21.1		0.144
	Matched	3.24	2.719	5.3	74.8	0.670
Distance to market	Unmatched	6.18	8.170	-67.9		0.000
	Matched	6.18	7.145	-33.0	51.4	0.011
Mobile ownership	Unmatched	0.81	0.675	30.2		0.035
	Matched	0.81	0.862	-12.8	57.7	0.323
Access to credit	Unmatched	0.17	0.094	22.6		0.105
	Matched	0.17	0.352	-53.7	- 137.6	0.006
Extension contact	Unmatched	0.61	0.427	37.8		0.008
	Matched	0.61	0.574	7.9	79.2	0.603

**Table A3.** Matching quality test: balancing property

	Before matching	After matching (algorithms)		
		NNM*	KBM	RM
Pseudo-R <sup>2</sup>	0.241	0.073	0.081	0.080
LR $\chi^2$	67.59	17.3	19.1	18.9
P-value	0.000	0.188	0.120	0.127
Mean bias	20.4	14.1	14.5	15.1
Median bias	14.3	11.6	9.0	12.1

Note: \* seven nearest is used

**Table A4.** Full OLS regression results

Variable	Production	Yield	Price	Share sold	Cost	Gross income	Net income	Product quality	Other crops income
Contract	<b>2.84***</b> (0.900)	<b>2.30**</b> (0.991)	<b>190.26***</b> (11.61)	<b>0.14***</b> (0.04)	<b>798.94***</b> (96.44)	<b>6264.59***</b> (994.56)	<b>3577.2***</b> (1416.3)	<b>0.63***</b> (0.082)	<b>5602.78***</b> (2047.15)
Age	-0.131* (0.076)	-0.15* (0.084)	0.493 (0.971)	0.003 (0.003)	-7.038 (7.93)	-138.32* (83.22)	-177.81 (115.02)	0.008 (0.007)	-55.36 (173.22)
Family size	-0.165 (0.241)	-0.173 (0.265)	3.18 (3.104)	-0.014 (0.1)	25 (24.449)	-160.87 (265.87)	-62.63 (352.58)	-0.006 (0.022)	236.09 (548.67)
Active labor	0.773** (0.361)	0.66* (0.397)	-3.30 (4.60)	-0.006 (0.016)	-10.45 (34.80)	602.50 (394.18)	606.8 (498.61)	0.035 (0.033)	36.12 (820.79)
Education	0.33*** (0.119)	0.39*** (0.131)	1.46 (1.55)	0.008 (0.005)	13.58 (132.88)	409.43*** (132.88)	532.87*** (174.203)	0.013 (0.011)	239.01 (271.25)
Farm size	-0.12 (0.228)	0.054 (0.251)	-1.93 (2.91)	0.005 (0.01)	24.566 (20.72)	32.13 (249.12)	35.41 (299.69)	-0.023 (0.021)	982.52* (518.70)
Malt barley area	15*** (0.637)	-1.78*** (0.702)	37.76*** (8.12)	-0.14*** (0.028)	184.72*** (55.46)	-1031.37 (698.59)	-1260.84 (789.8)	0.167*** (0.058)	-4616.65*** (1448.54)
Off-farm income	0.065* (0.037)	0.065 (0.042)	0.22 (0.48)	-0.001 (0.001)	5.57 (4.09)	62.77 (41.37)	48.28 (58.96)	-0.002 (0.003)	53.11 (86.24)
Mobile ownership	-0.65 (0.915)	-1.09 (1.00)	34.25*** (11.68)	0.07* (0.04)	-48.44 (97.12)	-315.07 (1001)	-1887.19 (1387.97)	0.081 (0.084)	-1080.53 (2081.22)
Extension contact	0.688 (0.757)	0.571 (0.835)	12.07 (9.73)	0.005 (0.033)	11.45 (74.90)	673.80 (833.46)	226.35 (1090.74)	0.21*** (0.07)	3903.59** (1723.57)
Farming experience	0.106 (0.072)	0.11 (0.08)	-0.006 (0.931)	0.0002 (0.003)	9.19 (7.36)	122.58 (79.75)	124.1 (107.74)	-0.004 (0.006)	-141.78 (164.84)
Total livestock	-0.003 (0.009)	-0.007 (0.009)	0.027 (0.114)	0.0004 (0.0004)	0.083 (0.75)	-6.78 (9.80)	-5.96 (10.61)	0.0003 (0.0008)	1.22 (20.46)
Distance to market	-0.12 (0.095)	-0.142 (0.105)	5.03*** (1.22)	-0.01** (0.004)	-6.55 (9.09)	-14.92 (104.24)	-107.65 (134.81)	0.002 (0.008)	-216.45 (216.17)
Credit from Microfinance	-0.43 (1.05)	-1.25 (1.159)	-9.41 (13.57)	0.033 (0.047)	8.03 (103.92)	-1510.25 (1162.51)	-1366.48 (1523.21)	-0.03 (0.096)	-1059.89 (2392.1)
Intercept	2.69 (2.80)	22.5*** (3.09)	695.47*** (35.89)	0.58*** (0.125)	3733*** (301.115)	16334*** (3074.92)	15022*** (4370.4)	1.44 (0.258)	11508.64* (6378.09)
F-value	57.48	3.48	35.03	7.16	11.73	7.01	3.26	11.26	2.66
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0013
Adjusted R2	0.7710	0.1205	0.6559	0.2565	0.4550	0.2517	0.1583	0.3621	0.0841

Note: figures in parentheses are standard errors; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10; Source: Field survey, 2015



## Chapter 4

# Co-operative Organizations in Ethiopia: Development and Economic Functions in a Changing Institutional Environment

**Publication information:** published as Tefera D.A., Bijman J., Slingerland M.A. (2016). Agricultural co-operatives in Ethiopia: Evolution, functions and impact. *Journal of International Development*: DOI: 10.1002/jid.3240

## Chapter 4

# Co-operative Organizations in Ethiopia: Development and Economic Functions in a Changing Institutional Environment

### Abstract

To what extent can co-operative organizations strengthen rural development in sub-Saharan Africa? This chapter explores the development of co-operative organizations in Ethiopia, particularly the changes in economic functions. Co-operative development in Ethiopia has been strongly influenced by various political regimes and government policies. Based on expert interviews and a literature review, we examine the factors that influence a shift in economic functions from provision of inputs to commercialization of farm products. Our result shows that the impact of commercialization on farmer welfare is still inconclusive. Both the institutional environment and the internal governance structure have a hard time adjusting to the changing economic conditions.

**Key words:** Co-operative organizations; market access; transaction costs; productivity; smallholders; sub-Saharan Africa; Ethiopia

## 1. Introduction

Agriculture is the largest sector in most sub-Saharan economies and agricultural growth remains a viable means of poverty reduction in this region (Dorosh and Mellor, 2013). However, smallholder farmers face high production and transaction costs due to underdeveloped basic infrastructure, such as all-season roads, transport and market facilities, and limited access to productive resources (Barrett, 2008; Poulton et al., 2006). Increasing smallholder productivity and strengthening market access is severely constrained as a result of pervasive market imperfections and coordination problems (Gebremedhin et al., 2009; Poulton et al., 2006). Since the early years of the 21st century, academia, governments and donors have recognized the importance of these challenges and have shown renewed interest in the institutions of collective action as pathways for enhancing smallholder production and commercialization and more generally for economic and social development in rural areas (e.g. World Bank, 2008; UN, 2009; DFID, 2010; FAO, 2012; Shiferaw et al., 2011; Herbel et al., 2013).

Also, local and national governments in emerging economies have renewed their attention for co-operative organizations<sup>3</sup>. Some authors have claimed that sub-Saharan Africa is experiencing a renaissance in co-operative development (Wanyama et al., 2009). While several studies have addressed these general trends, there is a lack of country-focused studies on co-operative organizations in the developing world (Johnson & Shaw, 2014).

Ethiopia is one of the African countries where co-operative organizations are again in the spotlight. As part of its effort to transform the agricultural sector, the Ethiopian government has placed large emphasis on promoting co-operatives as one of the main organisational vehicles for enhancing food security and reducing rural poverty. Already in the mid-1990s, the Agriculture Development Led-Industrialization (ADLI) was launched to accelerate economic transformation of the agricultural sector (Teshome, 2006). While this policy focused on the development and dissemination of agricultural technologies through public sector research, extension and education services (Spielman

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<sup>3</sup> In this chapter co-operative and co-operative organization are used interchangeably

et al., 2011), also co-operative societies were made an integral part of the strategy, particularly in catalysing smallholder commercialization (Bernard et al., 2010).

Over the last decade, the literature on co-operative development in Ethiopia has grown rapidly. For instance, the International Food Policy Research Institute (IFPRI) has carried out several impact assessment studies on co-operatives in Ethiopia. The overall picture, however, on the development and functionality of co-operatives, in relation to shifting government policies as well as to changes in market conditions, has not been painted. This chapter aims to present an overview of the recent development of agricultural co-operatives in Ethiopia, particularly the new focus on commercialization of farm products.

While we acknowledge that co-operatives may have several social, political and economic functions, this chapter focuses on the economic activities, and it uses Transaction Cost Economics (TCE) as the main theoretical perspective. We consider the co-operative as an organizational solution for the high transaction costs that farmers normally encounter in buying farm inputs and selling farm products. Two key economic functions of a co-operative organization in the value chain is provide its members better access to farm inputs, credit and technical assistance on the one hand and to sell the members output to traders or processors on the other hand. This chapter investigates the changing role co-operative organizations play in inputs and output markets and the impact of this (changing) role on farmer welfare.

The purpose of this chapter is to study the transformation of co-operative organizations in Ethiopia, particularly in the light of the need to strengthen market access for smallholder farmers. Our exploration consists of two parts. First, we place the current promotion of co-operative organizations by the Ethiopian government into a historical overview of co-operative development. Second, we systematize recent empirical studies on the impact of co-operatives on production and marketing of agricultural products. The paper generates a comprehensive picture of the evolution and impact of farm co-operatives and fills a gap in the literature on the political economy of co-operative development in Ethiopia.

The chapter proceeds as follows. In the next section we present our theoretical framework. Section 3 explains the methodology of our study. Section 4 documents the trends

and progress in co-operative development in Ethiopia. Section 5 synthesizes the recent empirical studies on the impact of co-operatives in improving smallholder productivity and access to markets. Section 6 discusses the findings. Section 7 concludes and suggests directions for future research.

## **2. Theoretical Framework**

As we focus on the evolution of the economic function of co-operative organizations in linking farmers to markets, we use TCE as our main theoretical framework. The key mechanism of TCE is that the characteristics of the transaction determine the extent of transaction costs and thereby determine what is the most efficient governance structure for that transaction (Williamson, 1985). The working hypothesis of TCE, as expressed by Williamson (1991a: 79), is that economic organization is an effort to “align transactions, which differ in their attributes, with governance structures, which differ in their costs and competencies, in a discriminating (mainly, transaction cost economizing) way.” Available governance structures range from pure markets to pure hierarchies, although most real life governance structures are so-called hybrids, which combine elements of markets and hierarchy (Menard, 2004).

Co-operatives have been conceptualized as hybrid governance structures that reduce the transaction costs that smallholders face in their transactions with suppliers of farm inputs and buyers of farm products (Bonus, 1986; Hendrikse and Bijman, 2002). These transaction costs are high because farmers are geographically dispersed, have limited resources to obtain market information, have low bargaining power, often face uncompetitive market structures, and experience constraints in accessing credit and technical assistance.

While we acknowledge that co-operatives often also have social and political functions, leading to the multidimensionality in benefit of co-operatives (Borda-Rodriguez et al., 2016), this chapter focussed on the economic services provided to members. The provision of economic services to farmers helps in increasing agricultural production and thus improving food security (Shiferaw et al., 2011). These services are often solutions to constraints that farmers experience in transacting with other economic entities. We distinguish between two types of transactions that farmers engage in; on the one hand

farmers transact with suppliers of farm inputs, credit and technical assistance; on the other hand farmers have sales transactions with traders and processors. Table 4.1 summarizes the role of co-operative organizations in solving smallholder production and marketing challenges.

**Table 4.1.** Services of co-operative organizations to deal with smallholder constraints

Constraints of smallholder producers	Collective action as potential solution
<b><i>Production process</i></b>	
♦ Lack of access to agricultural inputs (e.g. improved seeds, fertilizers)	♦ Co-ops supply inputs where no other supplier exists or other suppliers are unattractive
♦ Lack of access to credit, for instance for purchasing inputs	♦ Co-ops provide (access to) low cost credit or provide inputs on credit
♦ Lack of know-how of (improved) production methods	♦ Co-ops provide training and technical assistance
♦ Lack of access to irrigation water	♦ Co-ops facilitate access to irrigation water
<b><i>Marketing process</i></b>	
♦ Lack of access to remunerative markets	♦ Co-ops help farmers to link to modern value chains (e.g. supermarkets and export markets)
♦ Information asymmetries on prices, markets, product characteristics	♦ Co-operatives in their marketing function collect necessary market information & make it available to members
♦ Inadequate infrastructure raises cost of selling farm products	♦ Co-operatives provides storage and facilitate bulk transportation
♦ Weak linkages to other actors in the value chain	♦ Co-operatives facilitate vertical coordination & integration of farmers into food value chains
♦ Low bargaining power	♦ Co-operatives enhance bargaining power

Source: Authors' compilation based on literature and field observation

## 2.1 Transactions in support of agrifood production

One of the key elements of agricultural transformation towards more commercial agriculture is that the market mechanism becomes more important for many aspects of the farming business; not just for selling farm products, but also for obtaining proper inputs, credit, equipment and temporary labour, markets become the dominant coordination mechanism.

As the cost of using the market mechanism is relatively high for smallholders (Poulton et al., 2010), collective action may be a beneficial strategy for realizing economies of scale and scope. Providing inputs like fertilizers, feed, agrochemicals and seeds have traditionally been one of the main economic functions of agricultural cooperatives. They facilitate input access for farmers through bulk purchase, which lowers prices, or

affiliation with larger group members (Kaganzi et al., 2009). Given that physical availability of inputs is often an important constraint to access, with thin and unreliable rural distribution networks in most African countries, Kindness and Gordon (2001) claim that co-operatives act as a vehicle for input distribution. Dorward et al. (2004) emphasise the effectiveness of co-operatives in coordinating the provision of various services to smallholders. In addition to supplying inputs, co-operatives often provide technical assistance about the use of those inputs (Markelova et al., 2009). Finally, co-operatives provide credit by supplying inputs on loan to be paid back when the harvest has been sold.

## **2.2 Transactions in marketing farm products**

Many empirical studies on African agrifood markets have shown that high transaction costs are a serious constraint on smallholders market participation (Gabre-Madhin, 2001; Holloway et al., 2000). These transaction costs result from the small size of the farm, lack of market information, weak bargaining position and perishability of many agricultural products (Abebe et al., 2016). Collective action in the form of a co-operative allows smallholders to pool resources to overcome the risks related to asset specificity, to realize economies of scale, and to gain countervailing power in sales transactions (Staatz, 1987).

This problem of transaction costs in selling farm products is even more serious in modern (or high-value) supply chains. When the quality requirements for farm products go up and additional investments in quality improving assets and activities are needed, farmers' vulnerability to market risks increases. In other words, farmers become more dependent on particular buyers and particular markets for earning back their investments.

For many farmers this development towards more strictly-coordinated value chains is an incentive to set up collective action organisations. Narrod et al. (2009) found that co-operatives in India were able to increase smallholder access to higher value markets by reducing transaction costs. Other studies have also shown that co-operatives are successfully in improving countervailing power and linking smallholders to modern value chains (Fischer and Qaim, 2012; Francesconi and Heerink, 2010; Hellin et al., 2009; Ito et al., 2012; Shiferaw et al., 2011; Wollni and Zeller, 2007).

### **3. Data and methods**

This chapter is based on several data sources. The starting point was academic literature on the development and impact of co-operative organizations in Ethiopia. The second source consisted of grey literature, such as reports of consultants and NGOs supporting co-operative development, as well as government documents. The third source consisted of interviews with experts who are directly involved in supporting or managing co-operatives. The fourth source was field observations by the principal investigator. For selecting our interview respondents, we used purposive sampling. The key informants are government officials engaged in co-operative promotion at national and woreda (=district) level, managers of seed co-operatives, managers of co-operatives and NGOs experts working on facilitating co-operatives (Table B1 in Appendix B).

Using a semi-structured interview guide, interviews were held at national level (in Addis Ababa) in January-March, 2015. Experts were asked about their personal experiences with and opinions on the development of co-operatives and about the reasons underlying historical changes. In addition, interviews were held with woreda and village level experts in April-May, 2015 in Ambo and Arsi area, central Ethiopia. These semi-structured interviews consisted of standard questions followed by open questions on individual experiences and opinions. The topics covered ranged from co-operative organizational structures and functions, to co-operative impact on rural livelihoods as well as community development. Table B2 in appendix B provides a list of the topics used in the interviews.

## **4. Co-operative organizations in Ethiopia**

### **4.1 Phases of development**

Using collective action to deal with social and economic challenges has a long tradition in Ethiopia. Respondents told us that informal and traditional associations have existed for a long time and continue to provide social, cultural and economic services to local communities. The different forms of traditional collective action institutions include *Equb* (mobilizing credit on rotating basis), *Iddir* (providing insurance in the event of death and for covering funeral costs) and *Debo* (labour sharing). These institutions are still active and are used in urban areas (*Iddir and Equb*) and rural regions (*Iddir and Debo*) to support the livelihoods of local communities (Lemma, 2008). Kedir and Ibrahim (2011) found that

*Equb* are important for informal savings among urban dwellers, mostly for middle income earners. Bisrat et al. (2012) showed that shorter waiting periods and lower interest rates motivate membership in *Equb*. *Iddir* on the other hand function to allay socio-economic risk and serve as informal insurance (Aredo, 1993). Experts explained that informal collective institutions are often village-based, and bounded by social (e.g. family) and religious ties.

Both interviews and literature has informed us that co-operative development in Ethiopia has always been strongly influenced by the state. Based on changes in regimes and policies, we discuss the historical profile and development of co-operatives in Ethiopia in five different phases.

#### *Initiation (1950 - 1974)*

The history of formal co-operative development in Ethiopia started in the Imperial period between 1950 and 1974 (Kodama, 2007). A co-operative development program was initiated to improve the growth of the agricultural sector and the rural economy. Several producer, multipurpose and consumer co-operatives were established. However, they were not very successful and operated in an inefficient manner (Lemma, 2008). Most sources agree that during the Imperial era co-operatives were fairly limited in scope and experience.

#### *Planned economy (1974 - 1991)*

The planned economy period is also called the Derg regime. Co-operatives were established by the government under the guiding thoughts of socialism and were characterized by collective ownership, central planning and state control (Emana, 2009; Rahmato, 2002). During this period, different types of co-operatives were established with the main aim of political patronage of farmers (Francesconi, 2009; Kodama, 2007). The number of primary co-operatives and the number of members increased significantly. While in the Imperial period only 149 co-operatives were founded, the planned economy period saw the birth of more than 10,500 primary co-operatives, which resulted in a membership of 4.8 million families (Lemma, 2008).

Under the planned economy regime, co-operatives faced multiple difficulties, such as non-transparent governance, involuntary membership, low leadership capabilities, politically

established prices for farm products, and internal corruption (Rahmato, 2002; Veerakumaran, 2007). Engdawork (1995) studied the contribution of co-operatives to rural communities using a survey among 11 producer co-operatives in Central Ethiopia, a region where many co-operative societies had been established. The author found that most co-operatives failed due to a lack of coordination and strategic direction (i.e., multiple and conflicting objectives). Towards the end of the Derg regime, state-owned co-operatives had collapsed in many parts of the country (Lemma, 2008).

#### *Institutional renewal (1991 – 2005)*

The first three years after the Derg regime were transition years. Our respondents explained that in the transition period, both physical infrastructure and new institutions had to be built up, including new ministries. Because under the planned economy regime co-operative membership was mostly compulsory, farmers immediately left co-operatives when sanctions on exit were relieved (Francesconi, 2009), and many co-operatives in rural areas were dissolved. The number of co-operatives (not only agriculture) reduced to about 7, 300 in the transition years (Lemma, 2008).

After the transition years, the federal government of Ethiopia recognized the important role that co-operatives can play in improving the socio-economic conditions of the rural poor. Starting from 1994, the government designed various policies to strengthen the operation of co-operatives, and made resources available for supporting co-operative development. The first formal legal framework was the Agricultural Cooperative Societies Proclamation 85/1994. Four years later, this was replaced by the Cooperatives Societies Proclamation 147/1998. The latter proclamation stipulated how all co-operatives – not just agricultural – should be organized: all cooperative societies are voluntary membership organisations established to solve members' socio-economic problems, and are jointly owned and democratically controlled by the members.

The proclamation comprehended the ICA (2015) co-operative principles. Under this proclamation the government established the federal co-operative promotion desk. Later, based on Proclamation 274/2002, the Federal Cooperative Commission (the current Federal Cooperative Agency) was established. In this period of institutional renewal, a new generation of co-operatives has been established under new rules for membership,

voting and ownership rights (Bernard et al., 2010). Agricultural co-operatives were mainly involved in distributing farm inputs.

#### *Rural innovation (2005 – 2010)*

While the previous period consisted mainly of establishing proper institutions, after 2005, the emphasis shifted towards more detailed policies on promoting agricultural production and supporting co-operatives to provide inputs and services. These objectives were central in the agriculture and rural development strategy of PASDEP<sup>4</sup> (MoFED, 2006). Because the government saw smallholders as crucial actors in revitalizing food systems, it facilitated farmers with improved infrastructure and new technologies (Spielman et al., 2011). The government also designed an agricultural marketing strategy, with an active role for co-operatives in strengthening smallholder commercialization. Experts explained that co-operatives were seen as an instrument for the execution of the government plan to enhance smallholder commercialisation.

The Federal Co-operative Agency developed its first Co-operative Development Plan for establishing new cooperatives in rural and urban areas (MoFED, 2006). The Plan included the target of increasing total membership with 70% and establishing at least one co-operative in each kebele<sup>5</sup>. As a result, the number of co-operatives and the total membership rapidly increased. The Plan also aimed at an increase in the number of co-operative unions, from 105 in 2005 to 646 by the end of 2010.

In order to be able to evaluate the impact of government policies, two nationwide surveys were conducted to collect data on co-operative development and smallholder commercialization (Bernard & Spielman, 2009). The smallholder survey was held in 2005. The survey among co-operatives was held in 2006, targeting primary co-operatives at kebele level. The results showed that the share of co-operatives in supplying inputs is about 70 percent while their share in output marketing is only 10 percent. The Plan stated the ambition to increase the share of co-operatives in inputs markets to 90 percent and in output markets to 60 percent. Generally, while this period of rural innovation contained strong state support for co-operatives facilitating smallholder production and

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<sup>4</sup> Plan for Accelerated and Sustained Development to End Poverty

<sup>5</sup> Kebele is the smallest administrative unit in the Federal Administration System of Ethiopia.

commercialisation, the focus continued to be on enhancing production, both in quantitative and qualitative terms. Our respondents acknowledged that next to push factors, also pull factors need to be in place to enhance production and marketing. This leads us to distinguish another period of co-operative development, with more emphasis on the sales of farm products.

*Market integration and value chain development (2010 – present)*

The most recent period in co-operative development in Ethiopia does not have a precise starting year. We place the start of this period in 2010, in line with the start of the latest five-year plan of the government of Ethiopia (2010/11- 2014/15). This plan, called the Growth and Transformation Plan (GTP), is geared towards fostering broad-based development in a sustainable manner to achieve the Millennium Development Goals (MoFED, 2010). The GTP foresees a central role for agricultural co-operatives in increasing the productivity and household incomes of smallholder farmers (ATA, 2012; MoFED, 2010). Through vitalizing input and output markets, agricultural co-operatives are important for the implementation of the Agricultural Growth Program.

The state has formulated several strategies to increase commercialization of smallholders (Gebre-ab, 2006; Gebremedhin and Jaleta, 2010). For instance, in 2008, the Ethiopian Commodity Exchange (ECX) was established as a formal institution to improve coordination in agrifood markets and to enhance smallholders market integration (Meijerink et al., 2014). Experts explained that the ECX became mandatory for the commercialization of coffee and other major industrial crops since 2010. They further explained that co-operative unions<sup>6</sup>, particularly in coffee and sesame, play a major role in the improved marketing system in connecting smallholders to remunerative regional and global markets.

One example of the enhanced involvement of co-operatives in marketing farm products can be found in the malt barley value chain (Tefera et al., 2016b). Because of increasing beer consumption, there is a large demand for domestically produced malt barley. Breweries and malting factories are sourcing malt barley through developing supply chain agreements with primary co-operatives and unions. In addition, woreda officials

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<sup>6</sup> Co-operative unions are second level co-operative in the federative co-operative system of Ethiopia

and NGOs are involved in the agreement to provide technical assistance, credit and other services. Through such a public-private partnership, the coordination problems present in value chain upgrading can be solved as each partner provides a part of the complementary services.

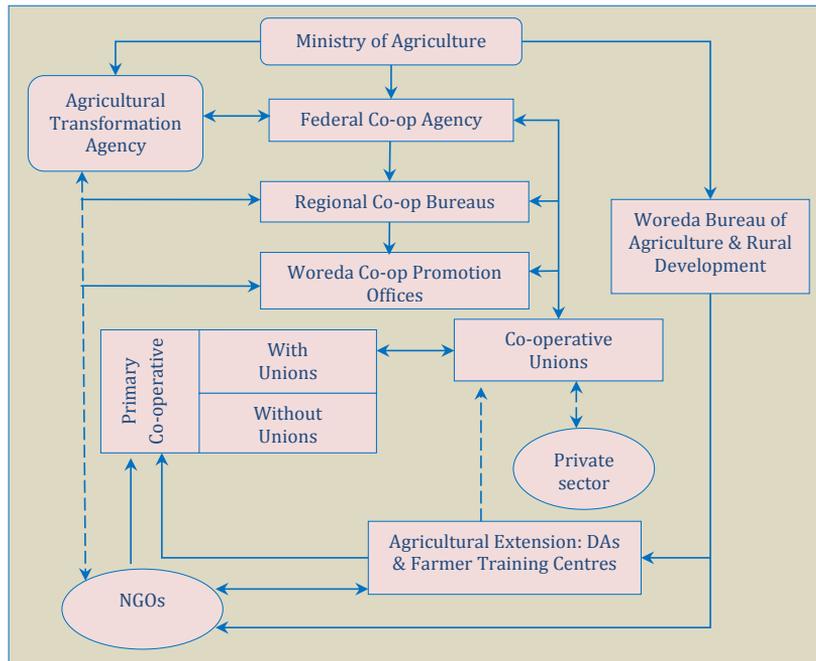
#### **4.2 Current institutional environment**

The results in section 4.1 on the historical development of co-operatives in Ethiopia already shows the large influence of the state, with policy goals changing over the years. In this section we would like to present a more detailed description and discussion of the current institutional infrastructure for regulating and promoting the development of agricultural co-operatives, as well as of the growing role of NGOs in co-operative development.

Since the mid-1990s, the government of Ethiopia developed a series of policies to promote co-operative development, with the implementation of the 1998 Proclamation being a milestone. Experts explained that the state mobilized resources to institutionalize not only the organisation of co-operatives themselves, but also the support for co-operatives at various levels of the administration. Figure 4.1 shows the key (state) organisations involved in the current co-operative promotion system, supporting capacity building, management and audit services, credit facilitation, and leadership.

Co-operative promotion starts with the federal Ministry of Agriculture (MoA), which is in charge of developing and implementing policies on co-operatives. One level below the Ministry is the Federal Cooperative Agency (FCA). The FCA was established in 2002 to promote the co-operative movement throughout the country. Respondents mentioned that the FCA plays a crucial role in the registration and legalization of co-operatives, by auditing and certifying them, and monitoring their performance. At federal level, other important government agency in promoting co-operatives is the Agricultural Transformation Agency (ATA). The government of Ethiopia established ATA in 2010 to promote agricultural transformation and bring about sustainable change (expert interviews). ATA plays a pivotal role in providing policy advice to the FCA and takes assignments related to rural transformation from the MoA. Experts further explained that ATA also takes assignments on reducing systemic bottlenecks in agricultural development from a transformation council, which is chaired by the Prime Minister. Given the

important role co-operatives are expected to play in the rural transformation, ATA has been assigned the task of developing “an integrated strategy that will enhance the support of agricultural co-operatives to contribute towards increasing the yields and incomes of smallholder farmers” (ATA, 2012).



**Figure 4.1.** Actors and relationships in the promotion of agricultural co-operatives in Ethiopia

(Source: Alemu et al., (2011); Bernard et al., (2010) and expert interviews)

At the woreda level, two agencies are supporting co-operatives: the Woreda Bureau of Agriculture and the Woreda Cooperative Promotion Office. As part of its rural development assignment, the Woreda Bureau of Agriculture provides agricultural extension. Throughout the country, extension activities on crop production, livestock husbandry and natural resource management are carried out by Development Agents, or DAs (Berhanu and Poulton, 2014). Respondents suggested that while DAs are mainly targeting individual farmers, they also provide technical support to primary co-operatives and co-operative unions. The other key structure at district level is the Woreda Co-operative Promotion Office, which has the assignment of directly promoting primary co-

operatives and co-operative unions. According to woreda experts, the co-operative promotion office is responsible for the provision of co-operative education to farmers.

Next to governmental agencies involved in promoting co-operatives, many NGOs are actively supporting co-operative unions and primary co-operatives. One example of such support for co-operatives is the Cooperatives for Change (C4C) program of the Dutch NGOs Agriterro and SNV. According to key informants, the C4C program supports co-operative unions to improve their business performance and organisational capacity. Through better performing co-operatives, smallholders will be integrated into value chains and remunerative markets. The C4C project is financially supported by the Gates Foundation. Also many of the economic studies carried out for ATA, for instance the Research for Ethiopia's Agricultural Policy (REAP) project of the International Food Policy Research Institute (IFPRI) are financially supported by the Gates Foundation. Other NGOs, such as Oxfam, Self-Help Africa, ACDI-VOCA and Technoserve are also involved in supporting the Ethiopian co-operative movement.

### **4.3 Growth and diversity**

In understanding the role of co-operatives in reducing transaction costs in marketing farm products, we need to make a distinction between primary co-operatives and co-operative unions. The co-operative unions are the key organisational level for smallholder commercialisation, because the unions make the actual link to domestic and foreign buyers. Supported by a favourable institutional environment, the number of co-operative unions (in all sectors) has been increasing to 326 in 2014 (FCA, 2015). Most of the new unions and primary co-operatives are multipurpose co-operatives (FCA, 2015). As shown in Table 4.2, the number of agricultural unions increased from 126 in 2008 to 181 in May 2014.

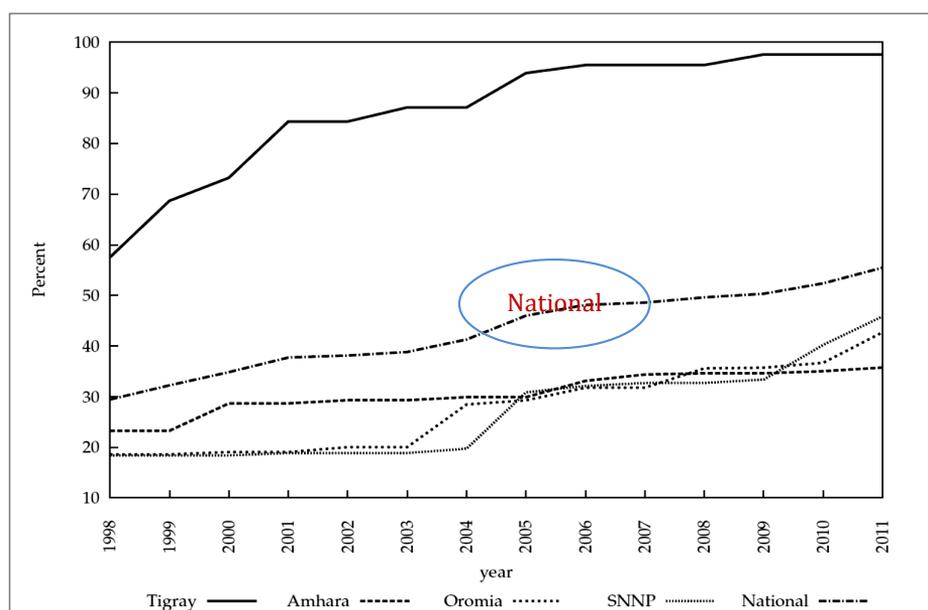
Experts indicated (and triangulated with field observations) that the role of primary co-operatives is particularly in distributing inputs and in collecting farm products, on behalf of the unions. While co-operative unions work at woreda level, primary co-operatives operate at kebele level. According to FCA, the number of primary co-operatives in agriculture increased from 6825 in 2008 to 15568 in 2014 (FCA, 2015). Figure 4.2 shows the regional distribution of the growth of agricultural co-operatives at kebele level. The

proportion of kebeles with at least one agricultural co-operatives grew (national level) from only 10 percent in 1991 to 29 percent in 1998 and 55 percent in 2011 (Figure 4.2).

**Table 4.2.** Growth in number of agricultural co-operatives in Ethiopia (2008 – 2014)

	Years						
	2008	2009	2010	2011	2012	2013	2014
Number of primary co-operatives	6825	9464	11340	10374	11697	13573	15568
Number of co-operative unions	126	128	154	160	181	181	181

Source: FCA, 2015



**Figure 4.2.** Proportion of kebeles with at least one agricultural co-operative in Ethiopia (1998 - 2011) (Source: Adapted from Bernard et al., (2013))

The main types of agricultural co-operatives include multipurpose, coffee, fruit and vegetables, and dairy co-operatives (Table 4.3). Agricultural co-operatives play an important role in the provision of agricultural inputs (fertilizers, improved seeds, and pesticides) to smallholders, distributing 95 percent of all fertilizers used (FCA, 2015). But their involvement in output marketing is still low. Experts emphasized that most co-operatives are also engaged in output aggregation, value addition and other agribusiness activities.

**Table 4.3.** Number of unions and primary co-operatives engaged in different sectors in 2014

Sector	Number of unions	Number of affiliated primary co-operatives	Estimated capital (million Ethiopian birr)
Multipurpose	139	4031	751
Coffee	12	563	276
Fruit and vegetables	8	181	13
Dairy	6	63	4.1
Livestock	4	36	2.8
Seed multiplication	3	55	2.3
Irrigation	3	23	1.5
Beekeeping	3	33	0.2
Forestry	2	16	0.4
Total	180	5,001	1,051.3

Source: FCA, 2015

Despite impressive growth figures, the development of co-operatives is not without challenges. Common problems for co-operatives in developing countries are low member participation, weak leadership, dependence on supporting organisations, and a lack of working capital (Borda-Rodriquez et al., 2016). Ethiopia is not an exception. From our literature review and interviews with experts we learned that co-operatives in Ethiopia face over-dependence on the government, weak internal governance, problems of leadership and low economic viability.

## 5. A review of empirical studies on the impact of co-operative in Ethiopia

While the institutional embeddedness and the historical development of co-operatives in Ethiopia illustrate the recent growth of agricultural co-operatives, the question of their impact on agricultural transformation and poverty reduction remains to be answered. Above we have distinguished two main pathways of impact: (1) providing inputs and services to enhance farm productivity, and (2) marketing farm products. As agricultural transformation policies promote both increased productivity and enhanced market access, we will now review the empirical literature on how co-operatives perform on these functions. Table B3 in appendix B provides an overview of the empirical studies that we have reviewed.

### 5.1 Co-operatives in supporting agrifood production

Improving smallholder agriculture productivity is important for enhancing farmer livelihood, reducing rural poverty and increasing food security. Through co-operatives smallholders may obtain inputs, adopt new agricultural technologies, and access technical assistance. Co-operatives can also provide credit services to member farmers which ease

production constraints. This all has led to the claim that co-operatives have a positive impact on farm incomes in particular and on food security in general (e.g., Shiferaw et al., 2011). Several empirical studies confirmed that co-operatives in Ethiopia have a positive effect on smallholder agricultural performance.

On the topic of farmers adopting new inputs and new agricultural technologies, several empirical studies have been carried out. For instance, Abebaw and Haile, (2013) showed that membership of a co-operative increased adoption of fertilizers. The average mineral fertilizer adoption rate increased by about 9-10 percentage points among the member farmers. Similarly, Rodrigo (2013) found an increase in adoption of pesticide use among members. Abebaw and Haile (2013) showed that this positive impact varies depending on demography, socio-economic characteristics and institutional conditions. Rodrigo (2013) and Abate et al. (2014) both showed that membership in agricultural co-operatives has a strong and positive effect on members' technical efficiency compared to similar non-member farmers. The average efficiency of members in producing the maximum output from the use of a given set of inputs is 5 percent higher than that of non-members. Abate et al. (2014) concluded that agricultural co-operatives are effective in improving efficiency gains since they facilitate easy access to input supply and technical assistance at farm household level. Francesconi and Ruben, (2012) showed that co-operative membership had a strong positive impact on milk production and productivity. The average production and productivity of member farms was 17 kg/day and 8 kg/cow respectively. The figures for similar independent farms were only 3.5 kg/day and 2.5 kg/cow.

Increasing productivity by applying new varieties, chemicals and/or equipment should lead to improved livelihood and reduced poverty. Getnet and Anullo, (2012) studied the impact of agricultural co-operatives on rural livelihood development and poverty reduction in South Ethiopia. Using indicators such as household income, input expenditure, household asset accumulation and savings, the authors found that membership improved livelihood and rural development through higher farm income and savings. The authors also showed that members had lower cost of inputs compared to matching independent farmers. They found that agricultural co-operatives in the study

region supply inputs at a lower price and purchase farm outputs at a higher price than traders in the nearby markets.

One of the key questions on the benefit of co-operatives is about inclusion. Is there a bias in the type of farming families that are included in or excluded from membership? Bernard et al. (2013) assessed the determinants of households participation in co-operatives and the use of the services rendered by the co-operative. Aiming to understand which factors are associated with farmers' decision to participate in a co-operative, demographic factor such as age, sex, and education, and economic factors including landholding size, resource ownership and specialization were used. The authors found that age and education level are positively correlated with participation in co-operatives. As to the economic factors, households with a larger farm size are more likely to participate in co-operatives. In terms of specialization, coffee, fruit and vegetables, pulse and oilseeds were considered in their modelling, but only coffee production was (negatively) associated with farmers' willingness to engage in a co-operative. Bernard et al. (2013) also indicated that co-operatives provided different services to rural communities including agricultural inputs (92 percent of samples co-operatives) and credit services (71percent).

Almost all the empirical studies show that membership in agricultural co-operatives is beneficial to smallholders in the context of improving farm productivity and farmer income. Most of the studies reported that better-off farmers are more likely to benefit from co-operative membership and have increased likelihoods of participation. As poor farmers are not necessarily excluded from the benefits of co-operatives (e.g. because of spill-over effects), the studies reviewed above do not provide a final answer on the inclusion/exclusion question.

## **5.2 Co-operatives in marketing agricultural products**

Smallholders in developing countries could benefit from increased market participation and commercialization. Smallholders access to urban and export markets would offer them higher output prices. Thus, increased market access could push sustainable increase in production and enhance food security. However, smallholders cannot access those markets individually and need collective action to improve their bargaining position and reduce transaction costs. In other words, agricultural co-operatives can be instrumental

in mitigating market imperfections. So far the theory, but what empirical evidence do we have on the impact of co-operatives on smallholders' commercialization in Ethiopia? Unfortunately, the number of empirical studies dealing with this question is still rather low.

Do co-operatives increase output market access for smallholder farmers in Ethiopia? Bernard et al. (2008b) analysed the impact of co-operative membership on access to output markets. The results indicated that co-operative members on average received 7.2% - 8.9% higher prices for their agricultural products than non-members. They also reported that membership and commercialization depend on a number of demographic and socio-economic factors. For instance, large farms have a better position for membership and commercialization than small farms. Bernard et al. (2013) showed that the commercialization service of agricultural co-operatives is still low and depends on the type of commodity, the specialization of the co-operative, the group homogeneity, member commitment and the decision-making process.

Francesconi and Heerink (2010) investigated the impact of membership by focusing on the organisational characteristics of co-operatives. As empirical setting they used two types of organisational forms of co-operatives: market-oriented and livelihood-oriented. The main difference between these two relates to their key function; marketing co-operatives allow members to sell their produce collectively and are linking farmers to output markets, whereas livelihood co-operatives are active mainly in input provisions, and members are free to sell their product wherever they want. The authors found that co-operative membership increases the commercialization rate particularly for members of marketing co-operatives. But membership in the livelihood co-operatives had a negative or no significant impact on commercialization. These findings were supported by Jena et al. (2012), who studied the impact of coffee co-operatives on members' livelihood. They reported that fair trade does not have a significant impact on coffee producers in Ethiopia unlike in other countries where it provides guaranteed markets and improved remuneration (e.g., Wollni and Zeller, 2007). Jena et al. (2012) also highlight that the fair trade strategy in their study area has low impact mainly due to the poor governance of co-operatives and the lack of awareness among members. The authors suggest that a fair

trade strategy could contribute to strengthening smallholder commercialization if the institutional environment and co-operative organisational structure are improved.

In an older study on market access for dairy farmers, Holloway et al. (2000) showed that co-operative organisations facilitated collective marketing of milk and reduced smallholder transaction costs in accessing milk markets. The authors also indicated that co-operatives increased smallholders market participation. Alemu et al. (2012) studied the importance of co-operatives in food value chain coordination in North Ethiopia and found three prevailing coordination mechanisms: spot market, contracting, and coordination through co-operatives. Although spot market is the dominant marketing channel in most value chains, contracting is also emerging and preferred by better-off farmers. The authors also found that co-operatives have been chosen as the preferred channel among the small producers of honey and milk in rural Ethiopia.

An increasing number of studies show that agricultural co-operatives in developing countries have positive effects on smallholder commercialization especially in the case of high-value crops such as horticultural crops (Barrett, 2008; Hellin et al., 2009; Narrod et al., 2009; Verhofstadt and Maertens, 2014b). Coffee co-operatives in Ethiopia are considered as fast growing agribusiness co-operatives and have become more market-oriented (Meskela and Teshome, 2014; Ruben and Heras, 2012). The latter studies also indicated that coffee co-operatives have provided higher profits to members and that they are economically viable. On the other hand, Bernard et al. (2007) suggested that even though the number of marketing co-operatives is growing in Ethiopia, the majority of co-operatives continue to be livelihood co-operatives, providing inputs and engaging in social services. Since commercialization is not the key function of livelihood co-operatives, membership has no clear advantage for improved output market access (Bernard et al., 2008b; Bernard and Spielman, 2009).

To sum up, smallholders integration into the emerging agrifood value chains has been claimed to be important to reduce poverty and increase welfare. The empirical evidence reviewed above has shown that the impact of co-operatives on commercialisation is still limited, and applies mainly to high-value crops. As relatively few empirical studies have been undertaken to determine the effect of membership of co-operatives on market participation of smallholder farmers, the results are not yet conclusive.

## 6. Discussion

Transformation of smallholder agriculture to increase food security and reduce poverty requires strong institutions that facilitate farmer access to input and output markets by reducing transaction costs. There is growing evidence that agricultural co-operatives as collective action institutions can strengthen rural development in Sub-Sahara Africa (e.g. Verhofstadt and Maertens, 2014a). This chapter has focused on one country – Ethiopia – in order to get better insight in the co-operative development, particularly the role of the institutional environment, and in the impact agricultural co-operatives have on increasing farm productivity and improving market access. As analytical approach, we used TCE.

Our analysis shows that over a period of 60 years, Ethiopian co-operative development has been strongly influenced by different types of governments and their political ideology. For instance, during the Imperial and Derg regimes the progress in the co-operative movement was slow and was hampered by compulsory membership. Mismanagement and excessive state interference resulted in high inefficiencies. Many other African countries have similar experiences before the era of market liberalization (Wanyama et al., 2009). However, since the early 1990s the co-operative movement in Ethiopia started a development of growth and expansion under a series of supporting policies. The 2011-2015 Growth and Transformation Plan was implemented to enhance economic growth via robust agricultural growth. Agricultural co-operatives are an integral part of this plan and are expected to play an important role in strengthening the commercialization of smallholder agriculture. This has led, over the last decade, to a substantial growth in the number of cooperatives and in the total number of members.

Our respondents claimed that co-operatives play a significant role in the various sectors of the rural economy of Ethiopia. Particularly in inputs markets, co-operatives are important, as they supply 95% of all fertilizers used. On the importance of co-operatives in output markets, we did not find reliable data. However, given the priority that the state gives to the development of co-operatives in commercialising farm products, there is good reason to believe this function will gain relevance. Also, the growing attention of NGOs for cooperatives in value chains is an indication of this new role.

The increasing importance of co-operatives in output markets also has implications for internal governance and leadership. When co-operatives engage in value chain

coordination agreements with (large) buyers of food and cash crops, a higher level of member commitment is needed as well as better bargaining skills of the co-operative managers (Bijman et al., 2016). Co-operatives face a number of internal and external challenges that make their transformation to more market-oriented business not an easy one. External factors are particularly related to a lack of working capital, which leads to delayed payment and reduced member commitment, and a high state interference in the strategic decisions. Internal challenges relate to poor managerial capabilities and a lack of accountability and transparency. Although our respondents acknowledged these limitations, and many NGOs are supporting co-operatives in making the transformation, there is still a long way to go.

Transaction cost theory predicts that agricultural co-operatives can play an important role in reducing the transaction costs for smallholder producers. Our review of the empirical studies on the impact of co-operatives provides positive evidence of this transaction-cost-reducing function in the inputs market. On reducing transaction costs in the output market, there the evidence is less clear. One explanation could be that co-operatives only recently started to step up their marketing activities. Another explanation could be that the coordination between primary co-operatives at village level and co-operative union at district level is not always as efficient as one would like it to be. While the unions are the main commercial organisations with their links to domestic and foreign buyers, the primary co-operatives have the relationships with the farmers. In theory this is an effective division of labour, but in practice it encounters organisational challenges.

An issue still unresolved is the inclusiveness of co-operatives. Bernard and Spielman (2009) found that the poorest of the poor Ethiopian grain farmers tend to be excluded from membership in marketing co-operatives. Studies in Ethiopia and Kenya found a negative relationship between the likelihood of co-operative membership and land size (Fischer & Qaim, 2012; Nugusse, et al., 2013). However, a study on producer-marketing groups in Kenya found that farmers with small landholdings were more likely to be member such groups. Comparing social benefits for the community with economic benefits for the members, Bernard and Tafesse (2012) found that Ethiopian co-operatives providing social services have a lower economic performance than co-operatives

focussing only on economic services. We hypothesize that strengthening the commercialization function of co-operatives comes at a cost for social inclusiveness.

## **7. Conclusion**

Agrifood systems in developing countries are in the process of transformation and structural change. The increase in urbanization, domestic economic growth, changes in consumer style and globalization have led to the emergence of modern agrifood value chains, including modern food retail (Reardon et al., 2009; Maertens et al., 2012; Verhofstadt and Maertens, 2013). To benefit from new market opportunities, farmers have to collaborate to increase their bargaining power and reduce the transaction costs related to participating in these modern value chains.

Given their vulnerability and their need to produce part of their own food requirements, smallholders cannot afford to switch to producing higher value crops without some guarantee that they will have access to quality inputs, seasonal credit and technical assistance. Co-operatives may provide the bargaining power to ensure access to those inputs. In addition, co-operatives can link farmers to agribusinesses that otherwise may not want to invest in service provision to or procurement from individual smallholders. Market failure and low institutional support lead to high transaction cost for smallholder farmers in developing countries. Co-operatives can play a significant role in reducing those transaction costs. In Ethiopia, co-operatives seem to have a positive impact on farmer income, rural livelihood and agricultural commercialization.

Our review of the literature on the effectiveness of co-operatives in linking farmers to input and output markets and thereby supporting productivity increases and farmer income has shown that key research questions remain unanswered. First, options for strengthening internal governance have not been investigated. From the work of Ostrom (1990, 2000), we know that internal governance has a major effect on the effectiveness and resilience of collective action organizations. Second, the trade-off between efficiency and equity (or exclusiveness and inclusiveness) has become more relevant for agricultural co-operatives in Ethiopia as they are transforming into more commercial organizations. More particularly, the question arises whether stricter vertical coordination in the value chain has implication for the type of collective action among

farmers. Third, what type and mode of outside support, from NGOs and state agencies, is most beneficial for the effectiveness and adaptive capacity of agricultural co-operatives in Ethiopia?

## Appendix B

**Table B1.** Characteristics and distribution of the interviewed key informants

Organisation name	Type of organization	Position and role of the interviewees (number of interviews)
Federal Co-operative Agency (FCA)	Government	Market facilitator (2x)
Agricultural Transformation Agency (ATA)	Government	Co-operative promotion officer (1x) Co-operative technical expert (1x) Seed marketing expert (1x) Input-output marketing expert (2x) Value chain development expert (2x)
Ethiopian Institute of Agricultural Research (EIAR)	Governmental Research	Director of agricultural marketing division (1x) Socio-economic expert (1x)
Hawassa University, Department of Co-operative Studies	Governmental University	Lecturer and researcher (2x)
Woreda Co-operative Promotion Office	Government	Co-operative promotion officer (2x) Field expert (1x)
Co-operative Union	Co-operative	Managers and staffs (6x)
Primary Co-operative	Co-operative	Chairperson and committee member (7x)
Woreda Bureau of Agriculture	Government	Extension officer (1x)
SNV-Ethiopia	NGO (Dutch)	Value chain advisor (2x) Field officer (2x)
Agriterra-Ethiopia	NGO (Dutch)	Field officer (2x)
Integrated seed systems development (ISSD)	NGO (local seed co-operatives)	Project coordinator (1x) Seed system expert (2x)
FFARM	Private PLC	General manager (1x)
Total interviews		40

**Table B2.** Overview of topics covered in the interviews, and the number of interviews

Key informant's institutional affiliation	Topics covered in interviews	Number of interviews
Government (Federal level)	Policy formation and development specific to co-operatives; historical development of co-operatives in the three regimes; types of services co-operatives provide; and the challenges they face in their course of development.	13
Government (Local level)	Membership issues; diversity of services that co-operatives provide to its members; co-operatives role in inputs and output marketing; local policies and co-operatives promotion; organizational structure and interaction with Union; co-operatives impact on the rural communities; and the challenges co-operatives face	17
Private sector	Information on private agro-dealers co-operatives interaction; perception of the co-operatives system; and challenges to work with co-operatives	1
NGOs	Information on types of assistances that NGOs provide to co-operatives; perception on the functioning of co-operatives in the rural settings; capacity building and input-output marketing support; and key challenges in co-operatives development	9

**Table B3. Recent Empirical Research on the Impacts of Agricultural Co-operatives in Ethiopia**

Source*	Topic	Empirical Settings	Summary of findings
Abate et al. (2014)	Impact of co-operatives on technical efficiency	Using national survey data of 1638 (564 member and 1074 non-members) households	Co-operatives are effective in providing services such as technical assistance which improves technical efficiency of member farmers. The average efficiency gains of co-operative service users is increased by 5% compared to matching non-member farmers.
Abebaw & Haile (2013)	Impact of Ethiopian co-operatives on technology adoption	Cross section survey of 965 households (183 member and 782 non-member)	Co-operative membership promotes technology adoption. Co-operatives have a positive effect on adoption of agricultural technologies. They indicate that membership improves the mean fertilizer adoption rate by about 9–10 percentage points among the member farmers.
Bernard et al. (2013)	Agricultural co-operatives in Ethiopia	National household survey of 3000 farmers	Co-operatives provide different services in the rural economy. The main services that co-operatives provide to members include agricultural inputs (92%) and credit service (71%). The authors also assessed the determinants and motivation of participation in a co-operative.
Rodrigo (2013)	Co-operatives and technology adoption in Ethiopian	Household panel data with sample size of about 1477 rural households	The author examines the impact of co-operatives in agricultural technology adoption. Based on this, the author finds that co-operative membership has a positive effect on agricultural performance. But this only works for the adoption of variable input (e.g. pesticides).
Getnet & Anullo (2012)	Co-operatives and rural livelihood development	Survey of 212 (99 member, 113 non-member) farmers in South Ethiopia	Co-operatives have a positive effect on the livelihoods of the service users in rural areas. They indicate that service users have improved farm incomes and savings (positive effect). But membership does not have significant impact on productive asset accumulations
Francesconi & Ruben (2012)	The hidden impact of co-operative membership	Survey of 100 farmers (50 member and 50 non-member) in Central Ethiopia	Membership has a positive impact on dairy production and productivity.
Bernard & Alemayehu (2012)	Multipurpose co-ops & commercialization	Survey of 172 primary co-operatives from all over Ethiopia	Open membership with externally encouraged social activities lead to the entry of new members which may not contribute to the marketing functions of co-operatives
Ruben & Heras (2012)	Governance in coffee co-operatives	Survey of 500 co-operative members, mainly coffee growers in Southern Ethiopia	Co-operatives impact on the coffee growing farmers assessed in terms of social capital. Their results show that productivity and market performance affected by social capital attributes.
Alemu et al. (2012)	Vertical coordination in food supply chains	Survey of 827 farmers in North Ethiopia	Co-operatives are one of the coordination mechanisms, next contract and open market, in dairy and honey value chains. Resource rich farmers prefer contracting while resource poor farmers choose co-operatives. Types of products and access to physical infrastructure also determines the choice of VC mechanisms.

<b>Sources</b>	<b>Topic</b>	<b>Empirical Settings</b>	<b>Summary of findings</b>
Jena et al. (2012)	Fair trade and coffee co-operatives	Cross section survey of 4 certified and 2 non-certified primary co-operatives. A total of 249 (166 certified and 83 non-certified) members	The authors reported that certification does not have significant impact on the livelihood of smallholder coffee producers. They elaborated that, co-operatives existing organizational structure, minimum price difference among certified and noncertified, and poor members awareness about their co-operatives led to such a dismal effect of fair trade.
Francesconi & Heerink (2010)	Co-operatives in an era of global commodity exchange	Survey of 368 households (78 member and 290 non-member) in Ethiopia	Co-operative membership does not lead to a higher rate of commercialization. Organizational forms adopted by co-operatives may determine members' degree of output market participation. Marketing co-operatives facilitate commercialization but livelihood co-operatives do not.
Bernard & Spielman (2009)	Reaching the rural poor through rural producer organizations	Survey of 205 primary coops in Ethiopia	Participation in marketing co-operatives depends on the demographic, institutional and socio-economic factors. For instance, poor farmers participate less and if they participate they are less inclusive in the decision making processes.
Bernard et al. (2008)	Impact of co-operatives on market access	Survey of 2,532 households of which 150 are co-operative members	Co-operatives obtain higher prices (7%) for their members. But it is also reported that membership has no positive impact on commercialization
Francesconi & Ruben (2008)	The life cycle of agricultural co-operatives	Survey of 200 primary coops in the highlands of Ethiopia	Agricultural coops faced cyclical challenges to sustain collective marketing activities over time. They showed that co-operatives established by farmers initiatives are more likely to engage in collective marketing than the externally (gov't) induced once.
Bernard et al. (2007)	Impact of co-operatives on smallholders commercialization	National survey on 7,200 farm households	Nationally, co-operative membership is low (only 9% of all rural household are members) and poorer farmers appears to be excluded. The authors also found out that co-operatives membership on average have low output aggregation impact.

Source: Authors' compilation; \* the order in the table is based on the year of publication.

## Chapter 5

# Is there a Trade-off between Inclusion and Efficiency of Producer Organisations?

**Publication information:** Tefera D.A., Bijman J., Slingerland M.A., Van der Velde G., Omta O. Efficiency and inclusiveness of producer organisations in rural Africa: Is there a trade-off? *It has been submitted to a journal*

## Chapter 5

# Is there a Trade-off between Inclusion and Efficiency of Producer Organisations?

### Abstract

Linking smallholders to modern food chains through producer organisations (POs) is one of the rural development strategies being promoted by governments and NGOs in sub-Saharan Africa. It is often claimed that POs facilitate market access for smallholders and thereby improve their income and livelihoods. However, the economic performance of POs may come at the expense of inclusiveness. We contribute to the debate on efficiency versus inclusiveness by providing empirical evidence on participation in and membership effects of rural POs. Using cross-sectional data from Ethiopia, we applied a propensity score-matching technique to analyse inclusiveness and membership effects. We find that demographic and economic factors determine farmers' decisions to participate in POs. Large landholdings, better farm resources, and poor market access increase the likelihood of participation. This means that the poorest farmers are left out, implying that POs are not inclusive. At the same time, our findings also show that PO membership has a positive effect on production, crop yield, product quality, prices, and farm income.

**Key words:** Producer organisations; inclusiveness; trade-off, market access; sub-Saharan Africa, Ethiopia

## **1. Introduction**

Smallholder agriculture remains crucial for economic development and reduction of poverty in developing countries (World Bank, 2008b). However, agricultural growth is challenged by low productivity and market failure, particularly in sub-Saharan Africa (FAO, 2013b; Wiggins, 2014). Cognizant to this, institutional innovations are required to improve smallholder productivity and market integration in this region. There is a renewed interest from donors, governments, and academia in producer organisations (POs) as an institutional solution to enhance smallholder performance through adoption of technologies and accessing markets (Bernard and Spielman, 2009; Fischer and Qaim, 2012; Narrod et al., 2009; Shiferaw et al., 2011). POs foster smallholders' participation in market-oriented production, which holds potential for diversifying farm income and increasing farm productivity.

A growing body of literature shows that food value chains in sub-Saharan Africa (SSA) are undergoing fundamental change (Minten et al., 2016; Tschirley et al., 2015; Verhofstadt and Maertens, 2013). Transforming food systems are characterised by increasing quality and food safety requirements and modernisation in distribution systems. Modern supply chain arrangements are adopted for guaranteeing a larger volume and consistent supply of high quality products. Smallholders face numerous challenges in entering into these modern value chains, including costs associated with accessing information, negotiating, and complying with quality and volume requirements (Poulton et al., 2010).

Many African governments are promoting POs, considering them an institutional solution to reduce transaction costs in coordinated food chains (Latynskiy and Berger, 2016). These policies have been supported by studies that show that POs are able to improve smallholder market positions through strengthening bargaining power, facilitating access to good quality inputs and market information, and reducing marketing risks (Bernard et al., 2008b; Kaganzi et al., 2009; Markelova et al., 2009; Shiferaw et al., 2011). POs are instrumental in improving farm income and agricultural performance (Chagwiza et al., 2016; Fischer and Qaim, 2012). In addition, POs help farmers to manage quality and meet the increasing quality requirements of modern food chains (Faysse and Simon, 2015; Francesconi and Ruben, 2012).

However, most POs have primarily been set up to provide farming inputs and have difficulties in strengthening their marketing functions (Bernard et al., 2008a; Verhofstadt and Maertens, 2014a). In addition, POs have organisational weaknesses and internal governance problems such as weak leadership and low member commitment that may hinder their effectiveness in value chain coordination (Hannan, 2014). Moreover, they may not be as inclusive as many NGOs and outside stakeholders would like them to be (Bernard and Spielman, 2009; Verhofstadt and Maertens, 2014a).

There is an ongoing debate about inclusiveness versus efficiency of POs (Bernard and Spielman, 2009; Bijman et al., 2016). Efficiency is crucial to ensure good business performance and long-term sustainability, while a fair distribution of benefits may be more important from a rural development perspective. Stakeholders such as governments and NGOs often expect the PO to treat all members equally and even provide benefit to non-members in the same community. POs often combine several objectives, ranging from political to social and economic goals. They typically undertake multiple activities, which are related to the diversity of member needs and aspirations. Contrary to this, as a business organization POs need to be selective in membership and activities to be competitive and to be able to access modern supply chains.

In Ethiopia, the number of POs is rapidly increasing (Tefera et al., 2016a). The government has placed emphasis on promoting POs as an institutional vehicle for enhancing smallholder commercialisation and food security (ATA, 2016; FCA, 2015). Several studies have shown that POs have a positive impact on farmer access to inputs and adoption of new technologies (Abate et al., 2014; Abebaw and Haile, 2013; Getnet and Anullo, 2012). However, most of the impact studies are commodity specific (e.g. coffee and dairy sectors) and the results are not conclusive. To our knowledge, besides Bernard and Spielman (2009), no study has systematically examined the interaction between inclusiveness and efficiency of POs. Against this backdrop the aim of this chapter is to investigate the interaction between inclusiveness and business performance of POs in malt barley value chains in Ethiopia. We seek to answer the following research questions: (1) what factors affect farmers' likelihood of participation in POs? (2) How does PO membership affect crop production, productivity, price, crop income, and product quality at farm level? (3) Are POs inclusive of the poorest smallholder farmers?

The chapter is structured as follows. Section 2 provides the theoretical framework about POs' changing role in high-value markets and develops a number of hypotheses. Section 3 provides background information on agricultural POs in Ethiopia. Section 4 describes data and econometric specification. Section 5 presents results and discusses the findings. Section 6 concludes and gives policy implications.

## **2. Theoretical approach**

This section will provide the theoretical framework for understanding the changing role of POs under dynamic institutional conditions and their impact on facilitating rural development. First we present what is known about POs and their impact. Second we provide what are the major changes. Two major changes are the need for tighter value chain coordination, and the greater emphasis on efficiency in POs.

### **2.1 Membership benefits**

In this sub-section, we explore what types of producers are joining a PO and what the impact of membership consists of. Generally, producer participation in rural POs is determined by socio-economic factors. Some studies have found that farmer characteristics such as level of education and age of the household head positively account for membership (Abebaw and Haile, 2013; Chagwiza et al., 2016; Fischer and Qaim, 2012; Verhofstadt and Maertens, 2014a). Farm characteristics such as landholding and livestock holdings have a positive effect on the probability of PO membership (Abebaw and Haile, 2013; Bernard and Spielman, 2009; Fischer and Qaim, 2012). Contrary to this, farm size has also been found to have a significant negative effect on the probability of PO membership (Chagwiza et al., 2016; Verhofstadt and Maertens, 2014a). In addition, some studies reported that the poor are excluded from membership (Francesconi and Heerink, 2010; Verhofstadt and Maertens, 2014a), whereas others conclude that there is a "*middle-class effect*" indicating that both the very small and the large farm owners are least likely to participate (Bernard and Spielman, 2009; Fischer and Qaim, 2012). Studies also show that distance to a market (or to an asphalt road) has a non-linear or an "*inverted U-shaped*" relationship with PO membership (Abebaw and Haile, 2013; Fischer and Qaim, 2012), which implies that POs are effective in reducing transaction costs for farmers at intermediate distance.

Given POs' role in rural development, many studies have empirically tested their impact on various socio-economic indicators. These studies have shown that agricultural POs play a positive role in enhancing rural livelihoods through facilitating agricultural production and market access (Fischer and Qaim, 2012; Ito et al., 2012; Verhofstadt and Maertens, 2014a). They provide multiple services to smallholders consisting of technologies, market information and bargaining power. For instance, agricultural POs have a positive effect on adoption of modern inputs (Abebaw and Haile, 2013), increase in technical efficiency (Abate et al., 2014), and farm outputs marketing (Barham and Chitemi, 2009; Francesconi and Heerink, 2010; Wollni and Zeller, 2007).

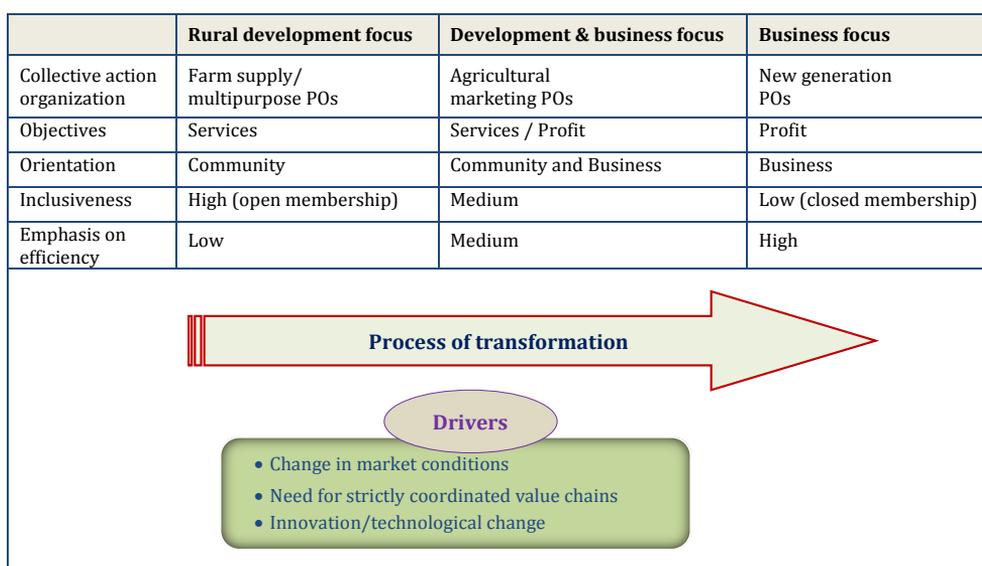
The performance of POs varies depending on the type of value chain they are involved in. For instance, in rural Africa the positive performance of POs is often linked to the traditional cash crops (e.g. coffee) and to emerging horticultural and dairy value chains (Chagwiza et al., 2016; Fischer and Qaim, 2014; Kaganzi et al., 2009; Verhofstadt and Maertens, 2014a). This chapter aims to provide empirical evidence on the performance and inclusiveness of rural POs in malt barley value chains in Ethiopia.

## **2.2 Producer organisation and modern food value chains**

The emergence of modern supply chains in SSA offers new market opportunities for smallholders and inclusive agricultural development (Fischer and Qaim, 2012; Verhofstadt and Maertens, 2013). In addition to increased income due to higher prices, linking smallholders to modern food chains provides benefits through better access to inputs and adoption of technologies. However, integration in modern food chains requires innovations such as product upgrading and effective farm business management (Kaganzi et al., 2009). Quality requirements and product upgrading demand a new set of skills and resources, which smallholders usually cannot attain by themselves. Smallholders also struggle to keep up with the new demand for larger volumes and consistency of supply. As a result, they are often excluded from modern value chains (Poulton et al., 2010).

To meet market requirements and access modern food chains, smallholders may benefit from membership in producer organisations (Markelova et al., 2009; Trebbin, 2014). POs can reduce transaction costs, increase bargaining power, and provide a range of services including access to modern inputs, new technologies, and market information that help improve the smallholders' position in modern value chains (Barham and Chitemi, 2009;

Chagwiza et al., 2016; Verhofstadt and Maertens, 2014a). However, for POs to compete in modern food chains, they need to comply with the strict quality requirements of these chains. In this regard, a distinction is made between community-orientation and business focus of POs (Bernard et al., 2008b). Community-oriented POs focus on service delivery and rural development, while business-oriented POs focus on commercial activities. Given the modernisation of food chains in emerging economies, POs are subject to a process of transformation from community-oriented towards business-oriented organisations (Bijman et al., 2016). On the basis of the literature discussed above, we propose the following key features of the transformation process in Figure 5.1.



**Figure 5.1.** Transformation process of producer organisations

A community-oriented PO has multiple objectives and provides multiple services to the whole community in which the PO is embedded. A business-oriented PO, on the other hand, focuses on generating economic benefits for its members. Although most POs in SSA are still community-oriented and contribute to rural development, the number of agricultural marketing POs is increasing (Lutz and Tadesse, 2017). In the last stage of the transformation process (fourth column), we find new generation POs which are yet to emerge in the developing world. However, there is abundant literature on the new generation POs in the global north (Chaddad and Cook, 2004; Hendrikse and Bijman,

2002). These types of POs are characterised by transferable shares, closed and selective membership, and offensive market strategies.

Choosing a business focus and accessing modern food chains require more investments, quality upgrading and setting a clear objective. Thus, a business PO is more likely to be selective in allowing farmers to become members. Lutz and Tadesse (2017) discussed that for POs to access modern food chains and achieve efficiency, the following would be important: (a) commitment of members to sell through the PO to realise the required scale, (b) active participation in the decision-making in the PO, (c) commitment to invest in the PO, and (d) clearly specified (i.e., narrow) objectives. Most POs, however, combine several objectives, ranging from political to social and economic. They typically undertake multiple activities, which are related to the diversity of member needs and aspirations (Bijman et al., 2016). This all-inclusion often leads to free riding and low commitment, which then forms a barrier for investments by members (Cook, 1995). Thus, we propose that tension exists between inclusion and efficiency.

Against the background of the above discussions, the hypotheses of this study are set out as follows: First, we expect poorer smallholder farmers to be excluded from PO membership. Second, we expect socio-economic factors to affect farmers' decision to participate in a PO. Third, membership improves malt barley total production, yield, and quality. Fourth, membership has a positive effect on the malt barley price and on farmers' farm income. Fifth, membership improves food crop production and total farm income.

### **3. Rural producer organisations in Ethiopia**

In the political economy of Ethiopia, smallholder agriculture is the engine for economic development and rural poverty reduction, contributing 40 percent to the national gross domestic product (FDRE, 2016). The government rural development strategy is called Agriculture Led Development Industrialization (ADLI). According to this strategy, agriculture is vital for the transformation of the rural economy towards both higher production in agriculture as well as industrialisation in rural areas. POs are seen as an integral part of the strategy to achieve economic transformation as they can catalyse the adoption of new technologies and strengthen smallholder commercialisation. Over the past years, the number of POs and the size of membership has rapidly grown (Tefera et al., 2016a). However, according to ATA (2016), POs are mainly perceived as entities

supplying inputs and providing social services, but with low output marketing activities. Cognizant to this, the government has developed a plan to increase the share of output marketing by POs by 50% in years 2015 - 2020.

The Cooperatives Societies Proclamation No. 147/1998 and associated amendments provide the legal framework for the operations of all types of POs in Ethiopia. The Federal Cooperative Agency (FCA), at national level, and the Regional Cooperative Promotion Agencies (RCPAs), at the regional level, are responsible for the guidance and monitoring of the organisation, management, and functions of the POs (Tefera et al., 2016a). According to the FCA, currently more than 55,000 primary POs of all types with more than nine million members exist in Ethiopia. However, with only 22 percent female members, women participation is generally low.

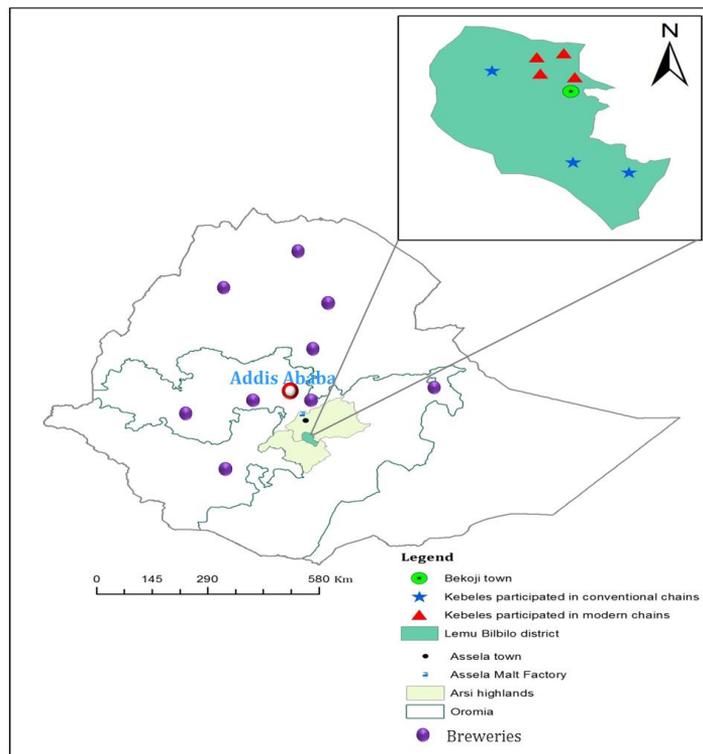
POs operating in the agriculture sector can be divided into two main types: multipurpose and single purpose POs (Tefera et al., 2016a). Single purpose POs focus on a particular business activity and are prevalent in the coffee, fruit, vegetables, and dairy value chains, while multipurpose POs are engaged in a wide range of activities and services such as distribution of fertilizers and improved seeds, and farm output marketing. They also organise agricultural training for members, provide market information, and facilitate credit provision. In this study we focused on agricultural POs that provide multiple services to rural communities in the Arsi highlands of Ethiopia. The agricultural POs in this area are active in facilitating both the production and the commercialisation of cereal grains such as wheat and malt barley.

Driven by the fast-growing brewery industry, malt barley supply chains in Ethiopia are experiencing fundamental changes (ATA, 2016; Rashid et al., 2015). In the Arsi highlands, large brewers such as Heineken and Diageo source malt barley directly from smallholders through vertical coordination arrangements. As part of their contract packages, brewers introduce new technologies and strengthen coordination in the supply chain. In these modern chains, brewers use POs as their main suppliers. They distribute modern inputs, arrange logistics, and aggregate malt barley from smallholders. Farmers also trade their malt barley to local collectors and traders through spot market transactions i.e. conventional chains.

## 4. Research methods

### 4.1 Study context

The study was conducted in the Arsi highlands of Oromia, Ethiopia (Figure 5.2). The Arsi highlands is the main barley belt and responsible for the majority of national production (ATA, 2016). In this area, local livelihood is mainly dependent on crop production and livestock husbandry. Major cereal crops include malt barley, food barley, wheat, and maize. Farmers also grow pulses such as field peas and faba beans on a rotation basis with cereal crops to maintain the fertility of the soil. The topography and agro-ecology of the area is also suitable for livestock raising, especially dairy farming.

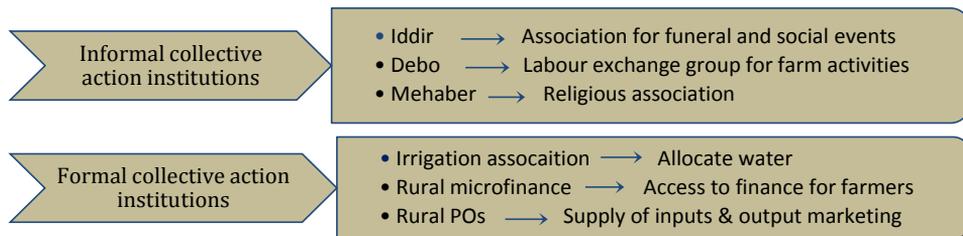


**Figure 5.2.** Location of the study area in Oromia regional state, Ethiopia

Malt barley is the dominant cash crop in the region. But farmers also sell parts of their food crops. Local traders buy malt barley mostly from farmers and sell to the Assela Malt Factory (AMF), the main malt factory in the country and located in this region. The factory has been sourcing its malt barley from traders through conventional chains and is responsible for 70% of malt supply to the brewery industry. In addition, after breweries

have collected their malt barley through modern chains they are transporting it to AMF for processing into malt.

In the Arsi area, participation in collective action institutions has a long tradition. In the farming communities both formal and informal collective institutions are present. Figure 5.3 shows the most common collective action institutions in the region. In this area, POs support smallholder livelihoods through provision of various services. For instance, a recent study in fertilizer supply chains has reported that agricultural POs in the Arsi area play a critical role in the supply of fertilizers to farmers (Agbahey et al., 2015). In addition, POs are also engaged in the supply of improved seeds, market information, and consumables (e.g. edible oil, sugar). Moreover, POs play an intermediary role in linking farmers to the malt factory and to foreign-owned breweries.



**Figure 5.3.** Diversity of farmer collective action institutions in the study area  
(Source: authors' field study)

Agricultural POs in the study area are guided by the Galema union located in Bekoji town. The main function of the union is to supply inputs and execute output marketing. It distributes most of the fertilizers to affiliated POs so that farmers have easy access. Galema union has about 90 member POs. The union also provides transportation services to member POs by delivering their product to the required destination. It organises output marketing and enters into contracts with large buyers or processors. POs are also supported by the district PO promotion agency, which performs registration, audit, and guidance of the POs.

#### 4.2 Data collection

Our study employs a mix of qualitative and quantitative approaches. A structured questionnaire was carefully administered among malt barley farmers in the Lemu Bilbilo district (= *woreda*) to gather primary data. A total of 148 smallholders were interviewed

in three villages (= *kebeles*) of the studied woreda. The sample includes 78 PO members and 70 non-member farmers. Three multipurpose POs were purposely selected from Lemu Bilbilo woreda in consultation with Galema union staff and the woreda PO promotion agency (Table 5.1).

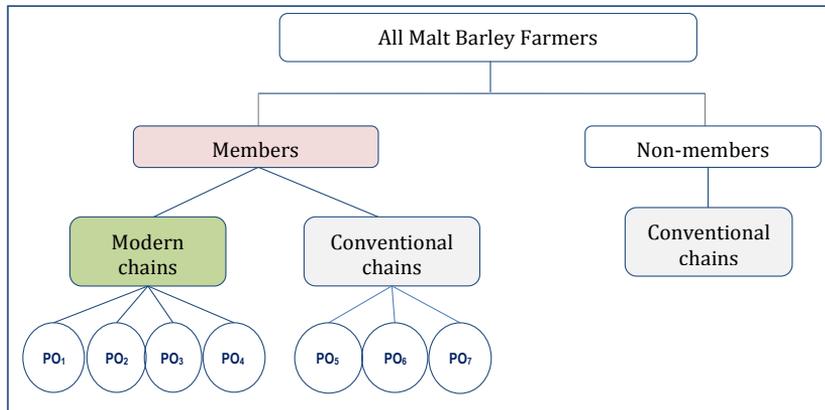
Sample members were randomly selected from the members' list of the three POs. Non-members were selected from the same woreda using snowball-sampling methods. In selecting POs we used targeted sampling, using consultation and help from POs leaders and heads of the *kebeles*. Then face-to-face interviews were held with household heads. In the interviews, information was gathered on topics like household demography, socio-economic characteristics, production and marketing of crops in general and of malt barley in particular, access to markets, access to collective institutions and the characteristics of collective institutions.

**Table 5.1.** Characteristics of selected POs

Villages	POs	Membership			Sample size	Entry fee (Birr)	Distance to market (km)
		Male	Female	Total			
Lemu Micheal	PO <sub>5</sub>	359	8	367	25	50	8.1
Ululee Hassa	PO <sub>6</sub>	181	8	189	26	20	12.3
Koma Katera	PO <sub>7</sub>	158	6	164	27	50	16.2
Total	3	698	22	720	78	-	-

Source: Author's calculation based on survey data

In addition, semi-structured interviews were conducted with key informants consisting of experts in the woreda, notably the PO promotion agency and the Galema union management, to gain insight in the functions, management, organisational capacity, membership issues, and the challenges of POs. Several interviews were also held with NGO experts who directly work in supporting POs in the woreda. To supplement the survey data with more in-depth information, focus-group discussions (FGDs) were held with PO leaders. A total of seven FGDs were held, each consisting of three to five participants. The seven FGDs represented seven POs, including the three POs in which the survey was conducted, and four other POs. The latter four are linked to the brewery companies through contract arrangements (modern chain), while the former three participate in the conventional chain (Figure 5.4). Information was also gathered through participation in PO meetings and by direct field observations.



**Figure 5.4.** Malt barley farmers by PO membership and type of value chains

### 4.3 Analytical framework

Impact analysis in randomised experiments can be easily executed by computing the differences of the mean values of performance indicators for treatment and control groups. However, determination of treatment effects based on observational studies is complex as it entails controlling for observable and unobservable selection bias. To control for selection bias problems an econometric approach such as Propensity Score Matching (PSM) is commonly used (Rosenbaum and Rubin, 1983). For instance, Abebaw and Haile (2013), Chagwiza et al. (2016), and Fischer and Qaim (2012) used PSM in estimating the welfare impact of PO membership. In our study, selection bias is likely because the decision to participate in a PO is made by each individual farmer. Self-selection cannot be assumed to be equally likely for all farmers. The fact that our sample was drawn from the same woreda might also be a source of bias, arising from spill-over effects. That is, non-members may obtain indirect benefits from PO activities in the woreda. PO members and non-members may also differ in unobservable characteristics, which might have a direct influence on impact indicators.

We first used the naive t-test to analyse and directly compare the performance of members and non-members on selected impact indicators. We then applied a PSM-technique to measure the performance of members and non-members using the same impact indicators but controlling for selection bias. It should be noted that PSM controls for selection bias for observable characteristics, while it does not address selection bias

related to unobservable characteristics. We were therefore unable to control for the latter type of selection bias. We compared the results for the two analytical approaches.

PSM involves three basic steps which we describe as follows. First, a binary choice model (logit model) is used to model a farmer's decision to participate in a PO. Second, propensity scores, i.e., the probability of a farmer to join a PO, are estimated on the basis of the logit model. In this step a matching algorithm is chosen that uses the estimated propensity score to match each member farmer (treatment group) with one or more non-member farmers with a similar propensity score (control group). Third, differences in the outcome variables (farm performance) are calculated for the matched treated and untreated cases to estimate membership effects.

Following Abebaw and Haile (2013) and Fischer and Qaim (2012), a farmer's decision to join a PO can be determined using a random utility framework. This framework states that a farmer chooses being member of a PO if the utility gained from membership is larger than the utility of non-membership. The utility gain of membership can be expressed as a function of observed covariates ( $X$ ) in a latent variable model as follows:

$$D_i^* = \beta X_i + \varepsilon_i \quad \text{with} \quad D_i = \begin{cases} 1 & \text{if } D_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

Where,  $D_i^*$  is an indicator of latent PO membership,  $\beta$  is a vector of parameters to be estimated, and  $\varepsilon_i$  is the error term. The observed dependent variable, membership status ( $D_i$ ), where  $D_i = 1$  for PO members and  $D_i = 0$  for non-members, is also related to the latent variable as shown in equation (1). The choice of explanatory variables included in  $X$  is guided by theory and previous studies. A farmer's decision to participate in a PO is conditioned by various baseline farm and farmer characteristics (Abate et al., 2014b; Abebaw and Haile, 2013). Based on these empirical studies, the likelihood of PO membership largely depends on demographic characteristics, resource endowment, and access to services. In our study, we also used these farm household characteristics to model the likelihood of PO membership (see Table 5.2).

Following Abadie and Imbens (2016) and Caliendo and Kopeinig (2008), the potential outcomes of the PO are represented by ( $D_i$ ) for each household  $i$ . The average treatment

effect on the treated (ATT), which in our case is the average impact of PO membership on farm performance, can be estimated as follows:

$$\tau_{ATT} = E(\tau | D = 1) = E[Y(1) | D = 1] - E[Y(0) | D = 1] \quad (2)$$

Where,  $E[Y(1) | D = 1]$  is the expected outcome value for member farmers;  $E[Y(0) | D = 1]$  is the expected outcome value for member farmers if they had not been member.  $E[Y(0) | D = 1]$  is the counterfactual and not-observed. We need a proper substitute for  $E[Y(0) | D = 1]$  to estimate ATT. In this case, PSM helps to construct the counterfactual from the non-member farmers. In doing so, we invoke the conditional independence assumption (CIA) and the common support assumption to control the selection bias problem (Caliendo and Kopeinig, 2008). The non-confoundedness assumption (i.e., CIA) ensures that selection to treatment (PO membership) is only based on a set of observable characteristics of the farmers, determining both the probability of being a member and the potential outcome (production, productivity, price, income, and quality). In other words, it does not account for any unobservable differences. The common support condition ensures that farmers with similar observable covariates have a positive probability of being both member and non-member. If CIA holds and there is overlap between member and non-member groups, the PSM estimator for  $\tau_{ATT}$  is given as:

$$\tau_{ATT}^{PSM} = E_{p(x)|D=1} \{E[Y(1) | D = 1, p(x)] - E[Y(0) | D = 0, p(x)]\} \quad (3)$$

Where,  $p(x)$  is the predicted propensity score from the logit model. In the literature a number of matching methods have been used to match similar member and non-member farmers. The most commonly-used matching methods are the nearest neighbour matching, radius matching, and kernel-based matching (Becker and Ichino, 2002; Caliendo and Kopeinig, 2008). In the nearest neighbour matching, each treated farmer is matched with the comparison farmer that has the closest propensity score. But in case of kernel-based matching, all treated farmers are matched with a weighted average of all controls, using weights that are inversely proportional to the distance between the propensity scores of treated and control groups. In our case, the individual from the non-member group is chosen as a matching partner for the individual in the member group

that is closest in terms of propensity score. We also analysed the data using other matching methods such as kernel-based matching to check the robustness of our results.

## **5. Results and discussion**

We present the findings of the study in three parts. First, we present the descriptive results including comparison of members and non-members based on socio-economic characteristics. Also a comparison of farm performance in terms of total production, crop yield, product quality, price, gross income and net income between members and non-members is presented. Second, we provide econometric results focusing on the inclusiveness and membership effects. Third, qualitative results on the PO service by types of value chain are presented.

### **5.1 Comparative analysis**

#### *a) Characterisation of members and non-members*

We found that PO members differ from non-members in terms of socio-economic characteristics, productive asset ownership, and access to institutions and services. We used an independent t-test for this comparative analysis. The results (Table 5.2) show that PO members are different from non-members by most of the human capital variables except household head age and sex.

On average, PO members have a larger-sized family and have thus more family labour available. PO members have a significantly more entrepreneurial attitude and show more innovativeness as compared to non-members. In terms of resource endowment, PO members have larger livestock holdings, farm size, and malt barley area as compared to non-member farmers. With respect to access to services, PO members (62%) have significantly more contact with extension services than non-members (21%). On average, 61% of PO members have savings, which is significantly higher compared to non-members (34%). The mean distance to markets is significantly higher for PO members at 1% level of probability.

**Table 5.2.** Characteristics of farmers, according to PO membership

Variables	Full sample	Member	Non-member	Diff.	Sig.
<b>Human capital</b>					
Age (year)	44.16 (0.97)	45.45(1.27)	42.73(1.48)	2.72	
Sex (0-1)	0.986 (0.01)	0.987(0.01)	0.985(0.01)	0.001	
Family size (No.)	6.46 (0.22)	7.37(0.27)	5.44(0.29)	1.93	***
Available family labour (No.)	3.92 (0.16)	4.49(0.23)	3.28(0.19)	1.2	***
Education (year)	4.54 (0.28)	4.03(0.38)	5.11(0.42)	-1.08	*
Innovativeness <sup>7</sup>	2.73 (0.07)	2.89 (0.09)	2.54 (0.08)	0.35	***
Entrepreneurial attitude <sup>8</sup>	2.66 (0.07)	2.79 (0.09)	2.51 (0.08)	0.28	**
<b>Livelihood and resource endowment</b>					
Farm size (ha)	2.79 (0.21)	3.73 (0.34)	1.76(0.17)	1.96	***
Malt barley area (ha)	0.69 (0.06)	0.94 (0.10)	0.44(0.03)	0.5	***
Barley farming experience(year)	20.00 (0.95)	20.05 (1.28)	19.94(1.42)	0.11	
Food insecurity (0-1)	0.18 (0.03)	0.15 (0.04)	0.21(0.05)	-0.06	
Off-farm activity (0-1)	0.22 (0.03)	0.19 (0.04)	0.27(0.05)	-0.079	
Total livestock holding (TLU) <sup>b</sup>	8.60 (0.79)	11.47 (1.38)	5.39(0.47)	6.08	***
<b>Access to institutions and services</b>					
Savings (0-1)	0.48 (0.04)	0.61 (0.05)	0.34(0.06)	0.27	***
Mobile ownership (0-1)	0.62 (0.04)	0.67 (0.05)	0.57(0.06)	0.09	
Extension contact (0-1)	0.43 (0.04)	0.62 (0.05)	0.21(0.05)	0.41	***
Access to credit (0-1)	0.09 (0.02)	0.07 (0.03)	0.11(0.04)	-0.04	
Distance to market (Km)	9.68 (0.36)	12.29 (0.52)	6.76(0.17)	5.54	***
Debo membership (year)	19.66 (0.92)	20.18 (1.18)	19.07(1.44)	1.10	
Iddir membership (year)	19.05 (0.92)	19.05 (1.18)	19.04(1.45)	0.007	
N	148	78	70	148	

Source: Author's calculation based on field survey; Standard errors in parentheses; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10; b = TLU = Tropical Livestock Unit, to describe livestock numbers of various species as a single unit.

### b) Production, quality and income

In Table 5.3 we present the results on malt barley production, yield, prices, product quality, malt barley income, production costs, food crops income, and total household income. We observe important differences in total production, prices, product quality, production costs, farm income and off-farm income between PO members and non-members. The results indicate that membership has a positive and significant effect on malt barley production and product quality, and hence on malt barley prices. Members also make more costs than non-members, which might be linked to improving quality. Moreover, PO membership has a positive and significant impact on the total farm income. On the other side, membership has a negative and significant effect on off-farm income. The results also clearly show that although PO members have significantly higher total

<sup>7</sup> Innovativeness measures, on a Likert scale, farmers' behaviour towards innovation. For example we ask questions such as: Are you enjoying trying out new things? Are you among the first to try new activities? Are you actively seeking new markets?

<sup>8</sup> Entrepreneurial attitude measures, on a Likert scale, farmer's entrepreneurial attitude. Do you consider yourself an entrepreneur? Are your neighbours considering you as an entrepreneur? Do you see and recognise good chances?

malt barley production, they do not have significantly higher yields per hectare. Surprisingly, non-members achieve higher yield and net income per hectare than members. These differences, however, are not statistically significant. So we need to be careful in drawing conclusions. Despite this direct comparison, it should be noted that robust inferences and conclusions of impact of PO membership on performance can only be drawn when controlling for confounding factors. Thus, reliable membership effects are estimated using PSM technique.

**Table 5.3.** Comparison in the performance of PO members and non-members

Performance indicators	Full sample	Mean outcomes		Diff.	Sig.
		Member	Non-member		
MB <sup>b</sup> total production (qt)	11.99 (0.85)	15.39 (1.46)	8.20 (0.49)	7.19	***
MB productivity (qt/ha)	18.80 (0.51)	18.11(0.79)	19.57(0.62)	-1.46	
MB Price (ETB/qt)	829 (8.33)	871(10.40)	782 (10.80)	89.56	***
MB variable cost (ETB/qt)	237(10.29)	246(11.77)	196(16.88)	50.27	*
MB gross income (ETB/ha)	15576 (47)	15813 (738)	15312 (567)	500.6	
MB net income (ETB/ha)	10990 (77)	10712(855)	12273 (1828)	-1561	
MB stated quality <sup>a</sup>	2.08 (0.04)	2.21(0.06)	1.96 (0.06)	0.25	***
Other crops income (ETB/ha)	7202 (82)	7710 (1138)	6635 (1200)	1075	
Total farm income (%)	94.5 (0.92)	96.2 (0.99)	92.64(1.57)	3.51	*
Off-farm income (%)	5.5 (0.92)	3.84 (0.99)	7.35(1.57)	-3.51	*

Source: Author's calculation based on survey data; *Note:* Standard errors in parentheses; a = Farmers ranked quality of their malt barley: 1 low quality through 3 high quality; b = Malt barley; \*\*\* P < 0.01, \*\* P < 0.05, \* P < 0.10; qt = quintal =100kg; ha = hectare; ETB = Ethiopian birr, local currency

## 5.2 PSM analysis

### a) Factors determining PO membership

A logistic regression model was fitted to identify factors that affect a farmer's decision to participate in a PO. The likelihood of being a member of a PO is modelled as a function of selected observed characteristics. We summarise and present the main results in Table 5.4. In the analysis, we include seven covariates, four of which explain membership. These include farm size, malt barley farming experience, livestock holding, and distance to market. The results are robust as the model shows a highly significant association of membership with the covariates. The model's chi-square value indicates a high significance level. Moreover, the pseudo R<sup>2</sup> (0.56) also shows a good model fit. Finally, the model indicates that 88% of sample observations are correctly predicted.

We find that PO membership is positively related to farm size, livestock holding, and distance to market but negatively associated with malt barley farming experience. Our findings, consistent with Abate et al. (2014), Bernard and Spielman (2009), and Fischer

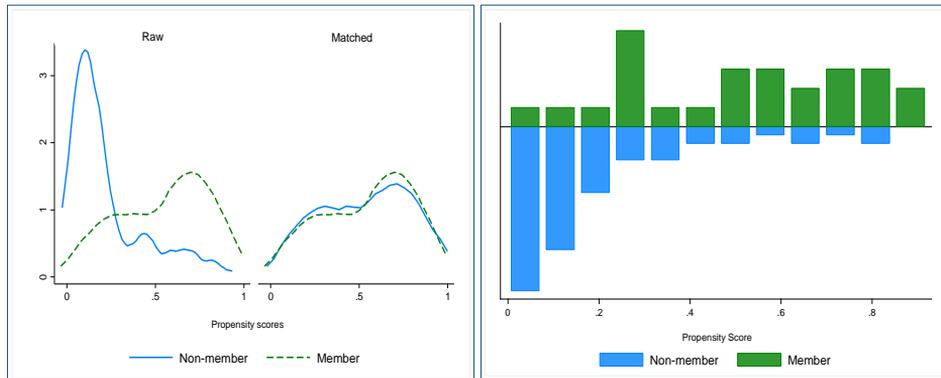


in collective institutions. Those studies further identified that there is a middle-class effect. This means that the probability of PO membership is higher among farmers with an intermediate level of resources. Owners of very small and large farms are less likely to join POs. Contrary to these studies, a more recent study by Chagwiza et al. (2016) has indicated that dairy POs in Ethiopia are inclusive of poorer smallholders. The authors claim that POs are pro-poor as resource-limited small farmers benefit from PO services through intensification effects. Several empirical studies show that distance to market (road) has an inverted U-shaped relationship with membership (Abebaw and Haile, 2013; Fischer and Qaim, 2012; Verhofstadt and Maertens, 2014a). That is, distance to market increases probability of membership up to a certain threshold, beyond which it declines.

*b) Average treatment effects of membership*

We used a logit model to estimate the propensity scores. The propensity score for members ranges from 0.022 to 0.99 with a mean value of 0.821. The mean value of propensity scores for the non-members is 0.202 with the range of 0.009 - 0.882. Since the matching procedure uses the propensity scores rather than all covariates, it is necessary to check whether the matching procedure successfully balances the distribution of the covariates used to predict the propensity score in both the treatment and control group.

We checked the common support assumption for the overlap in the distribution of propensity scores. The overlap in the predicted scores of the treatment and control groups were examined using a histogram of the propensity score distribution (Figure 5.5, right panel). The histogram provides a visual check of the degree to which there are similar cases in the matched non-member and member groups. Another regularly used approach to check for common support is the minima and maxima comparison. With this approach one ignores all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group (Caliendo and Kopeinig, 2008). According to this approach, the common support region is [0.022, 0.882], which suggests adequate overlap. In Figure 5, left panel, we also show the density distribution of the propensity scores for the two groups before and after matching.



**Figure 5.5.** Propensity score distribution and common support (before and after matching)

The estimates for average treatment effect on the treated (ATT) measure the mean impact that PO membership has on its members along a number of variables. The empirical results show that PO membership increases agricultural performance (Table 5.5). Overall, we found that PO membership has a positive effect on malt barley production, productivity, quality, price, and net income. But the impact on production, productivity, and product quality is not statistically significant. On average, PO members have 3895 birr higher malt barley net income per hectare than non-members. We also found that PO members received 38 birr higher malt barley price per quintal than non-members. Similar results have been reported by Bernard et al. (2008b) who showed that PO members received significantly higher prices for farm outputs compared to non-members. However, those authors also found that POs have limited impact on farm output sold.

The explanation for the positive effects of POs in our study could be the multiple services that POs provide to their members. POs facilitate agricultural training and provide market information. They are also directly involved in the supply of fertilizers and improved seeds, at lower costs. In addition, member farmers can access extension and advisory services from POs which help them to produce better quality products. With the engagement of breweries in the upper part of the value chain, quality has become more important and has led to higher prices. Furthermore, we found that membership has a positive and significant effect on the income from food crops. In addition to malt barley, farmers sell parts of their food crops. On average, PO members have 3216 birr higher food crops income per hectare than non-members. As the POs under study are multipurpose, their services also enhance food crop production and marketing.

**Table 5.5.** Estimation of ATT of PO membership

Performance indicators	Diff.(ATT)	Std. error	P >  z
MB total production (qt)	1.42	1.58	0.369
MB productivity (qt/ ha)	1.88	1.82	0.301
MB price (ETB/ qt)	38.3	18.57	0.039**
MB net income(ETB/ ha)	3895	402.14	0.000***
MB stated quality	0.19	0.201	0.339
Food crops income (ETB/ha)	3216	1821	0.077*

Note: ATT is estimated using psmatch command in stata 14; \* P < 0.10; \*\* P < 0.05; \*\*\* P < 0.01

Unlike the direct comparisons shown in Table 5.3, the ATT-estimates control for the selection bias. Thus, the ATT-estimates measure the difference in the performance of the two groups due to membership. One can observe the difference in magnitude and levels of significance in the selected performance indicators reported in Table 5.3 and Table 5.5. Such discrepancy is likely to be due to the difference in precision between direct comparison and PSM. The fact that our samples are drawn from the same woreda might be a source of bias, i.e. non-members may benefit from spill-over effects. As members may systematically differ from non-members, a direct comparison (Table 5.3) of these two groups could be misleading. The PSM technique is more precise than the direct comparison. Hence, we consider the ATT-estimates (Table 5.5) to be better impact indicators.

The PSM results show that rural POs positively contribute to an increase in agricultural performance. Our result is in line with the growing body of literature on the positive effects of PO membership on farmer income (refer to section 2.1).

We conducted an additional analysis to examine whether POs are selective of member farmers to achieve efficiency. We employed a non-parametric Kruskal-Wallis test based on selected attributes of members. We consider member attributes such as innovativeness, entrepreneurial attitude, loyalty, participation, and leadership. The attributes are measured on a five-point scale ranging from strongly disagree to strongly agree. We used Cronbach's alpha for validity test, and the results show more than 0.7 for all attributes, demonstrating sufficient internal consistency. In Table 5.6, we present the summary of the results. The result shows that POs are selective in accepting farmers as members in order to achieve efficiency and business performance. For instance, PO<sub>6</sub> performs better in all selected performance indicators and has more innovative, entrepreneurial, and committed members. This result suggests that POs are not inclusive. Thus, for increased business performance POs tend to be selective of particular groups of

farmers. A similar result is reported by Lutz and Tadesse (2017), arguing that POs should take selection of members seriously to be able to engage in business activities and to achieve efficiency.

**Table 5.6.** Member attributes and performance of POs

Attributes	Mean values			P-value
	PO <sub>5</sub>	PO <sub>6</sub>	PO <sub>7</sub>	
<b>Member attributes</b>				
Innovativeness	2.80	3.26	2.63	0.091*
Entrepreneurial attitude	2.68	3.08	2.63	0.125
Leadership	3.45	3.65	3.34	0.798
Loyalty/commitment	3.57	3.68	3.52	0.640
Participation	3.19	3.22	3.11	0.151
<b>Performance indicators</b>				
MB total production (qt)	9.4	24.4	12.3	0.000***
MB price (birr/qt)	798	933	880	0.000***
MB stated quality	1.9	2.4	2.3	0.003***

Source: Author's calculation based on survey data; N = 78; \* P < 0.10; \*\*\* P < 0.01

### c) Robustness and matching quality

In the PSM analysis, we used kernel-based matching as a robustness check. The results, summarised in Table 5.7, are consistent with the results in Table 5.5 except for the significance for most of the performance indicators. We also checked matching quality using the covariates balancing test. The test results are presented in Table 5.8. The pseudo-R<sup>2</sup> indicates the explanatory power of the covariates. After matching there should be no systematic differences in the distribution of covariates between member and controls and, thus, the pseudo-R<sup>2</sup> value should be fairly low. Our result shows that the pseudo-R<sup>2</sup> decreased from 0.276 before matching to a range of 0.016 - 0.020 after matching (Table 5.8). These fairly low values indicate that after matching there was no systematic difference in the distribution of covariates between the two groups. A likelihood ratio (LR) test of joint significance of all model covariates is also used to check balancing. The LR test should not be rejected before, and should be rejected after matching. Our results confirm this. Thus, the matching process is successful regarding balancing distribution of covariates between member and control farmers.

**Table 5.7.** ATT of PO membership (kernel based matching)

Performance indicators	Diff.(ATT)	Std. error	t-stat
MB total production (qt)	1.75	1.83	0.96
MB productivity (qt/ha)	0.73	1.95	0.37
MB price (ETB/qt)	46.78	29.12	1.61*
MB net income (ETB/ha)	3967	10037	0.40
MB stated quality	0.12	0.18	0.66
Food crops income (ETB/ha)	3506	3239	1.08

Note: ATT is estimated based on psmatch2 command in stata, \* significant at 10%

**Table 5.8.** Balancing of covariates before and after matching

Tests	Before matching	After matching		
		Three-nearest	Kernel	Radius
Pseudo-R <sup>2</sup>	0.276	0.020	0.020	0.016
LR $\chi^2$	29.32	1.45	1.32	1.19
P-value	0.000	0.984	0.988	0.991
Mean bias	32.5	10.5	11.9	8.2
Median bias	21.0	7.2	13.2	3.2

### 5.3 Qualitative analysis

The results of the qualitative study show that POs have important livelihood and economic benefits for member farmers and their rural communities. Particularly, the benefit in terms of access to fertilizers and improved seeds was well acknowledged in the focus group discussions (FGDs). We learned from the FGDs that POs organise agricultural training related to cultivation techniques including weed and pest management. For instance, in one of the FGDs, row planting and proper application of fertilizers was mentioned as a lesson learnt from recent training. These cultivation techniques have a positive effect on crop yield and product quality. Our findings are in line with other studies about POs providing services to improve farm productivity (Latynskiy and Berger, 2016; Shiferaw et al., 2011). The other important benefit that most participants mentioned, is the dividend that POs pay to members.

Given the change in malt barley value chains, POs provide services such as collecting and distributing market information, bargaining with customers, aggregating, transporting and storing products. They facilitate training provided by the processor on production and quality improvement of malt barley. They are also involved in facilitating quality-grading of malt barley by experts from the processing company. Consequently, member farmers are engaged in product upgrading and receive price premiums of up to 20%, which have a direct effect on farm income. Similar results are reported by Trebbin (2014), showing that POs in India played an important role in linking farmers to modern value chains, Fischer and Qaim (2012) showing similar results for banana farmers in Kenya, and Moustier et al. (2010) showing that POs in Vietnam help farmers to access high-value markets.

In the FGDs, participants from POs that are not linked to foreign breweries indicated that their involvement in value-adding activities is limited. We also learned from in-depth interviews that low levels of marketing are mainly attributed to weak organisational

capacities due to low educated leaders, low member commitment, and weak interaction with the union. This result is consistent with Hannan (2014), who showed that good governance of a PO essentially concerns good management and leadership which ultimately determines the business performance of a PO. Bijman et al. (2016) also argued that effective participation in value chains and linkages to demanding markets require increased member commitment and active participation. In sum, to link-up farmers to demanding markets, the provision of business-oriented services, adherence to good governance, having committed members and effective leaders are all necessary.

## **6. Conclusion and implications**

Due to changes in markets, technology and government policies, the institutional environment of rural POs in African countries is rapidly changing. These changes require POs to adjust their organisational structures and their strategies to be able to more effectively link smallholders to modern food chains. POs are becoming more business-oriented (Bijman et al., 2016; Penrose-Buckley, 2007). Involvement in agribusiness activities, innovation and upgrading has implications for inclusion of particular groups of farmers.

This chapter sought to contribute to the debate about the efficiency and inclusiveness of rural POs. Specifically, we attempted to provide empirical evidence on the determinants of participation, the extent of inclusiveness, and the membership effects. We employed a PSM technique to control for selection bias and to determine the average membership effects.

Our findings show that, consistent with literature, the motivation to participate in a PO is determined by demographic and economic factors. We found that large landholding and more farm resources increase the likelihood of participation in a PO. This suggests that poorer farmers are excluded from membership. It seems that POs are becoming more selective in accepting members, in order to improve efficiency. Membership seems to be especially beneficial for innovative and entrepreneurial farmers. We also find a positive relationship between distance to market and PO membership. This suggests that in remote areas, agricultural POs can be considered to be a suitable institution to support smallholders' market access (by reducing transaction costs) and thereby improve their livelihoods.

We find a positive relationship between membership and various performance indicators. PO membership positively affects total malt barley production, yield, price, product quality, net crop income, and income from food crops. These estimated impacts on farm performance and rural livelihood appear to be in line with previous studies in agribusiness and development economics. We attribute these positive effects to the fact that rural POs provide access to better seeds and fertilizers at relatively low prices, and to technical assistance and market information.

Considering POs in rural Africa, there is a clear development dilemma. Should POs focus on business and make a profit for internal capitalisation and investment, or should they be inclusive and contribute to community and rural development? Commercial orientation may result in only the most efficient farmers being welcome, and the exclusion of other farmers. This conflicts with the traditional idea among supporters of cooperatives, such as governments and NGOs, that POs should be inclusive and contribute to community and rural development. Our results show that there is tension between efficiency and inclusiveness of agricultural POs.

Our study has implications for public policies in Ethiopia. To enhance the role of POs in commercialisation of smallholder agriculture, the government of Ethiopia follows two complementary lines (ATA, 2016). The first line is to transform POs into efficient business-oriented organisations to increase quantity and quality of output. The second line is to improve the organisational capacity of POs. In relation to these policies, we suggest measures to strengthen the role of POs at local level in two ways. First, to strengthen support to the commercial activities of the PO: (a) enhancing access to finance; (b) providing facilities for quality grading and storage; (c) ensuring networking of POs within a union and actors downstream in the food chain, such as a processor; and (d) using appropriate incentives for increasing members output. Second, enhancing the internal organisation and management of POs through participation in training programmes. For instance, the provision of short-term and long-term training programmes for PO leaders may strengthen internal governance.

Our study is not without limitations. Because of time and logistic reasons, the sample has been restricted to the Arsi area and therefore is not representative of the whole country. To generalise the results to the national level, the study should have participants from

different regions. In addition, non-members may experience spill-over effects and in some cases have equal access to fertilizers, which may result in a bias in the treatment effect.

However, the results of this study encourage further research on how innovations in governance and strategy of POs relate to integration into modern value chains. The key research issue would be about the organisational attributes that qualify POs to engage in modern food chains. The shift towards market orientation influences the organisational structure of the PO. Rigorous research is therefore needed on the determinants of the PO market orientation and the associated organisational restructuring. In addition, we suggest further investigation of the transformation processes in other sectors, notably dairy, grains, and vegetables. This will generate better insights on the impact pathways of POs in the modernisation of African agriculture.



**Chapter 6**  
**Quality Improvement in Food Supply Chains:**  
**Determinants of Farmer Performance**

**Publication information:** Tefera D.A., Bijman J., Slingerland M.A., Van der Velde G., Omta O. Quality improvement in African food supply chains: Determinants of farmer performance. *It has been submitted to a Journal*

## **Chapter 6**

# **Quality Improvement in Food Supply Chains: Determinants of Farmer Performance**

### **Abstract**

The integration of smallholders in modern value chains in sub-Saharan Africa is an important pathway for improving income and farmer livelihoods. Connected to demographic shifts, rapid urbanization, and the emergence of a middle-class, there is a demand for higher product quality. Smallholders need to enhance the quality of their products to access modern food markets, but factors that determine smallholders' decision to invest in quality upgrading are not well understood. Using cross-sectional data from the Ethiopian malt barley value chain, we analyse the factors that explain smallholders' decision to improve quality. We also develop a new conceptual framework for studying quality improvement at farm level. Our findings show that socioeconomic, institutional and market factors affect the smallholder's decision to improve product quality. The findings lead to a number of policy implications.

**Key words:** Product quality, value chain, institutional arrangements, smallholders, sub-Saharan Africa, Ethiopia

## 1. Introduction

In most sub-Saharan Africa (SSA) countries smallholder agriculture is an important driver of food security, rural employment, and reducing poverty. In Ethiopia, for instance, more than three-quarters of the population is employed in smallholder agriculture and about 40% of the GDP is derived from this sector (FDRE, 2016). However, food insecurity and malnutrition is still prevalent in rural areas, where most of the population rely on low-productivity semi-subsistence farming. In recent decades, SSA food systems have changed due to rising incomes, urbanization, and globalization (Jayne et al., 2010; McCullough et al., 2008; Minten et al., 2016; Tschirley et al., 2015). These changes affect both export supply chains and emerging domestic food chains (Haggblade, 2011). Smallholders are increasingly integrated in these chains, which means they purchase more and other inputs, they change their cultivation methods, and they sell a larger share of their production. Value chain integration is often seen as a pathway to increase food security and improve smallholders livelihood (Bolwig et al., 2010; Kilelu et al., 2017a; Kissoly et al., 2017).

Many studies have been conducted about how best to integrate smallholders in agricultural value chains, for improved productivity and welfare effects (Barrett, 2008; Barrett et al., 2012; Maertens et al., 2012; Minten et al., 2016; Verhofstadt and Maertens, 2013). However, as food security has been the main focus of these studies, not much attention has been given in to product quality improvement. Driven by the emergence of a middle-class and changes in consumption patterns, the demand for processed foods as well as higher quality products is on the rise. Tschirley et al. (2015) argue that the increasing diversity in diets and the growing demand for product quality will lead to more processed and non-grain food products. The demand for higher quality food products by the growing number of urban food consumers offers both opportunities and challenges for smallholders (Bijman and Bitzer, 2016).

Producing better quality products will increase smallholders' competitiveness as well as their ability to access more remunerative markets. However, quality improvement involves risk taking and investments, which could be challenging for resource-poor farmers. Producing quality products for demanding markets requires adoption of new standards, exerting more effort (thus cost) in the processes of producing, harvesting, sorting, storing, packaging, and marketing. Complying to those quality requirements is

challenging for smallholders given their lack of appropriate and sufficient farm resources and farmer capabilities (Poulton et al., 2010). To overcome these challenges and link smallholders to demanding markets, three types of institutional arrangements including Producer Organizations (POs), Contract Farming Arrangements (CFAs), and partnerships are often suggested (e.g. World Bank, 2008). Royer et al. (2016) claim that participation in these institutional arrangements help farmers to improve product quality and access modern chains. These institutional arrangements facilitate smallholder access to inputs, credit and extension services, and enhance coordination in value chains (Kilelu et al., 2017b).

Our study uses a micro-perspective in exploring the determinants of the farmer decision to engage in quality improvement activities. This chapter contributes towards filling the empirical and theoretical gap in the development literature through employing an econometric model and developing a new conceptual framework to investigate the factors influencing quality improvement by smallholders.

Our approach is based on a case study of a domestic food chain, the Ethiopian malt barley value chain. Driven by the fast growing brewery industry in Ethiopia, the malt barley value chain is undergoing fundamental changes (Rashid et al., 2015). The demand for malt barley is growing fast and a number of foreign-owned breweries started sourcing malt barley from smallholders. The production of barley with good malting quality is of critical importance to the brewery industry. Previous studies on the barley sector focused on trade arrangements, value chain description and actors' collaboration (Alemu et al., 2015; Persoon, 2014; Watabaji et al., 2016a). To our knowledge, no study has systematically explored the factors that affect smallholder performance in improving quality at micro level. The main objective of this study is, therefore, to better understand how smallholders manage quality improvement in malt barley chains. Our main research questions are: (1) What factors determine smallholders' decision to improve malt barley quality?, (2) Which institutional arrangements provide farmers with the necessary incentives to improve quality?, and (3) Does investing in malt barley quality pay-off for smallholders?

The chapter is organized as follows. Based on a review of the literature, section 2 provides the analytical framework of the study. Section 3 provides description of context value chain. Section 4 presents the methodology including data collection and analysis

approaches. Section 5 presents findings. Section 6 discusses these findings. Finally, section 7 concludes and presents policy implications.

## **2. Building an analytical framework**

Quality and safety are becoming increasingly important in the management and marketing of food products. In a dynamic market environment, quality attributes of a product are a critical element in competition (Bowbrick, 2014). Quality is a complex concept, the meaning of which may vary for specific products and between individuals, regions and countries. Thus, quality may have a different interpretation for different value chain actors (Van Tilburg et al., 2007). For producers the main quality attributes include crop yield and disease resistance, for processors it is the uniformity of the raw material, for the wholesaler it is shelf life and availability, and for consumers it is healthiness, taste and convenience.

Two types of quality attributes are often identified in the development literature (Bijman and Bitzer, 2016; Bowbrick, 2014): intrinsic quality and extrinsic quality. Intrinsic quality attributes are those attributes directly related to the physical characteristics of a product, such as colour, texture, shape, appearance, size, taste, moisture content, and protein content. Extrinsic quality attributes do not directly relate to the physical characteristics of the product; examples include brand name, type of shop the product sells, and the specific social and environmental conditions of production and distribution.

Improving product quality involves costs for the producers (Bowbrick, 2014; Mujawamariya et al., 2012). Producers incur costs in cultivation, harvesting, sorting, and packaging and storing. Farmers will only accept these cost if there is a good chance their revenues more than offset the additional costs.

Malt barley is a speciality product with both intrinsic and extrinsic quality attributes. Intrinsic malt barley quality is associated with the physical properties consisting of grain size, colour, appearance, moisture content, and protein content. These attributes can be managed and improved through good crop management, proper harvesting and post-harvest handling. Extrinsic quality of malt barley is not directly related to the physical properties, but includes for instance the use of pesticides in cultivation. In the brewery

industry the intrinsic quality attributes of malt barley are highly relevant and therefore they are commonly measured in malt barley transactions.

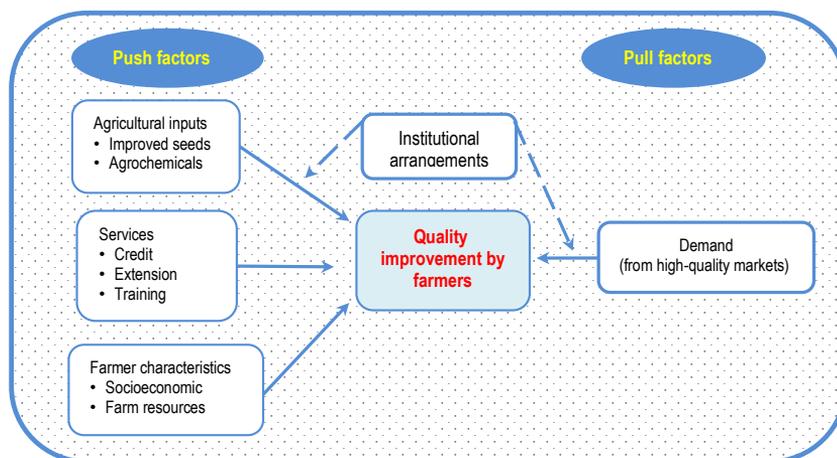
At micro level, the decision of the smallholder to engage in quality improvement is determined by several factors. For instance, Royer and Bijman (2012), studying the Benin pineapple sector, identified six factors that influence quality improvement at farm level. These include: (a) agronomic techniques used by the farmer, (b) access to inputs, (c) availability of market information, (d) extent of transaction costs, (e) quality of the physical infrastructure, and (f) availability of certification services. Mujawamariya et al. (2012) indicated that harvest and post-harvest practices, environmental factors and market factors (such as a price incentive) determine the supply of quality gum arabic by local collectors in Senegal. On top of these factors, participation in institutional arrangements (POs and CFAs), farmers socioeconomic characteristics, and the presence of specific buyers could influence the smallholder decision to improve product quality.

These factors can influence the smallholder decision to improve quality along two pathways: push factors (supply side) and pull factors (demand side) (see Figure 6.1). The push factors can be grouped into three categories: farmer socioeconomic characteristics, access to agricultural inputs, and availability of services. Let us zoom in on these factors. First, socioeconomic characteristics such as age, innovativeness, education and entrepreneurial attitude of the household head, and available farm resources enable smallholders' capacity and capability to improve quality. Knowledge and experience play a key role in farmers' decisions to adopt innovation and to interpret information related to quality requirements (Meijer et al., 2015). Farmers' education and knowledge affect technology adoption and implementation of farm management practices that could improve productivity and quality (Royer and Bijman, 2012).

Second, access to inputs affects smallholders' involvement in quality improvement. To improve crop yield & product quality, access to and utilization of modern inputs greatly matter. For instance, adoption of improved varieties, fertilizers and pesticides increased wheat productivity and quality in Ethiopia (Shiferaw et al., 2014). Third, services including credit, extension, and training help farmers to upgrade their product. For instance, credit is used from traders, agro-dealers, and other sources to smooth-out farmers' capital constraint to purchase the necessary inputs (Olomola, 2014). These

different services are crucial in upgrading quality by farmers and could be provided by the state or private sector or NGOs.

Pull factors mainly include the demand dimension (Figure 6.1). Accessing high-quality markets requires producing products that fulfil high-quality requirements (Reardon et al., 2009). Producing high-quality products implies additional costs for the farmer, which she will only accept if there is a good chance the additional revenues more than offset the additional costs. Thus, there should be particular demand conditions that induce farmers to decide to improve quality. For instance, buyers are paying higher prices for better quality products.



**Figure 6.1.** Conceptualizing determinants of quality improvement at micro level  
(Source: Authors' design)

Institutional arrangements such as CFAs and POs are often used to remedy the institutional void in linking smallholders to markets (Narrod et al., 2009; Royer et al., 2016; Suli et al., 2013). They often facilitate the availability of market information for farmers and reduce market risks. We argue that these institutional arrangements are also important on the supply side (Figure 6.1), through supporting farmers' access to modern inputs and services. Several studies have shown that POs provide services that are critical for enhancing farmers' capacities to meet the quality demands and link-up in high-value markets (Fischer and Qaim, 2012, 2014; Latynskiy and Berger, 2016; Shiferaw et al., 2011; Trebbin and Hassler, 2012). POs do this by (a) facilitating information flows and reducing

transaction costs; (b) giving technical assistance and collective purchasing of modern inputs; (c) providing storage and transportation services.

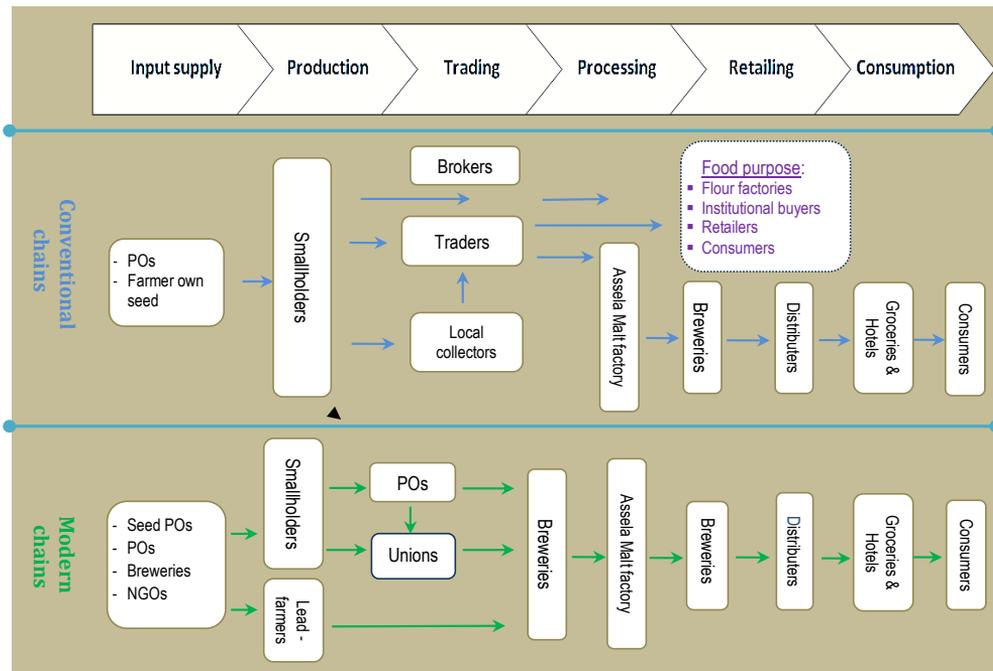
A rapidly growing literature portrays CFAs as an innovative approach to promote value chain development and to link smallholders to markets through facilitating access to modern inputs, credit, and specialized training (Abebe et al., 2013; Jia and Bijman, 2014; Kleemann, 2016). The demand for food quality and safety leads to more vertical coordination in food value chains, and CFAs help to organise the strict coordination needed (Bijman and Bitzer, 2016). Royer et al. (2016) provide an overview of how CFAs facilitate quality improvement by smallholder farmers: access to credit, supply of modern inputs, extension and advisory services, quality control and inspection services, and market linkages. The effectiveness of CFAs depends on a number of factors such as product characteristics and institutional environment. For instance, CFAs have been effective in high-value products such as horticulture and vegetable supply chains (Maertens et al., 2012)

Based on the above review of the development literature, we developed a number of propositions that provide guidance for the empirical investigation of the factors influencing smallholder performance in improving quality. The propositions of this study are as follows. First, farm resource endowments positively affect smallholder performance in improving malt barley quality. Second, the use of improved seed varieties positively relates to malt barley quality improvement. Third, membership in a PO increases the likelihood of improving malt barley quality. Fourth, participation in a CFA promotes malt barley quality improvement.

### **3. Malt barley value chain in Ethiopia**

In this section we provide an overview of the value chain context. Barley is among the top five important cereal grains in Ethiopia (CSA, 2015). Two types of barley exist: food barley (food purpose) and malt barley (brewing beer). The Arsi highlands of Oromia are the main production area of malt barley (ATA, 2016) and the Assela Malt Factory (AMF), located in this area, is the largest malt barley processing plant in the country. The value chain of barley – malt - beer consists of input supply, production, trading, processing, retailing, and consumption (Tefera et al., 2016b). Driven by the fast growing brewery industry, the demand for malt barley has increased over the last decade, leading to a restructuring of

the malt barley value chain. Figure 6.2 shows the structure of the conventional and modern chains.



**Figure 6.2.** Conventional & modern malt barley value chains; Source: adapted from Tefera et al. (2016b)

In the modern chain, foreign breweries like Heineken (Netherlands) and Diageo (UK) are using vertical coordination in their supply chains. POs are the main suppliers to the companies and play intermediary roles including contract negotiation, product aggregation, and transportation (Alemu et al., 2015). CFAs are used to safeguard the vertical coordination between the companies and smallholders. In the conventional chain, AMF is the dominant buyer of malt barley from traders through spot market transactions. The conventional chain is characterized by a limited participation of POs, dominance of traders, and the involvement of many local collectors and brokers (Figure 6.2). The malt factory (AMF) has complained about quality problems of malt barley collected from traders (Watabaji et al., 2016a). Specifically, problems of impurity and variety mix were raised as the main quality problems in the conventional chain.

Malting is a biological process that turns barley into malt, the key ingredient in beer making (Oser, 2015). It is a three step process consisting of steeping (soaking the barley grains into water), germination, and kilning (drying the final malt). Malt quality essentially depends on the malting quality of barley grains. Thus, barley must meet strict quality criteria to be acceptable for malt production and indirectly for beer production. The main attributes of high quality malting barley are high germination rate (>95%), good grain size, natural colour, low moisture content (<13.5%) and low protein content (9-11.5%) (Kumar et al., 2013; Oser, 2015).

We observed in the field that the quality standards used by AMF are the industry standards. However, foreign brewers used their own private grades and standards in purchasing malt barley through the modern chain. They strictly applied the quality standards as malt quality is highly dependent on the quality of malt barley grain. In-depth interviews also showed that the main factors that could affect the malting quality of barley include the variety used, the agronomic practice, crop management, and the post-harvest handling. We asked farmers how they determine the quality of malt barley and most of them use colour, grain size, absence of foreign matter, and varietal purity as key parameters. Traders also used the same parameters.

## **4. Methodology**

### **4.1 Data collection**

We collected primary data using a farm household survey in April-May, 2015. A multi-stage sampling technique was employed to select targeted farm households. First, we purposively selected Lemu Bilbilo district (=woreda) in the Arsi highlands. Second, we selected seven POs of which four are participating in modern chain and three are in conventional chain (Table 6.1 and Figure 6.3). In Table 6.1 we present the basic characteristics of the seven POs including information on membership size, gender composition, and whether they are involved in CFAs (CFA status). The selected POs are rather diverse: the membership size varies from 164 to 367; the female membership ranges from 3 to 10 percent; the average entrance fee varies from 20 to 50 Birr; and the POs are 3 to 16 km away from the woreda market.

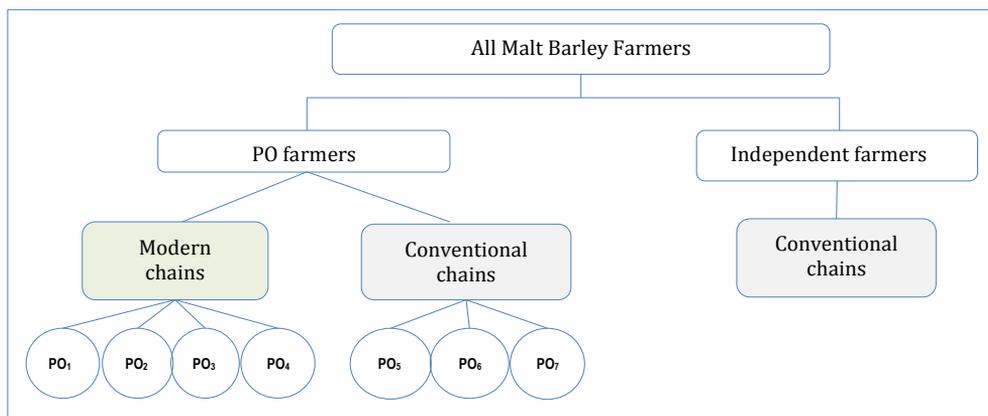
In Figure 6.3, we show the sample malt barley farmers by the types of value chains and PO membership. POs are involved both in the modern and the conventional chain. Four of

the total sampled POs (PO<sub>1</sub>-PO<sub>4</sub>) are linked to the modern chains, while the other three (PO<sub>5</sub>-PO<sub>7</sub>) operate in the conventional chain. In addition, we have sample independent farmers who participated in the conventional chain.

**Table 6.1.** Characteristics of selected producer organizations

Villages	PO#	# of farmers selected	Membership			Entry fee (Birr)	CFA status	Distance to mkt (Km)
			Male	Female	Total			
Bekoji Negeso	PO <sub>1</sub>	29	329	38	367	20	Yes	3.0
Lemu Dima	PO <sub>2</sub>	28	266	29	295	20	Yes	6.8
Lemu Burkitu	PO <sub>3</sub>	23	242	22	264	35	Yes	9.6
Chiba Micheal	PO <sub>4</sub>	30	345	10	355	24	Yes	3.6
Lemu Micheal	PO <sub>5</sub>	25	359	8	367	50	No	8.1
Ululee Hassa	PO <sub>6</sub>	26	181	8	189	20	No	12.3
Koma Katera	PO <sub>7</sub>	27	158	6	164	50	No	16.2
	Non-member	70					No	
Total		258	2,001					

Source: Authors computation from the survey and interview data



**Figure 6.3.** Malt barley farmers by PO membership and type of value chains

Finally, we randomly selected farmers from the PO member lists. We also selected independent farmers from similar villages (=kebeles) using a snowball approach. During the selection of farmers for the sample support was obtained from PO leaders and kebele chair persons. The final sample includes 258 households, including 43% who participated in the modern chain and 57% (27% independent farmers and 30% PO farmers) who sold their malt barley via the conventional chain. A questionnaire was prepared and carefully administered to gather household-level data. Well-trained enumerators have collected the data through face-to-face interviews. Semi-structured interviews were also conducted with key informants and actors within the value chains to gather insights from experts.

## 4.2 Data organization and analysis

Malt barley quality is the main dependent variable. It is an ordinal variable with ordered categories of quality. We asked each farmer to state the quality of their malt barley on a scale of 1 through 3, where 1 indicates a low quality and 3 a high quality. For control variables we used household age, education, entrepreneurial attitude, total livestock, farm income, PO membership, CFA participation, and types of improved and new seed varieties used. Finally, we used an ordered logit model to analyze the determinants of quality at farm gate. The use of this model is justified by the ordinal nature of our dependent variable. (Mujawamariya et al., 2012) used this model to assess the factors influencing the supply of quality gum arabic in Senegal. In Table 6.2 we present a summary of the expected signs of the effect of each of the determinants (discussed in Section 2) of quality improvement.

**Table 6.2.** Expected effect of variables on quality improvement

Variables	Measurement and description	Expected effect
<b>Farmer characteristics</b>		
Entrepreneurial attitude	Household head entrepreneurial attitude <sup>a</sup>	+
Education	Household head years of schooling	+
Age	Age of the Household head in years	+
<b>Resource endowment</b>		
Farm income	Proportion of farm income from the sale of crops, livestock, land rent out	+
Total livestock	Household's livestock ownership in TLU <sup>b</sup>	+
<b>Technology</b>		
Holker variety	Household use of Holker seed variety (0-1)	+
Traveler variety	Household use of Traveler seed variety (0-1)	+
Sabini Variety	Household use of Sabini seed variety (0-1)	+
<b>Institutional arrangements</b>		
CFA participation	Household participation in CFAs (0-1)	+
PO membership	Household membership in POs (0-1)	+

Note: a = a Likert scale variable with 5 scales; b= TLU = Tropical Livestock Unit, describes livestock numbers of various species as a single unit

Descriptive analysis was used to characterize and compare the performance of the three groups of malt barley farmers (CFA farmers, PO farmers, and independent farmers) in terms of socioeconomic attributes, access to technologies, organizational characteristics, and selected performance indicators. We used a non-parametric Kruskal-Wallis (KW) test and a chi-square test for the comparative analysis of the three groups. Correlation analysis and box plots were used to examine the relationship of product quality with prices and net income per hectare. The KW test was also used to check the strength of the associations among quality and prices and net income. As some of the variables in our

analysis are Likert scale variables (e.g. entrepreneurial attitude and innovativeness) we used Cronbach's alpha to validate internal consistency.

## **5. Results**

In this section, we present the results of the study in three parts. First, we present the comparative analysis of the three groups of farmers in terms of socioeconomic, technological, and organizational characteristics and selected performance indicators. Second, we provide the results on correlation analysis of quality, price, and net income. Third, we provide the empirical results on the determinants of smallholder performance in quality upgrading.

### **5.1 Descriptive results**

#### *a) Comparative analysis on household & farm characteristic for CFA, PO, and independent farmers*

In Table 6.3, we present farm level summary statistics. We present the mean scores of the three groups of farmers in terms of farmer characteristics, resource endowment, organizational characteristics, and access to technologies. Farmer level of education, available family labour, entrepreneurial attitude, innovativeness, and family size are significantly different among the three groups. CFA farmers are higher educated, have a more entrepreneurial attitude and show innovativeness than the other two groups. In contrast, PO farmers have more family members in the household and more labour available.

Farm resources enable farmers to implement farm management practices that affect technology use, crop yield and quality. Farmers with more resources are more likely to invest and engage in quality upgrading activities. Especially when farmers target high-value markets they require more resources for weeding, harvesting, and post-harvest product handling. As can be observed in Table 6.3, farm size, malt barley area, and total livestock holdings are significantly different among the three groups of farmers. PO farmers have larger farms and cultivate a larger malt barley area than the other two groups of farmers. But CFA farmers have more livestock holdings.

The other factors associated with quality upgrading at farm level are access to new technology and organizational characteristics. Two key institutional arrangements,

namely PO and CFA, are identified to promote product quality and link farmers to modern chains. On average, about 43% of the sample producers participated in CFAs and sold their malt barley through the modern chain. Interview results indicate that in the CFAs the processors provided modern inputs and specialized extension to malt barley producers. On average, about 30% of the sample producers are member of a PO and sell malt barley through spot market transactions in the conventional chain. In the field we observed that POs provide a range of services including improved seeds, fertilizers, market information, and technical assistance. All these services have positive implications for improving crop productivity and quality. The remaining 27% of sample producers did not belong to a PO or a CFA.

**Table 6.3.** Comparison on farmer and farm characteristics for CFA, PO, and independent farmers

Variables	CFA farmers (n=110)	PO farmers (n=78)	Independent farmers (n=70)	P-value
<b>Farmer characteristics</b>				
Age (years)	44.55	45.45	42.72	0.447
Education (years)	5.96	4.03	5.11	0.000***
Family size (#)	6.22	7.37	5.44	0.000***
Family labour(#)	3.82	4.48	3.28	0.000***
Farming experience (years)	23.11	23.72	20.70	0.288
Entrepreneurial attitude <sup>a</sup>	3.76	2.79	2.51	0.000***
Innovativeness <sup>a</sup>	4.06	2.89	2.54	0.000***
<b>Resource endowment</b>				
Farm size (ha)	2.70	3.73	1.76	0.000***
MB area (ha)	0.79	0.94	0.43	0.000***
Farm income (%)	96.81	96.15	92.64	0.371
Off-farm income (%)	3.18	3.85	7.36	0.371
Total livestock in TLU	14.45	11.47	5.39	0.000***
<b>Organizational characteristics</b>				
CFA participation(0-1)	110 (100%)	0	0	-
PO membership(0-1)	110 (43%)	78 (30%)	0 (27%)	-
<b>Technology</b>				
Holker variety (0-1)	110 (100%)	43 (55%)	14 (20%)	0.000***
Traveler variety (0-1)	0	0	6 (8.6%)	-
Sabini Variety (0-1)	0	0	27(38.5%)	-
Miscal-21 variety (0-1)	0	35 (45%)	23 (33%)	-
DAP fertilizer (qt)	2.6	1.6	1.7	0.000***
Urea fertilizer (qt)	0.48	0.47	0.31	0.409
NPS fertilizer (qt)	1.96	0.87	1.72	0.126
Herbicide 2-4-D (litre)	1.12	1.4	0.85	0.004***

Source: Survey data; \*\* P < 0.05, \*\*\* P < 0.01; qt = quintal = 100kg; MB = malt barley; ha = hectare; a= a Likert scale variable with 5 scales

In the study area, malt barley farmers have used various improved seed varieties, including Holker, Miscal-21, Sabini, and Traveler. The use of the Holker variety is significantly different among the three groups. All contract farmers used Holker, and PO farmers used Holker (55%) and Miscal-21 (45%). Independent farmers have used all types of varieties (Table 6.3). Malt barley farmers used three types of fertilizers: DAP,

Urea, and NPS. The use of DAP fertilizer is significantly different among the three groups of farmers. Contract farmers used more DAP than PO farmers and independent farmers. The three groups are significantly different in the use of the weed controlling herbicide 2-4-D.

Our descriptive analysis can be summarized as follows. (a) Contract farmers are higher educated and have a more entrepreneurial attitude, which could help them to understand the importance of quality upgrading and accessing better market opportunities. (b) PO farmers have more family labour, larger farms, and cultivate more malt barley, which could improve their capacity to improve quality. (c) Contract farmers use improved seeds and more modern inputs such as fertilizers, which could lead to intensification and ease quality improvement.

*b) Mean performance of contract, PO, and independent farmers*

Summary statistics for the mean performance of the three groups is given in Table 6.4. Our performance indicators include malt barley total production, yield, share sold, selling price, cost of production, malt barley income, and food crop income. Contract farmers perform better in all the selected performance indicators than the other two groups. Contract farmers perform best in improving quality. But improving quality requires additional investments in seed purchase, fertilizer purchase, and weeding. These costs are different among the three groups of farmers at 1% level of significance. Contract farmers have higher costs than the other two groups of farmers. This is plausible as the contractor (the brewery) demands high quality, requiring farmers to invest more to meet the quality requirements.

**Table 6.4.** Mean performance of contract, PO, and independent farmers

Performance indicators	CFA farmers (n=110)	PO farmers (n=78)	Independent farmers (n=70)	P-value <sup>a</sup>
MB production (qt)	17	15	8	0.000***
MB yield (qt/ha)	21.7	18.1	19.6	0.000***
MB stated quality	2.8	2.2	1.9	0.000***
MB selling price (ETB/ha)	1013	871	782	0.000***
MB share sold (%)	0.71	0.40	0.62	0.000***
MB gross income (ETB/ha)	22177	15813	15312	0.000***
MB production cost (ETB/ ha)	6634	5741	5577	0.000***
MB seed cost (ETB/ ha)	1245	816	780	0.000***
MB fertilizer cost (ETB/ha)	1307	1278	1282	0.000***
MB weeding cost (ETB/ha)	620	392	365	0.000***
Food crop income (ETB/ha)	13653	7710	6635	0.005***

Source: Survey data; \*\* P < 0.05, \*\*\* P < 0.01; ETB = Ethiopian birr, local currency; a = KW test

Thus, CFAs promote intensification in malt barley production. However, incurring increased costs is rewarding as contract farmers received higher prices for higher quality and obtained higher income than the other two groups. CFAs have also a commercialization role, contract farmers have on average sold 71% of their malt barley, which is significantly different and higher than the other two groups of farmer. In addition, food crop income is significantly different among the three groups of farmer.

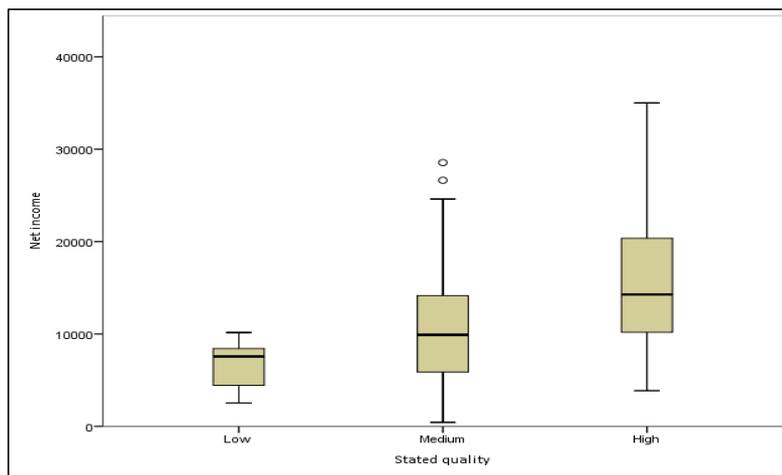
## **5.2 Does investing in quality pays-off?**

The key question here is whether or not investing in malt barley quality pays-off for smallholder farmers. We used Pearson correlation to see the association of product quality and selling price at farm level. The result ( $r = 0.726$ ,  $P\text{-value} = 0.000$ ) shows that malt barley quality is positively correlated with the selling price. This means, farmers receive a lower price for lower quality and a higher price for higher quality, indicating that quality is rewarded in malt barley transactions. As the foreign breweries place more emphasis on the quality of malt barley, they motivate producers through a price premium for quality. We also used the KW test to check the variability of the price among the three quality groups. The KW test ( $\chi^2(2) = 152.52$ ,  $P\text{-value} = 0.000$ ) indicates that there is a significant difference in selling price among the low, medium and high quality groups.

Product quality improvement entails adoption of improved technologies and increasing efforts and costs at the farm level. Smallholders need to invest time and resources to produce better quality malt barley, thereby increasing the cost of their farming business. Thus, to proof that investing in malt barley quality pays-off one needs to test the association of product quality and net return or income. The correlation result ( $r=0.363^{***}$ ) indicates that there is a significant positive correlation between malt barley quality and net income per hectare. We also used box blots (Figure 6.4) to see how net malt barley income per hectare varies among the three quality groups.

Figure 6.4 shows net malt barley income varies among the three quality groups. This means that net income is much higher in the high quality group than in the low quality group. The KW test result ( $\chi^2(2) = 26.285^{***}$ ) also revealed that the difference in malt barley net income is highly significant among the three quality groups. Thus, although investing in quality increase farm expenses (costs for herbicides, improved seeds,

fertilizers, and labour), it pays off as farmers obtained higher malt barley net income per hectare.



**Figure 6.4.** Net malt barley income and product quality relation

### 5.3 Estimation results

#### *Factors affecting malt barley quality improvement*

In identifying the factors that affect smallholder performance in improving quality, we used the following procedure. First, we conducted a correlation analysis among covariates to check potential multicollinearity. We present the correlation matrix in Table 6.5. The results indicate that the correlation coefficients for all covariates are less than 0.7 (0.005 – 0.636), which suggests that multicollinearity is not a major problem. Second, an Ordinary Least Square model was fitted and the model was tested for multicollinearity using the variance inflation factor (VIF). The variance inflation factors for all covariates are less than 10 (1.03 – 4.19), which indicates that multicollinearity is not a serious problem in this model.

**Table 6.5.** Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10
1 Entre. attitude	1									
2 Education	0.302	1								
3 Age	-0.305	-0.489	1							
4 Total livestock	0.115	-0.005	-0.013	1						
5 Farm income	-0.026	-0.169	0.252	-0.090	1					
6 CFA participate	0.595	0.196	0.017	0.073	0.115	1				
7 PO member	-0.241	-0.206	0.064	0.006	0.044	-0.567	1			
8 Holker variety	0.427	0.071	0.011	0.038	0.109	0.636	-0.132	1		
9 Traveler variety	-0.022	-0.020	-0.151	-0.022	-0.084	-0.133	-0.101	-0.209	1	
10 Sabini variety	-0.216	0.028	-0.073	-0.052	-0.188	-0.294	-0.225	-0.463	-0.052	1

Source: Author's computation based on survey data

Finally, an ordered logistic regression model was fitted. The estimated coefficients of the model, the standard errors and levels of significance are presented in Table 6.6. The likelihood ratio statistics as indicated by Model  $\chi^2$  are highly significant ( $P < 0.000$ ), suggesting the model has a strong explanatory power. The pseudo  $R^2$  value (0.29) is also high, suggesting a good fit of the model. The parameter estimates of the ordered logistic model provide only the direction of the effect of the covariates on the dependent variable. As the coefficients do not represent the actual magnitude of change, the marginal effects are estimated to measure this magnitude (Table 6.7).

**Table 6.6.** Parameter estimates of the ordered logit quality improvement model

Covariates	Coef.	Std. err	Z	P >  Z
Entrepreneurial attitude <sup>a</sup>	0.599***	0.218	2.74	0.006
Education(year)	0.095*	0.049	1.93	0.054
Age (year)	0.035**	0.016	2.15	0.032
Total livestock in TLU <sup>b</sup>	0.005	0.011	0.41	0.678
Farm income (%)	0.017	0.014	1.25	0.210
CFA participation(0-1)	2.866***	0.578	4.96	0.000
PO membership(0-1)	0.994**	0.441	2.26	0.024
Holker variety(0-1)	0.656*	0.394	1.66	0.096
Traveler variety(0-1)	2.290**	0.968	2.36	0.018
Sabini variety(0-1)	1.015*	0.554	1.83	0.067
/cut 1	4.263	1.759		
/cut 2	7.815	1.847		

*Model diagnostics:*

Pseudo  $R^2 = 0.2948$

Model  $\chi^2 = 140.65$ \*\*\*

Log likelihood = -168.24

Number of observations = 258

Source: survey data; \*  $P < 0.10$ , \*\*  $P < 0.05$ , \*\*\*  $P < 0.01$ ; a Likert scale variable with 5 scales; b= TLU = Tropical Livestock Unit, describes livestock numbers of various species as a single unit

As can be observed in Table 6.6, age, entrepreneurial attitude and education positively and significantly affect smallholder performance in improving quality. This is plausible as education improves the ability interpret information related to quality. Age of the household is considered as a proxy for experience in farming, which would support quality improvement. Farmer entrepreneurial experience links to her ability to see new (income) opportunities by improving quality. As expected, our results show that PO membership, participation in a CFA, and the use of improved seed varieties increase the likelihood of improving quality by smallholders. The possible explanation for this pattern is that POs and CFAs facilitate the provision of modern inputs, new technology, and technical assistance which help farmers to improve crop productivity and quality. These institutional arrangements also help smallholders to link-up with remunerative markets and ensure premium prices. Surprisingly, resource endowment indicators, such as total

livestock and farm income, are not significantly determining quality improvement at farm level.

In Table 6.7 we report the marginal effects, which measure the expected change in the probability of a particular decision being made with respect to a unit change in a covariate. Farmer entrepreneurial attitude increases the likelihood of improving malt barley quality. For instance, a unit increase in the score of entrepreneurial attitude, say from “neutral” to “agree”, would result in a 2% and 13% less likeliness to be in the low and medium quality category respectively and 15% more likeliness to be in the high quality category. A unit increase in education and age of the household head results in a 2% and 0.8% increase in the probability of being in the high quality category respectively. The probability to participate in quality improvement is higher among smallholders linked to CFAs. A unit increase in contract participation would increase the smallholder chance of producing high malting quality barley by 61%. The probability to participate in the quality improvement is higher for smallholders who belong to POs. Being member of a PO increases the likelihood of producing high quality malt barley by 24% (Table 6.7).

**Table 6.7. Marginal effects from ordered logit quality improvement model**

Covariates	Low		Medium		High	
	Coef	p-value	Coef	p-value	Coef	p-value
Entrepreneurial attitude <sup>a</sup>	-0.017**	0.015	-0.133***	0.007	0.149***	0.006
Education(year)	-0.003*	0.071	-0.021*	0.057	0.023*	0.054
Age(year)	-0.001**	0.048	-0.008**	0.034	0.008**	0.032
Total livestock in TLU <sup>b</sup>	-0.0001	0.677	-0.001	0.679	0.001	0.678
Farm income(%)	-0.001	0.222	-0.004	0.212	0.004	0.210
CFA participation(0-1)	-0.086***	0.002	-0.524***	0.000	0.610***	0.000
PO membership(0-1)	-0.024**	0.021	-0.217**	0.020	0.241**	0.017
Holker variety(0-1)	-0.020	0.148	-0.142*	0.086	0.162*	0.089
Traveler variety(0-1)	-0.027***	0.001	-0.391***	0.000	0.418***	0.000
Sabini variety(0-1)	-0.020**	0.020	-0.219**	0.047	0.239**	0.041

Source: survey data; \* P < 0.10, \*\* P < 0.05, \*\*\* P < 0.01; a Likert scale variable with 5 scales; b= TLU = Tropical Livestock Unit, describes livestock numbers of various species as a single unit

As expected, utilization of improved varieties has a positive and significant impact on the probability to improve malt barley quality by smallholders. The probability of producing better quality malt barley is higher for smallholders who used the Holker, Sabini, or Traveler variety. For instance, the marginal effect results indicate that a unit increase in the use of Holker, Traveler, or Sabini variety would result in a 16%, 42%, and 24% increase in the probability of being in the higher quality category respectively.

## **6. Discussion**

The study of coordination, collaboration and quality alignment in food supply chains has become increasingly important in developing and emerging economies. Researchers and development practitioners acknowledge the relevance of coordination and value chain organization for better smallholder linkage to higher-value markets (Bijman and Bitzer, 2016). In our study, we focus on the factors affecting farmers' decisions to improve product quality. Using insights from literature, we developed a new conceptual framework for determinants of quality improvement at micro level. We argued that product quality improvement at farm level is conditioned by a combination of push and pull factors. At micro level, smallholders' quality improvement performance is influenced by socioeconomic characteristics, availability of modern inputs, access to services, participation in particular institutional arrangements, and the availability of exacting buyers.

We applied the new conceptual framework to Ethiopian malt barley value chains and validated it using cross-sectional survey data from 258 households. With a fast growing brewery industry, the market demand for malt barley is rapidly increasing at a rate of 20% per annum (ATA, 2015). This can create a lucrative market for malt barley farmers and thereby reduce rural poverty. However, farmers will only benefit from the growing demand if the malt barley supplied meets the quality requirements of the brewery companies.

Consumer concerns are growing for food quality and safety, which drives changes in food value chains. Food quality is assured by the use of standards and inspection at various stages of the chain. Stringent standards and high quality requirements present challenges for smallholders, who may not have the necessary resources and capabilities. It is mostly the better-off farmers that are able to meet quality standards and obtain premium prices in modern supply chains (Verhofstadt and Maertens, 2013). In general, smallholders' ability and capacity in terms of knowledge, experience and resource endowments affect their decisions regarding their farming activities (Meijer et al., 2015). For instance, when farmers decide to improve quality, farming knowledge and experience can help them to interpret the quality requirements and assess market opportunities (Royer and Bijman, 2012).

Quality improvement activities such as timely weeding, proper harvesting and storing, and post-harvest handling require more resources and investment. As improving product quality entails cost (Mujawamariya et al. 2012), farmers need to obtain additional revenues to cover these costs. Thus, farmers invest in quality improvement only if they trust that the quality improvements they generate will be duly rewarded (Abate and Bernard, 2017). For instance, according to our key informant interview results, in the conventional malt barley chains farmers could not invest more on cleaning products and other postharvest handling as local collectors and traders do not properly reward them for supplying high-quality barley. In contrast, farmers decide to invest in quality upgrading in the modern chain as contractors guarantee them to pay a premium price for high-quality malt barley.

Our analysis also reveals that smallholders' participation in specific institutional arrangements has a positive effect on improving malt barley quality. Connected to this, POs and CFAs are the two institutional arrangements that facilitate coordination in malt barley value chain. Brewery companies provide improved seeds and pesticides to farmers and agree to buy the malt barley against premium prices. CFAs are used to safeguard the vertical coordination between smallholders and companies. Contracting helped farmers to access modern inputs, which, in turn, increased productivity and farm income. Many studies have also shown the positive role of CFAs in integrating smallholders into high-value markets (Abebe et al., 2013; Kleemann, 2016; Otsuka et al., 2016). However, we need to point out that not all farmers could benefit from the CFAs in malt barley chain. The companies were only selecting those farmers that are able to produce the quality and quantity of malt barley demanded. This raise the concern about the inclusion of low resource endowed farmers in the CFAs. Studies elsewhere also show that contractors such as multinational companies often eschew contracting with poor farmers due to the high transaction costs involved (Barrett et al., 2012).

POs can reduce transaction costs and integrate smallholders into the modern food value chains. They provide multiple services such as improved seeds, fertilizers, and technical assistance to farmers, which is critical for enhancing malt barley quality. Studies in Africa and China reported similar results on POs helping smallholder farmers in meeting quality requirements and linking them to changing food markets (Faysse and Simon, 2015; Francesconi and Ruben, 2012; Yang et al., 2017). However, there is also evidence that POs

could be less inclusive and only select specific members when accessing higher-value markets (Bijman et al., 2016; Royer et al., 2017). For instance, POs in China have weak communication capacity and limited capital to influence quality coordination (Yang et al., 2017). POs in Africa face internal and external challenges and are not always able to effectively integrate farmers into high-value markets (e.g. Shiferaw et al. 2011; Tefera et al., 2016).

Our results also show that the use of improved seed varieties positively relates to the likelihood of improving malt barley quality. This is in line with Shiferaw et al. (2014), who showed that adoption of new varieties improved productivity and quality in wheat value chains in Ethiopia. Finally, we found that household age, level of education, and entrepreneurial attitude increases smallholder performance in quality improvement. We found that farm resource endowment does not determine malt barley quality improvement. This is a bit surprising. Contrary to our result, Kebebe et al. (2017) have shown that farm resource endowment reinforces farmers' capability to adopt technologies and access dairy value chains.

## **7. Conclusion**

Quality is becoming increasingly important in food value chains in developing countries. The proliferation of food quality standards and stringent quality requirements pose pressure on smallholders that seek to access high-value markets. Despite this, linking smallholders to high-value markets is considered as a viable strategy to improve farmer livelihoods and food security. For smallholders to participate in higher-value markets and gain positive margin, they need to meet the high quality requirements (Bijman and Bitzer, 2016). Meeting quality requirements are often challenging as smallholders lack resources, capabilities, and organizational support, particularly in sub-Saharan Africa. Our study focused on quality improvement and its determinants at smallholder level using a case study of the Ethiopian malt barley sector. We formulated and tested the following four propositions: (1) Farm resource endowments positively affect smallholder performance in improving malt barley quality; (2) The use of improved seed varieties positively relates to malt barley quality improvement; (3) Membership in a PO increases the likelihood of improving malt barley quality; and (4) Participation in a CFA promotes malt barley quality improvement.

The study contributes to the growing value chain and development literature in two ways. First, it provides empirical evidence on what determines quality upgrading by smallholders in food value chains. Second, it develops a new conceptual framework for studying determinants of quality improvement at micro level. While many factors could influence smallholders' quality improvement effort and performance, we distinguish between factors that enable farmers, so called *push factors*, and those which incentivize farmers, called the *pull factors*. The push factors consist of farmer characteristics, access to modern inputs, and availability of services, while the pull factors are those related to the demand for higher quality products (see Figure 6.1). Institutional arrangements interpose on both sides of the farm. In general, governments and practitioners often focus on the push factors but we argue that pull factors are equally important to effectively link smallholders to modern chains. In addition, private sector actors (in our case the brewery companies) turn out to be crucial for coordination and organization of the value chain and providing attractive markets.

Our findings have important implications for policy makers and stakeholders including businesses. First, the study indicates that access to and use of improved seeds is a key determinant for improving product quality in the upstream part of the supply chain. We therefore suggest to strengthen local seed systems and ensure adequate supply of improved seeds to farmers. Our research also reveals that institutional arrangements are important for facilitating coordination and quality alignment within the chain. It is therefore relevant for the government to facilitate the enabling environment for effective operation of the POs, CFAs and their interlinkage. One key approach to support coordination and quality improvement, and to sustainably link farmers to higher-value markets, could be through promoting co-innovation. Bitzer and Bijman (2015), defined co-innovation as the combination of collaborative, complementary and coordinated innovation. Our findings will also be of interest to businesses and practitioners. For instance, to build efficient supply chains and maintain sustainable sourcing from smallholders, companies should strengthen the involvement of POs in their supply chains as POs undertake various intermediary functions and can reduce transaction costs.

We are aware of the limitations of our study. First, conclusions are limited by consideration of only one case even though the case provides in-depth perspectives of

quality improvement at micro level. Second, in our empirical analysis we assumed that farmers know their products when grading the quality, but there might be a bias due to lack of knowledge about intrinsic and extrinsic product quality attributes.

Quality improvement issues do not end at the farm level, but they have to be addressed along the value chain. Thus, the results of this study encourage further research to investigate how quality is managed in other stages of the value chain. Which factors determine quality upgrading performance at PO, processor, and trader level? Identifying quality determinants at PO, processor, and trader level is important to align quality improvement activities along the value chain and design integrated quality assurance strategies. The other important issue refers to the role of the institutional environment. How can national and local government authorities and NGOs enable co-innovation for quality improvement and sustainably link smallholders to the high-value markets?

## Chapter 7

### General Discussion and Conclusions

#### 1. Introduction

Over the last decades, rapid transformation of the food value chains (FVCs) in developing and emerging economies has gained a lot of research interest (Reardon et al., 2009). For instance, in Asia and Latin America several studies have been conducted to examine transformation of food systems and its development implications (Minten et al., 2013; Mohan, 2016; Reardon et al., 2012a; Reardon and Minten, 2011; Reardon et al., 2012b). These studies show that FVCs in this region are witnessing major structural transformation characterized by innovations in the midstream (processing, wholesaling) and downstream (proliferation of supermarkets) value chain segments. The transformation is also associated with extensive consolidation, rapid organizational changes, and modernization of procurement systems (Reardon and Timmer, 2012). The structural transformation in FVCs commonly described in supply chain management and agribusiness literature as “*the rise of supermarkets*” in which multinational enterprises modernize and expand urban food retail markets (Reardon et al., 2012b). And “*the quiet revolution*” whereby small and medium sized domestic enterprises invest in supply chain coordination (Reardon et al., 2012a). The same authors noted the quiet revolution in staple food chains mainly rice. Dries et al. (2009) and Dries and Swinnen (2004) have documented similar patterns in restructuring of food supply chains in Eastern Europe.

Also in Africa, food systems are rapidly changing (Tschirley et al., 2015; Weatherspoon and Reardon, 2003) due to external and internal drivers. External drivers are climate change, foreign direct investment (FDI) and globalization. Internal drivers of change include rapid urbanization, rise of per capita income, and population growth. Reardon et al. (2015) noted that Africa is urbanizing rapidly and this has a direct effect on the transformation of food systems. Expanding cities result in a rapid increase in urban food demand. In addition, consumer preferences and shopping habits are swiftly changing (Bekele et al., 2016; Tschirley et al., 2015). The same authors also showed that urban and peri-urban consumers have a wider choice of outlets. Reardon et al. (2015) highlighted that the quiet revolution in food supply chains has emerged in Africa similar to the

transformation process in Asia. For instance, Teff value chains in Ethiopia (Minten et al., 2016), horticulture in Rwanda and Senegal (Verhofstadt and Maertens, 2013), vegetables in Kenya (Andersson et al., 2015), and dairy in Kenya (Kilelu et al., 2017b) have all exhibit extent of transformation in market conduct, use of technology, and quality differentiation.

The emergence of modern supply chains has development implications as it provides market opportunities for smallholder producers (Verhofstadt and Maertens, 2013). The economic implications and food security effects of modern supply chains destined to export markets is well documented (Chege et al., 2015; Maertens et al., 2012). However, empirical evidence is sparse on the process of modernization in domestic food chains and its implications for rural-urban food security. To our knowledge, the only empirical work that addresses this topic in the sub-Saharan Africa (SSA) context is a recent work by Maertens and Vande Velde (2017). The authors document developments in rice chain in Benin and the positive implication for producers' commercialization and food security. Upgrading of domestic and staple food chains is central for food security and it has received considerable attention in African food policy debates (Maertens and Vande Velde, 2017; Reardon et al., 2015). This dissertation, therefore, contributes to the sparse evidence on the domestic food chains by using case studies from Ethiopia.

Ethiopia is a representative country for the changes in the food systems in SSA. First, Ethiopia, being the second most populous country on the continent next to Nigeria, has a high population growth rate and very young population. According to the recent estimates, the majority of the population, about 64% is under the age of 24 years. This has implication for food demand. Second, Ethiopia is urbanizing fast and the urban population is growing (Dorosh and Thurlow, 2014). This has implications for the type of food demand as well as for logistic. Third, driven by economic reform, privatization, and macroeconomic stability, Ethiopia has attracted increased foreign direct investment (FDI) in recent years (UNCTAD, 2017). Fourth, Ethiopia has an agriculture led fast growing economy. Agriculture constitutes the major component of the Ethiopian economy and is an important sector for rural employment, poverty reduction and food security (Dorosh and Mellor, 2013), which is also the case for many SSA countries. However, productivity is generally low because of constraints including lack of modern inputs, limited access to technical know-how, lack of access to financial service, and slow technological innovation.

In addition, underdeveloped value chains as well as coordination and market access problems affect smallholders' food and nutrition security.

In this dissertation, therefore, we studied organizational innovations that address the above mentioned farm, institution, and market related challenges. In particular, we focused on foreign direct investment, organizational innovations, and the restructuring of food value chains. We analysed the economic implications of contract farming arrangements (CFAs), producer organizations (POs), and partnerships in Ethiopia. In doing so, we improve the understanding of the key drivers of the transformation processes in African food systems and their development and food security implications.

This chapter presents a synthesis of the main findings of the dissertation. It also discusses how these findings are related to theoretical and empirical evidence in the key debates in the literature. The rest of this chapter is structured as follows. Sections 2-4 synthesize the main findings from each chapter and discuss them in relation to the broader theoretical and empirical literature on agribusiness, rural development and supply chain management. Each section also highlights our contribution to the academic literature. Finally, section 5 provides implications.

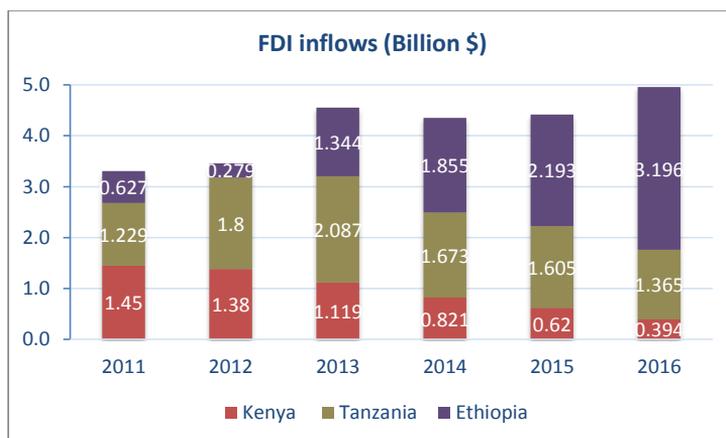
## **2. FDI and quality upgrading in African food chains**

Foreign enterprises have been facilitating modernization in the food systems of developing countries particularly in Asia and Latin America (Reardon and Timmer, 2012). In transition countries as well FDI facilitates restructuring in food supply chains through inducing new technology, knowledge and skills, and financial assets (Dries and Swinnen, 2004). Multinationals adopt proactive sourcing strategies and implement new supply chain management practices. Several reasons are forwarded for multinational companies to invest in modernizing supply chains in developing countries. Traditional reasons include managing volatility, capturing margins, and securing sustainable supply. The modern reasons consist of ensuring food safety and quality, protecting brand reputation, and delivering differentiated product.

While the modernization of African food systems has lagged behind the rest of the developing world, rapid growth in foreign investments signal change (Reardon, 2015). FDI inflows in SSA have shown a significant increase in the past decades (Nondo et al.,

2016). Several factors contribute to the growth in FDI. The key drivers include policy reforms, trade liberalization, improvement in macroeconomic stability, and improved investment climate (Busse et al., 2016). The increase in FDI has direct and indirect implications. The direct effects include employment creation, increased exports and tax revenues. It is in this context that FDI is considered an essential vehicle for economic growth and industrialization (Gui-Diby and Renard, 2015). For instance, Coniglio et al. (2015) have indicated that FDI plays a significant role in job creation in SSA. Creation of decent jobs is crucial given the young population of Africa. This could also be associated with the issue of migration that the continent is facing. The indirect effects are associated with the spillovers in diffusion of technologies, tacit knowledge, and business skills in the host economy. Primary sectors (e.g. mining and agriculture) and manufacturing are the dominant sectors that attracts the most FDI (UNCTAD, 2017). Despite this progress, infrastructure gap, global market risks, regulation and compliance, political stability, and rent seeking behavior are posing challenges for doing business on the continent (Nondo et al., 2016).

FDI inflows at sub-region level reveal that Ethiopia is performing well compared to other countries in East Africa (Figure 7.1). According to UNCTAD (2017), FDI inflows in Ethiopia has accelerated reaching \$3.2 billion in 2016, which rose by 46% compared to 2015.



**Figure 7.1.** FDI inflows in Ethiopia, Kenya, and Tanzania (2011 - 2016); Source: UNCTAD (2017)

Studies on the impact of FDI on modernization of African food systems have focused on the emergence of supermarkets (Weatherspoon and Reardon, 2003) and export supply

chains (Maertens et al., 2012; Rao and Qaim, 2011). There is also empirical evidence on the implications of FDI at macro level (Coniglio et al., 2015; Gui-Diby and Renard, 2015). However, what is missing in the academic debate is the impact of foreign investments on domestic chains and the implications for upgrading in quality, rural development, and smallholder commercialization. Another pressing issue that needs research attention is the role of development practitioners and non-government organizations (NGOs). In the development discourse, recently there is evolution. That is, the development paradigm has changed from the conventional *aid-first* approach to the new approach *from aid to trade* (Bräutigam, 2011). The *aid to trade* model augments development assistance with trade partnerships. The shift from the old to the new model has changed the engagement of NGOs in the development process. We paint how FDI and partnerships influence development in domestic grain chains on the basis of two of our chapters.

Chapters 2 and 6 discuss how FDI and partnerships enhance coordination and economic upgrading in the food chains. Chapter 2 focuses on how foreign investment influences the structure of supply to the domestic food industry and the implications for rural producers. Whereas Chapter 6 extends our analysis on the key factors affecting quality improvement at the upstream part of the value chain. In both cases, our analysis is informed by a theoretical framework based on supply chain management, collective action theory, and transaction cost economics.

The literature on food supply chains mostly focuses on high-value export oriented chains (Maertens et al., 2012; Reardon et al., 2004). However, the landscape of food chains is more diverse and consists of modern domestic chains, conventional chains, and the interaction of the two. Recently there is a growing interest in the transformation of domestic food chains (McCullough et al., 2008; Minten et al., 2016; Reardon, 2015). These studies claim the process of modernisation in domestic food chains is important as these chains have the potential to benefit a large number of smallholders contrary to the high-value export chains that are often exclusive. In Chapter 2 we delve deep into this issue using a case study from the barley sector in Ethiopia.

Chapter 2 analyses supply chain re-structuring processes, looking into how foreign brewery companies set up new sourcing strategies for malt barley, by directly sourcing from smallholders. We used a multiple case study approach to explore the changes in malt

barley supply chains that are due to foreign investments. Our analysis makes use of a conceptual framework based on Transaction Cost Economics (TCE), Supply Chain Management (SCM) and Value Chain Upgrading. The analyses reveal that foreign breweries implement higher levels of vertical coordination in the malt barley value chains, thereby allowing for economic upgrading and livelihood improvement. The Chapter also contributes to the debate on the intermediary role of POs in value chain coordination by providing evidence that POs facilitate horizontal and vertical coordination through contract negotiation, inputs distribution, quality control and product aggregation. This study was motivated by the fact that market demand for malt barley is rapidly increasing due to the fast growing brewery industry in Ethiopia. In order to meet the requirements of domestic demand and reduce the import bill, the Ethiopian government aims to expand malt barley production and promote local sourcing.

The appearance of foreign companies in the malt barley chain has brought important changes in the structure and economics of the supply chain. Our findings show that entrance of companies has resulted in the co-existence of a *modern chain* and a *conventional chain*. The modern chain is characterized by a higher level of vertical coordination. Whereas, the conventional chain is characterized by spot transactions and dominated by local traders. Overall, annual market demand for malt barley is increasing at a rate of 20 percent. This can create a lucrative market for malt barley producers and thereby reduce rural poverty.

Our findings also reveal that the implementation of various sourcing strategies helps companies to experiment and build efficient supply chains. In setting-up their sourcing strategies, companies use public private partnerships (PPPs), as an organizational innovation, which facilitates supply chain collaborative activities. These partnerships involve a combination of public, private sector, and non-government organization (NGO) partners. In our case study, we learn that companies collaborate with NGOs, POs, and local government agencies to enhance coordination and to transfer technologies to producers, thereby improving malt barley productivity and quality. Literature on partnerships indicate that PPPs promote value chain development through facilitating capacity building, market access, and risk sharing (FAO, 2016). Several studies note that PPPs enhance smallholder integration in modern value chains through

facilitating access to modern inputs, technical assistance, and credit (Bitzer and Bijman, 2014; Bitzer et al., 2013; Van Wijk and Kwakkenbos, 2012). In addition, it can assist farmers in applying good agricultural practices, enhance production efficiency, raise product quality, and overcome constraints to the adoption of new technology (Narro et al., 2009). Consistent with literature, we find that PPPs in malt barley value chain support smallholders in linking to high-value markets and engage in upgrading activities.

Looking at the implication for farmers, our result shows that company-induced sourcing structures (collaboration models) encourage smallholders to engage in economic upgrading activities and thereby increase farm productivity and farmer livelihoods. Another important insight from this chapter is that POs are intermediaries in value chain coordination and transaction costs reduction. We find that POs are the main suppliers to companies and facilitate contract negotiation, input distribution, and malt barley collection. Hence, the general conclusion that can be drawn from this study is that local sourcing by multinational companies facilitates modernization of food chains by enhancing chain coordination and product quality. Considering the contribution to the broader literature on developing countries, our study is the first in-depth study to document the process of FDI facilitating modernization in a domestic grain value chain.

In Chapter 6 we zoom-in and discuss on one key dimension of the value chains, i.e. *product quality*. Food quality becomes increasingly important given the dynamics in consumer preferences. However, the quality aspect of food chains usually receives little attention and is not subject to thorough investigation. In this chapter, we focus on how quality becomes more important for smallholders' competitiveness. We empirically analyse the factors influencing a farmers' decision to invest in quality improvement. The key methodological issue in studying quality upgrading is how to measure quality. Quality is an elusive concept (Bijman and Bitzer, 2016), different for different actors in the value chain. For instance, for producers quality is about crop yield and disease resistance, for processors it is the uniformity of the raw material, for the wholesaler it is shelf life and availability, and for consumers it is healthiness, taste and convenience (Van Tilburg et al., 2007). We used ordered logistic regression to identify the important factors affecting smallholder performance in quality improvement.

Our findings highlight that quality upgrading has both benefits and costs and actors will only invest in quality improvement as far as benefits exceeds costs. For example, farmers incur costs in cultivation, harvesting, sorting, packaging and storing. Farmers will only accept these costs if there is a good chance their revenues more than offset the additional costs. At micro level, the decision of the smallholder to engage in quality improvement is determined by several factors. Using insights from literature, we developed a new analytical framework for determinants of quality improvement at micro level. We argued that product quality improvement at farm level is conditioned by a combination of push (production related) and pull (availability of buyers) factors. Our empirical results validated this framework. We find that socioeconomic, technological and institutional factors such as type of improved seed varieties, level of education, age (a proxy for farming experience), entrepreneurial attitude, PO membership, and participation in a CFA are important determinants for quality improvement at farm level. Important are also the findings on how quality could be improved. Quality upgrading depends on access to modern inputs and services including credit, extension, and training. It is also determined by the institutional arrangements and the associated incentives.

We also find that POs are playing an integral role in quality upgrading and development of the malt barley value chain in the research area, through facilitating modern input distribution, contract negotiation, organization of trainings, and product aggregation and transportation. This new value chain coordination role of POs helped farmers to access high-value markets. Brewery companies used CFAs to safeguard the vertical coordination in local sourcing of malt barley from smallholders. CFAs facilitate transfer of technology and technical know-how, which, in turn, improves crop yield and quality. At the higher level of abstraction, while many factors could influence smallholders' quality improvement effort and performance (Royer and Bijman, 2012), the results of this chapter contributes to the literature by distinguishing between factors that enable farmers, so called *push factors*, and those which incentivize farmers, called the *pull factors*.

### **3. Transformation of POs and participation in modern value chains**

Chapters 4 and 5 provide evidence on the development, economic function, and effectiveness of one specific organizational innovation, the producer organization. POs perform diverse economic functions and play a crucial role in the integration of smallholders into modern value chains. The process of modernization in African food chains presents opportunities for smallholders to become integrated into more remunerative markets. Empirical evidence shows that smallholder linkages to modern chains benefit them through improvement in farm productivity and family income (Barrett et al., 2012; Fischer and Qaim, 2012; Maertens and Vande Velde, 2017). However, responding to the opportunities can require substantial investment for meeting requirements such as larger volume and consistent supply of high quality products. Smallholders often lack productive resources, appropriate skills, technology, and financial services (Poulton et al., 2010).

In order to benefit from the process of modernisation, smallholders need to find solutions to the constraints they experience both in upgrading their production and in accessing input and output markets. There is a renewed interest in POs to address the above mentioned smallholder challenges (World Bank, 2008). POs can support smallholders' access to markets, reduce transaction costs, and thereby improve farmers' income and productivity. The new institutional economics theories characterize POs as a hybrid governance structure that arises to reduce transaction costs (Bonus, 1986; Cook, 1995). Whereas value chain literature characterizes them as one of the tiers or stages in the value chain (Bijman et al., 2011).

Understanding the drivers of PO existence, functions and impact, and farmers' membership decisions are of particular interest for the ongoing modernization of food chains. In Ethiopia, like elsewhere in the developing world, POs are prominent farmer economic organizations. As economic organizations, POs perform diverse functions such as distribution of inputs, provision of technical assistance, adoption of new technologies, and output marketing, thereby supporting rural development and poverty alleviation. Cognizant to the importance of POs to the political economy of Ethiopia, the government has committed itself to promote POs. POs are seen as an integral part of the rural development strategy of Ethiopia; the Agriculture Led Development Industrialization (ADLI). According to the Federal Co-operative Agency (FCA), currently more than 55,000

primary POs with more than nine million members exist in Ethiopia. But, with only 22% female members, women participation is generally low.

There is limited empirical evidence on smallholder commercialization and economic functions of POs. In Ethiopia, existing studies mainly focus on technology transfer (Abebaw and Haile, 2013; Chagwiza et al., 2016), livelihood improvement (Getnet and Anullo, 2012) and commercialization (Bernard et al., 2008b; Francesconi and Heerink, 2010), and results are diverse and inconclusive. Yet, what is missing is a study on the trade-off between inclusiveness and efficiency of POs. Driven by the emergence of tighter coordinated value chains, POs may shift in economic functions, from mainly input supply, to also marketing.

In Chapter 4 we explore the development and changes in economic functions of POs under a changing institutional environment. We identify the factors that influence a shift in economic functions from provision of inputs to commercialization of farm products, based on an extensive literature review and primary qualitative data. Our findings show that, in Ethiopia development of POs is highly influenced by political ideology and government policies. This means, different government regimes directly affected the organizational structure and functional performance of POs. For example, during the Derg regime command economy was the central ideology of the political economy of Ethiopia and POs faced extensive state interference and control, which resulted high inefficiencies. In the present regime POs operate under the umbrella of regulated market economy; however government interference in strategic decisions of POs is often raised as a challenge. POs may not get enough room to manoeuvre for their own interests and to make good use of available resources.

We also find that POs perform diverse economic functions to enhance agricultural production. Particularly in inputs markets, POs are important, as they supply 95 percent of all fertilizers used. However, given the waves of change in food chains, there is a tendency to shift from mainly input supply to also marketing. This paves the way for increased smallholder commercialization and integration to modern value chains. Our findings also indicate that, besides government agencies, different actors from the private sector and NGOs play active roles in providing capacity building support and market orientation for POs. Our findings further reveal that POs face a number of internal and external challenges that make their transformation to more market-oriented

business not an easy one. External factors are related to a lack of working capital, which leads to delayed payment and reduced member commitment, and a high state interference in the strategic decisions. Whereas internal challenges are associated with internal governance of POs, which includes poor managerial capabilities and a lack of accountability and transparency.

In the broader literature, transaction cost theory predicts that POs can play an important role in reducing the transaction costs for smallholder producers. Several empirical studies confirm this transaction-cost-reducing argument (Holloway et al., 2000; Shiferaw et al., 2011; Staatz, 1987). Consistent with this evidence, we find that Ethiopian POs are effective in reducing transaction costs in the input markets. However, the results show less clear evidence on POs reducing transaction costs in the output markets. Two explanations are forwarded for this. First, POs only recently started to step up their marketing activities. Second, the coordination between the primary POs at village level and the co-operative union at district level is not always as efficient as one would like it to be. While the unions are the main commercial organisations with their links to domestic and foreign buyers, the primary POs maintain the relationships with the farmers. In theory this is an effective division of labour, but in practice it encounters organisational challenges.

Building on the findings and implications of Chapter 4, Chapter 5 delves deeper into the economic impact of POs, analysing the interaction between inclusiveness and economic performance. We extend the analysis to the factors that determine smallholders' likelihood of becoming a PO member. We measure the impact of PO membership using diverse performance indicators. Using primary household survey data, this chapter tests the effectiveness of POs in improving smallholder economic performance. The chapter employs a rigorous econometric approach to control for selection bias and to determine the direct effects of PO membership. In addition, the chapter also makes use of primary qualitative data to supplement the quantitative analysis.

Our findings show that, consistent with literature, the motivation to participate in a PO is determined by demographic and economic factors. We found that larger landholding and more farm resources increase the likelihood of participation in a PO. This suggests that poorer farmers are excluded from membership. We also find a positive relationship between distance to market and PO membership. This suggests that in remote areas,

agricultural POs can be considered a suitable institution to support smallholders' market access and thereby improve their livelihoods.

Looking at the impact outcomes, our analysis reveals that POs can indeed facilitate value chain development and improve economic performance of rural producers. We find a positive relationship between membership and various performance indicators. PO membership positively affects total malt barley production, crop yield, prices, product quality, net crop income, and income from food crops. We attribute these positive effects to the fact that rural POs provide access to better seeds and fertilizers at relatively low prices, and to technical assistance and market information. These estimated impacts on farm performance and rural livelihood appear to be in line with previous studies in agribusiness and development economics (Barham and Chitemi, 2009; Fischer and Qaim, 2012; Ito et al., 2012; Verhofstadt and Maertens, 2014b).

However, the positive impact of POs may come at the expense of inclusiveness. In order to compete in highly coordinated chains and improve efficiency POs may have to be selective towards their members (Lutz and Tadesse, 2017). Consistent with literature, we find that POs in barley value chains are becoming more selective in accepting members and membership seems to be particularly beneficial for innovative and entrepreneurial farmers. Our findings in this chapter contribute to the academic literature by providing empirical evidence on the trade-off between inclusiveness and efficiency of POs in a changing market environment.

Taken together, the results of Chapters 4 and 5 reveal that the Ethiopian PO can be considered as an effective institution for commercialization, livelihood improvement and productivity gains. The same conclusion has been made by a recent study on the performance of POs in technology transformation, intensification, and commercialization within the dairy value chain in Ethiopia (Chagwiza et al., 2016).

#### **4. The economic impact of modern supply chain participation**

Vertical coordination is increasingly used to safeguard quality requirements and comply with safety standards in modern chains. The growing body of literature shows that participation in modern supply chains has a positive impact on the livelihood and income of farmers. However, the effectiveness and implications of vertical

coordination is mostly explored in modern supply chains destined for export markets. It is also often claimed that export-oriented chains are less inclusive and leave out resource-poor farmers. Modernization in domestic food chains is equally important and generates market opportunities for the rural poor in developing countries. Few studies have looked at the need for upgrading of domestic food chains and its development implications.

In Chapter 3, we analyze impacts of CFAs on production, intensification, commercialization and prices, and farmer income using cross-sectional survey data. We also assess the factors that determine farmers' decision to participate in malt barley CFAs. We applied OLS regressions and propensity score matching technique to estimate the average effect of contracting on the selected performance indicators. Consistent with previous literature (Dries et al., 2009; Maertens and Vande Velde, 2017; Wang et al., 2014a), we find positive effects of participation in modern supply chains. Participation in modern supply chain has significant impact on smallholder commercialization and farm family income. Our findings reveal that CFAs have a positive impact on malt barley output growth, increased commercialization, intensification, quality improvement and farm gate prices, ultimately resulting in increased farmer income and spillovers towards productivity of other food crops. For example, CFAs increase malt barley production with 36%, yield with 13%, input costs with 19%, farm-gate prices with 22%, and net income with 31% in comparison with the sample average. Our estimated results are consistent across different matching methods and OLS regression, which shows the robustness of the treatment effect estimates.

Our findings suggest that CFAs, as an organizational innovation, play a crucial role in improving farm productivity and income of smallholders and hence contributes to food security in Ethiopia. Contract farming arrangements induce supply chain upgrading by the provision of improved technologies, technical assistance, and quality-based pricing. The results also imply that the introduction of CFAs by multinationals induce modernization and upgrading of domestic food chains in developing countries in general and Africa in particular.

We also identified the factors affecting participation in the modern supply chains. Based on the logit regression results, a number of economic and demographic factors

affect farmers' participation. The results show that education of the household head has a positive and significant influence on participation in a CFA. This is because education facilitates managerial capacity, farmers' ability to make informed decisions, and compliance with quality requirements. Having a mobile phone increases farmers' likelihood to participate in a CFA by enhancing access to information. Farmers having received credit from rural microfinance institutes are more likely to participate in a CFA. Results further show that access to government extension is positively correlated to CFA participation, while off-farm income (a proxy for off-farm employment) is negatively correlated. Distance to markets is another important factor and negatively influences the likelihood of CFA participation. This is plausible as companies prefer farms near the road or near market centers for logistic reasons and reduction of transaction costs in monitoring and provision of technical assistance.

At a higher level of abstraction, the results contribute to the broader literature on CFAs in developing and emerging economies. There is a large body of literature on smallholder participation in CFAs and the productivity and welfare implications of this participation (Bellemare, 2012; Mishra et al., 2016; Otsuka et al., 2016; Rao and Qaim, 2011). Yet, most of these studies focused on high-value export chains, while empirical evidence on the implication of CFAs in domestic grain value chains is sparse. This chapter fills this knowledge gap. The other important insight is related to conjoining CFAs and POs. In previous studies there is a debate on whether CFAs work better with or without POs. Our findings demonstrate that conjoining of POs and CFAs could lead to complementarity, overcoming the identified weakness of each.

## **5. Theoretical and methodological contributions**

This dissertation studies the role of organizational innovations in facilitating food chains transformation, and how POs, CFAs, and PPPs enhance coordination and effective alignment of supply chain activities. In addition, it looks at how those innovations encourage smallholders to engage in economic upgrading and bring about higher supply chain performance. In doing so it contributes to the broader literature in agribusiness and rural development in emerging economies.

This dissertation has contributed to the emerging agribusiness literature by focusing on FDI and its implications on quality upgrading, supply chain innovations, and rural development in developing countries. We used TCE and SCM to study the sourcing strategies and supply chain management practices adopted by foreign companies. Previous studies on the role of multinational enterprises in food supply chains management (e.g. Dries and Swinnen, 2004; Maertens et al., 2012; Reardon et al., 2009) have found that multinational investments induce supply chain innovations and facilitate modernization in food value chains, thereby improve livelihood of smallholders. Consistent with the broader literature this thesis found that foreign companies implement higher levels of vertical coordination in the malt barley value chains, thereby allowing for economic upgrading with positive livelihood implications for farmers (Chapter 2). One important insight is that most of the previous studies focused on higher-value chains related to export markets and supermarkets whereas, this thesis presents implications of FDI in upgrading of domestic (staple) food value chains.

The second important insight is connected to the new development paradigm – from-aid-to-trade. In the development discourse, the aid first approach becomes less relevant when it comes to development assistance and trade partnerships become important. This thesis contributes to the broader development literature through providing empirical evidence on how the new from-aid-to-trade approach changes the engagement of public and private sector stakeholders in the development process (Chapter 2). As we followed the whole value chain approach, the use of case studies is crucial. We used a multiple case study approach to collect relevant data and conduct within and among case comparison. In-depth case studies generate rich data and help to understand key value chain processes, actors and their networks and, information exchange along the value chains. However, there is limitation of generalizability in using such a method.

The thesis contributed to the contract farming literature by providing empirical evidence on implications of CFAs in smallholder commercialization and upgrading of grain value chains. Previous studies documented that participation in CFAs has positively affected farm productivity and farmer welfare (Bellemare, 2012; Mishra et al., 2016; Wang et al., 2014a). Consistent with literature, we find positive welfare implications of CFAs participation. Most of the previous studies focused on high-value export chains, while

empirical evidence on the implication of CFAs in domestic grain value chains is sparse. This is where this thesis makes a contribute (Chapter 3). The other important insight is related to conjoining CFAs and POs. In previous studies there is a debate on whether CFAs work better with or without POs. Our findings demonstrate that conjoining of POs and CFAs could lead to complementarity, overcoming the identified weakness of each.

As to the methodological issue, the study used cross-sectional survey to generate primary data from contracted and non-contracted households. We used multiple (9) outcome indicators in measuring the performance of CFAs. Two empirical models have been used to estimate the impact of CFAs participation. The first is the parametric (OLS) regressions, as all of the outcome variables are continuous this approach can be used. The second is non-parametric (propensity score matching) technique. This estimation technique controls selection bias problems using counterfactuals. Using a combination of the two approaches improves the robustness of the estimates.

At a higher level, this thesis makes a contribution to the broader collective action literature on POs role in farm performance and value chain coordination. Transaction cost theory predicts that POs can play an important role in reducing the transaction costs for smallholder producers (Holloway et al., 2000; Shiferaw et al., 2011; Staatz, 1987). POs do this by providing multiple services such as provision of inputs, market information, contract negotiation and bargaining with large buyers. Several empirical studies confirm this transaction-cost-reducing argument (Chagwiza et al., 2016; Fischer and Qaim, 2012; Verhofstadt and Maertens, 2014b). Consistent with this evidence, we find that POs can indeed facilitate value chain coordination and improve economic performance of smallholders (Chapters 4 &5). We used various methods to generate data including literature review, semi-structured interviews, focus group discussions, and farm household survey. The use of mixed methods through combining qualitative and quantitative approaches overcomes the weakness of each and helps to better address the research topics. In examining effectiveness of POs in improving smallholder economic performance, we used several performance indicators (Chapter 5). Two estimation methods have been followed, direct comparison using the naive t-test and propensity score matching technique. The first approach is simple and based on the direct comparison of members and non-members. However, as members self-select to the PO membership, such approach is prone to selection bias problems. Propensity

score matching controls selection bias problems particularly for observable characteristics.

The thesis has contributed to the literature on food quality management by empirically studying product quality upgrading and farmers' decision to invest in quality improvement. Based on an extensive literature review the thesis developed an analytical framework to conceptualize and study determinants of quality upgrading at farm level (Chapter 6). This enriches our understanding on the determinants of smallholder performance in quality upgrading. In the second stage, the thesis validated the analytical framework using empirical data from malt barley farmers in Ethiopia. While many factors could influence smallholders' quality improvement effort and performance (Royer and Bijman, 2012), the results of this thesis contributes to the literature by distinguishing between factors that enable farmers, so called *push factors*, and those which incentivize farmers, called the *pull factors* (Chapter 6).

## **6. Implications**

The findings from the present thesis imply that foreign direct investment augmented with partnerships induce supply chain innovations and hence modernization of domestic food chains. Our findings also imply that conjoining of POs and CFAs enhance effective alignment of supply chain activities and smallholder linkages to modern value chains. Furthermore, such effective marrying of POs and CFAs has strong potential to facilitate economic upgrading and rural development implications. This sub-section shortly describes the policy, business, and future research implications of the findings of the dissertation.

### *Implications for business*

This dissertation has provided important implications for agribusiness firms which wish to work with smallholders and their POs. Before the entrance of foreign companies, the Ethiopian malt barley value chain was characterized by weak coordination, low productivity and low quality. The appearance of foreign companies has brought about a number of important changes, as these companies facilitate the diffusion of technology and the collaboration among actors. As a result of these new collaboration models

productivity and quality has improved thereby boosting the performance of the supply chain.

Our findings have important implications to businesses and practitioners; for instance, to build efficient supply chains and maintain sustainable sourcing from smallholders, companies could strengthen the involvement of POs in their supply chains as POs can undertake various intermediary functions and can reduce transaction costs. Businesses could also consider the important role of NGOs in training farmers and in facilitation the collaboration models. Finally, this thesis finds that foreign breweries have used CFAs to safeguard the vertical coordination with malt barley suppliers. The use of CFAs ensures required quality and quantity supplied. Thus, businesses could consider CFAs in organizing their supply chains for sourcing farm products.

#### *Implications for policy*

The thesis has shown that the investments by multinational enterprises facilitate modernization of food supply chains, which has both commercialization and livelihood implications for smallholders (chapter 2). Foreign companies bring financial assets and introduce new technologies, knowledge and business skills, which induces change in the food supply chains, i.e. *the process of modernization*. At least two lessons for policy makers can be drawn. First, the government could exert more effort in attracting foreign direct investment (FDI) through establishing an investment friendly environment. Second, and building on the first recommendation, the government could prioritize foreign investments in food processing, in order to service the specific food demands of the growing urban population.

The thesis also shows that foreign-owned companies have used various strategies in sourcing malt barley from smallholders and building efficient supply chains. In setting-up of their sourcing strategies, companies use public-private partnerships which facilitate collaboration in the supply chain. It was shown that companies collaborate with NGOs, POs, and local government agencies to enhance coordination and to effectively transfer technologies to producers (Chapter 2). The implementation of collaborative models has important implications for output growth, increased commercialization, intensification, and improvement of livelihood for producers

(Chapter 3). One of the key messages for policy makers is, therefore, the need to expand and scale-up this experience to other high priority value chains to tackle food and nutrition security. For instance, domestic flour factories and millers could adopt these collaborative models in local sourcing of wheat, which is now mainly imported.

The study finds that participation in CFAs has a positive impact on farm performance and the welfare of smallholders (Chapter 3). Furthermore, our study has shown that access to improved seeds and linkages to institutional arrangements improve smallholder engagement in quality upgrading (Chapter 6). Thus, CFAs can be seen as an important tool for the development of food value chains and the integration of smallholders in modern supply chains. The findings in this study support policies aimed at facilitating voluntary CFAs in Ethiopia as opposed to compulsory contract schemes that have a negative welfare impact (Wendimu et al., 2016). Specialized extension service in CFAs is only provided for the contracted crop, the government could extend such services to other crops so that a larger number of farmers can benefit from it. The government could also exert more effort to support the seed system to increase the seed supply and regulatory framework for contractual transactions to promote CFAs in food value chains.

The thesis has shown that POs perform value chain coordination and positively affect farm productivity and commercialization of smallholders (Chapter 5). They also facilitate quality upgrading through provision of improved seeds, pesticides, and technical assistance. Despite this, participation in POs in Ethiopia is still limited particularly for youth and women. According to the recent data by the Federal Cooperative Agency of Ethiopia, women membership is only 22 percent. In addition, POs have challenges such as lack of working capital and managerial problems (Chapter 4). Hence, more could be done by the government to encourage farmers to join POs and facilitate credit provision. Our findings, however, show that POs seem to exclude resource-poor farmers. Therefore, policy makers should acknowledge that POs may not be able to support all farmers. In other words, POs may not be able to combine effective commercialisation strategies with inclusion of all farmers.

#### *Implications for further research*

This dissertation provides useful insights on the role of FDI in facilitating modernization of food value chains in the African context. These insights can support decision-making

on the facilitation of various organizational innovations to improve value chain upgrading and smallholder commercialization. However, we acknowledge that our findings cannot be generalized across different regions and sectors in the political economy of Ethiopia, because our sample is relatively small and Ethiopia has diverse geographic characteristics. Thus, we suggest further food value chain research as follows.

This dissertation highlights that NGOs play a crucial role in facilitating supply chain relations between smallholders and companies. More specifically, NGOs work with private industry through sub-contracted supply chain activities. This is the new role of NGOs as a result of the new development paradigm, from aid to trade. As we did not capture in our study the details of the new engagement of NGOs with private businesses, the new role of NGOs in supporting development processes requires further investigation.

This dissertation has revealed the importance of upgrading domestic food chains for smallholder linkages and development implications. Also the rapid urbanisation of Ethiopia merits further research in supply chain transformation. As urban consumers may have different food preferences, research is needed on the implications of rapid urbanization for quantity and quality of food as well as the supply chain management implications of changing food preferences.

The thesis indicates that CFAs have a positive impact on production, crop yield, intensification, commercialization and ultimately the income of farmers. In our outcome variable we did not capture the different food security dimensions; thus follow-up research is required on the impact of CFAs on food security. Most studies on the impact of CFAs measure the mean treatment effect i.e. the impact of CFA on the average farmer. However, treatment effects may vary among the matched samples. In our study, doing heterogeneous treatment effect was not successful due to the nature and limitation of the data. Thus, further research could look beyond the mean treatment effect and investigate heterogeneous treatment effect.

To expand our understanding of CFAs in facilitating smallholder engagement in upgrading activities and supply chain innovations, research on other crops than malt barley could generate useful comparisons and thus allow wider generalization. In Ethiopia, CFAs are

in the inception stage and existing studies show mixed results. Thus, more research could be done to unpack the potential of CFAs in linking farmers to remunerative market. Specifically, comparing CFAs in grains, vegetables, and dairy value chains would generate much more insights. Further, key attributes of the contract as perceived by upstream actors and their partners across the three value chains could be empirically investigated. This kind of analysis could provide comprehensive conclusion and useful insights for policy makers and business managers.

Another topic could be how conventional chains could be coordinated and structured so that numerous upstream actors can benefit from it. The thesis finds that conventional (traditional) chains are still important as they handle a larger volume of transactions of malt barley. This is also the case for most grain value chains in Ethiopian food systems. In these chains, grain traders as value chain actors play crucial roles in distribution and marketing of products. Further research is needed on the conventional chains, particularly on the functions and role of grain traders and the diversity of trade arrangement used by different traders.

The results on the impact of PO membership show that POs in Ethiopia improve farm productivity and commercialization of smallholders. However, they seem exclusive of resource-poor farmers. On the other hand, under the ongoing modernization of food value chains selecting capable farmers help POs to be competitive and efficient. First, follow-up research in Ethiopia is needed on the tension between inclusion and efficiency of POs. Second, organizational characteristics that may determine POs transformation process to more market oriented entities such as member commitment, leadership, and the issue of internal governance is also an arena that should be explored more thoroughly. Moreover, in the analysis of the impact of POs, we only determine the mean treatment effect of membership due to data limitation. Follow-up research could look beyond the mean treatment effect and investigate heterogeneous treatment effects.

The results of our study on the determinants of quality upgrading at farm level encourage further research to investigate how quality is managed in other stages of the value chain. Which factors determine quality upgrading performance at PO, processor, and trader level? Identifying quality determinants at PO, processor, and trader level is important to

align quality improvement activities along the value chain and design integrated quality assurance strategies.

## **7. General conclusions**

This dissertation aimed to understand the role of organizational innovations to facilitate modernization of food value chains, particularly how POs, CFAs and PPPs enable supply chain innovations and effective alignment of upgrading activities. The thesis systematically examines the development, inclusiveness and impact of those innovations, and discusses the challenges that need to be addressed to improve their efficiency, to serve the demands of supply chain partners, and to guarantee institutional sustainability.

The dissertation has demonstrated that organizational innovations triggered by foreign direct investment induce change in food supply chains and facilitate process of modernization. We find that the appearance of foreign companies in the malt barley chain has brought important changes in the structure and economics of the barley value chain, resulting in the development of a modern chain next to the conventional chain (Chapter 2). Our research shows that in setting-up sourcing strategies, companies use public private partnerships (PPPs) to facilitate supply chain collaboration. Companies manage to build efficient supply chains by involving NGOs and POs for organizing the provision of improved inputs, technical assistance and logistics. From local supplier perspective, the provision of new technology, a guaranteed market and quality-based pricing encourage smallholders to engage in product and process upgrading, which in its turn has positive implications for their income and livelihood.

The thesis further investigated economic implications of participation in the modern chain. Our findings reveal that linking farmers to the modern chain has significant positive impact on malt barley output, commercialization, intensification, product quality and farm-gate prices, ultimately resulting in increased farmer income and spillovers towards productivity of other food crops (Chapter 3). This is because the modern chain through CFAs facilitates provision of improved seeds, agrochemicals, and technical assistance. It also ensures guaranteed markets and quality-based pricing.

In addition to vertical coordination, supply chain innovations also entail horizontal coordination. To that end, this thesis examined the development and economic functions of POs under the ongoing modernization of food systems. It is shown that POs perform diverse economic functions to enhance agricultural and rural development (Chapter 4). Our findings have shown that POs provide multiple services consisting of inputs distribution and marketing of farm outputs. Particularly in inputs markets, POs are important, as they supply 95 percent of all fertilizers used. Given the transformation of food systems, POs are shifting from mainly input supply to also marketing. However, in this transformation POs face internal (e.g. mismanagement) and external (e.g. working capital) constraints. As to their evolution, PO development in Ethiopia is shaped by political ideology and government policies..

The thesis further delves into the economic performance of POs, looking into the inclusiveness and business performance. We measure the impact of PO membership across diverse performance indicators. The findings show that POs can indeed facilitate value chain coordination and improve economic performance of rural producers. PO membership positively affects malt barley production, crop yield, prices, product quality, net crop income, and income from other crops (Chapter 5). We attribute these positive effects to the fact that POs provide access to better seeds and fertilizers at relatively low prices, and to technical assistance and market information. Considering the results of Chapters 4 and 5 together, we conclude that the Ethiopian POs have improved their functional performance and are in the process of transformation towards market-oriented organizations.

The thesis also examined quality upgrading and its determinant at farm level. While many factors could influence smallholders' quality improvement effort and performance, we distinguish between factors that enable farmers, so called *push factors*, and those which incentivize farmers, called the *pull factors* (Chapter 6). The push factors consist of farmer characteristics, access to modern inputs, and availability of services, while the pull factors are those related to the demand for higher quality products. Quality upgrading is also determined by the institutional arrangements and the associated incentives. Thus, we conclude that local sourcing by multinational companies induces supply

chain innovations and facilitates modernization in food chains through enhancing chain coordination and product quality.

On the basis of our findings, we have provided business and policy implications to expand the use of organizational innovations to promote supply chain innovations and upgrading of food chains. The most important issue is to recognize the underdeveloped nature of domestic (local) food chains and the multifaceted problems of supply chain partners, and hence to promote organizational innovations to address these challenges. Integrating POs with CFAs in the PPP platforms could improve supply chain responsiveness and the economic welfare of local suppliers (e.g. farmers).

## Summary

Driven by rapid urbanization, economic growth, and changes in consumption patterns, food systems in emerging and developing economies are experiencing a fundamental transformation process. This transformation is usually characterized by increased vertical coordination, growth of modern distribution channels (e.g. supermarkets), consolidation of retail markets, and an increase in export orientation. The rapid growth in demand of modern food with higher quality and safety attracts multinational enterprises to invest in agriculture and food processing in emerging economies. The appearance of multinationals in the food systems of developing countries has been claimed to have a positive impact on economic development and reduction of poverty. The multinationals have adopted modern supply chain management practices for securing a large volume and consistent supply of high quality products. They introduce new technologies that boost productivity and post-harvest management for product upgrading.

While so far most research on the modernization of food systems has focused on export chains, there is growing interest in the transformation of domestic and staple food chains. Upgrading domestic food chains is needed for a more efficient supply to fast growing urban markets and to sustain access to affordable food for the rapidly growing urban consumers in sub-Saharan Africa (SSA). As domestic food value chains are more inclusive than high-value export chains, upgrading these food chains can contribute more to poverty reduction and food security. However, much remains to be understood about the process of modernization in domestic food chains and its implications for rural development. This dissertation has taken a step forward by analysing how beer multinationals induce supply chain innovations in domestic food value chains in Ethiopia.

The overarching aim of this dissertation is to improve our understanding on how organizational innovations facilitate modernization of domestic food chains. In particular, we focus on how organizational innovations facilitate effective alignment of supply chain activities and foster inclusion of smallholders. We seek to analyze the economic impact of Foreign Direct Investments (FDI), contract farming arrangements (CFAs), producer organizations (POs), and partnerships in Ethiopia. To do so, this dissertation addresses five major research questions: (a) What are the different sourcing strategies of foreign brewery companies and how does it affect quality and reliable supply? (b) How do CFAs

improve crop production, yield, product quality, and farm income within the domestic food supply chains? (c) How has farmer collective action developed over time and how has it adjusted to a changing institutional environment? (d) What factors determine smallholder participation in POs? Is there a trade-off between inclusion and business performance of POs? (e) Which factors influence farmer performance for improving quality at the upstream part of the food value chains?

Chapter 1 sets the stage for the thesis. It introduces key concepts and theoretical foundations of the research topics, draws attention to the knowledge gaps and outlines the methodology of the thesis. It also elaborates the emphasis placed on the transformation of food systems and the challenges and opportunities of the transformation process for rural producers. Guided by theories, the thesis used a combination of quantitative and qualitative methods to generate and analyze data.

Chapter 2 analyses supply chain re-structuring processes, looking into how foreign brewery companies set up new sourcing strategies for malt barley, by directly sourcing from smallholders. We used a multiple case study approach to explore the changes in the malt barley supply chains. Our analysis makes use of a conceptual framework based on Transaction Cost Economics, Supply Chain Management and Value Chain Upgrading. This study was motivated by the fact that the demand for malt barley (ingredient for beer brewing) is rapidly increasing due to the fast growing brewery industry in Ethiopia. In the past five years, beer consumption in Ethiopia increased at a rate of 19% per annum. In order to meet the requirements of domestic demand and reduce the import bill, the Ethiopian government aims to expand malt barley production and promote local sourcing. The analysis reveals that the appearance of foreign companies in the malt barley chain has brought important changes in the structure and economics of the barley value chain, resulting in the development of a modern chain next to the conventional chain. The modern chain is characterized by a higher level of vertical coordination and brewery control, while the conventional chain is characterized by spot transactions and is dominated by local traders.

We also show that the implementation of various sourcing strategies helps companies to experiment and build efficient supply chains. In setting-up sourcing strategies, companies use public private partnerships (PPPs) as an organizational innovation, to facilitate supply chain collaboration. These partnerships involve a combination of

public, private sector, and non-government organization (NGO) partners. We find that companies managed to build efficient supply chains by involving NGOs and POs for organizing the provision of improved inputs, technical assistance and logistics. By taking up the role of chain orchestrators, the foreign brewers have been able to increase the productivity, production and quality of malt barley. We also show that the provision of new technology, a guaranteed market and quality-based pricing encouraged smallholders to engage in product and process upgrading, which has in its turn positive implications for their income and livelihood.

Chapter 3 focuses on the contract farming arrangement as an organizational innovation. The chapter examined the implications of CFAs on production, intensification, commercialization and prices, and farmer income, using cross-sectional survey data. It also assesses the factors that determine farmers' decision to participate in malt barley CFAs. We used parametric and non-parametric approaches to estimate the average effect of contracting on the selected performance indicators. Consistent with previous literature, we find positive effects of participation in modern supply chains. Participation in modern supply chains has significant impact on smallholder commercialization and farm family income. Our analyses reveal that CFAs have a positive impact on malt barley output growth, increased commercialization, intensification, quality improvement and farm gate prices, ultimately resulting in increased farmer income and spillovers towards productivity of other food crops. For example, CFAs increase malt barley production with 36%, yield with 13%, input costs with 19%, farm-gate prices with 22%, and net income with 31% in comparison with the sample average in research area.

Our analyses imply that CFAs, as an organizational innovation, play a crucial role in improving farm productivity and livelihood of smallholders. CFAs induced supply chain upgrading by the provision of improved technologies, technical assistance, and quality-based pricing. The results also imply that the introduction of CFAs by multinationals induce modernization and upgrading of domestic food chains in Africa in general and Ethiopia in particular. Understanding the nature and impact of CFAs within the malt barley chain in Ethiopia is particularly important as the country aims at increasing malt barley production to meet the rapidly growing domestic demand and to reduce import. Considering the positive impact, CFAs contribute to the debate on how to speed-up agricultural transformation.

Chapter 4 explores and discusses the development and changes in economic functions of POs under a changing institutional environment. We identified the factors that influence a shift in economic functions from provision of inputs to commercialization of farm products, based on an extensive literature review and primary qualitative data. Our findings show that, in Ethiopia, development of POs is highly influenced by political ideology and government policies. This means that different government regimes have directly affected the organizational structure and functional performance of POs. For example, during the Derg regime command economy was the central ideology of the political economy of Ethiopia and POs faced extensive state interference and control, which resulted in high inefficiencies. In the present regime POs operate under the umbrella of a regulated market economy; however, government interference in strategic decisions of POs is often considered as a challenge. POs may not get enough room to manoeuvre for their own interests and to make good use of available resources.

We find that POs perform diverse economic functions to enhance agricultural production. Particularly in inputs markets, POs are important, as they supply 95percent of all fertilizers used. However, given the transformation of food systems, POs are shifting from mainly input supply to also marketing. This paves the way for increased smallholder commercialization and integration into modern value chains. Our findings also indicate that, besides government agencies, different actors from the private sector and NGOs play active roles in providing capacity building support and market orientation for POs. Our analyses further reveal that POs face a number of internal and external challenges that make their transformation to more market-oriented business not an easy one. External factors are related to a lack of working capital, which leads to delayed payment and reduced member commitment, and a high state interference in the strategic decisions. Whereas internal challenges are associated with internal governance of POs, which includes poor managerial capabilities and a lack of accountability and transparency.

Chapter 5 delves deeper into the economic performance of POs, looking into the interaction of inclusiveness and business performance. We extend the analysis to the factors that determine smallholders' likelihood of becoming a PO member. We measure the impact of PO membership across diverse performance indicators. We applied a propensity score matching technique to control for selection bias and to determine the

direct effects of PO membership. We find that, consistent with literature, the motivation to participate in a PO is determined by demographic and economic factors. We also find that larger landholding and more farm resources increase the likelihood of participation in a PO. This suggests that poorer farmers are more likely to be excluded from membership, implying that POs are not inclusive. We also find a positive relationship between distance to market and PO membership. This implies that in remote areas, POs can be considered a suitable institution to support smallholders' market access and thereby improve their livelihoods. Looking at the impact outcomes, our analyses reveal that POs can indeed facilitate value chain coordination and improve economic performance of rural producers. We find a positive relationship between membership and various performance indicators. PO membership positively affects malt barley production, crop yield, prices, product quality, net crop income, and income from other crops. We attribute these positive effects to the fact that rural POs provide access to better seeds and fertilizers at relatively low prices, and to technical assistance and market information. Considering the results of Chapters 4 and 5 together, we conclude that the Ethiopian POs have improved their functional performance. Thus, our results contribute to the debate on how to improve farm productivity and commercialization of smallholders.

Chapter 6 zooms in and discusses on one key dimension of the food value chains, product quality. We start from the assumption that quality is becoming more important for smallholders' competitiveness. We empirically analyze the factors influencing a farmers' decision to invest in quality improvement. We applied ordered logistic regression to identify the important factors affecting smallholder performance in quality improvement. The key methodological issue in studying quality upgrading is how to measure quality. Quality is an elusive concept, different for different actors in the value chain. For instance, for producers quality is about crop yield and disease resistance, for processors it is the uniformity of the raw material, for the wholesaler it is shelf life and availability, and for consumers it is healthiness, taste and convenience. In measuring product quality, two types of quality attributes are often identified, intrinsic and extrinsic attributes. Intrinsic quality attributes are those attributes directly related to the physical characteristics of a product, example colour, texture, shape, appearance, size, taste, moisture content, and protein content. While extrinsic attributes are not directly

related to physical characteristics, for example brand name. We measured quality based on intrinsic attributes, a scale variable as ranked by farmers themselves.

Our finding highlights that quality upgrading has both benefits and costs and actors will only invest in quality improvement as far as benefits exceeds costs. For example, farmers incur costs in cultivation, harvesting, sorting, packaging and storing. Farmers will only accept these cost if there is a good chance their revenues more than offset the additional costs. At micro level, the decision of the smallholder to engage in quality improvement is determined by several factors. We argued that product quality improvement at farm level is conditioned by a combination of push (production related) and pull (availability of exacting buyers) factors. We find that socioeconomic, technological and institutional factors such as type of improved seed varieties, level of education, age (as a proxy for farming experience), entrepreneurial attitude, PO membership, and CFA participation are important determinants for quality improvement at farm level. Important are also the findings on how quality could be improved. Quality upgrading depends on access to modern inputs and services including credit, extension, and training. It is also determined by the institutional arrangements and the associated incentives.

Chapter 7 provides a synthesis of the core chapters. It discusses key findings and scientific insights as well as directions for future research. In general, this dissertation discusses the importance of modernization in domestic food chains driven by FDI using empirical evidence from the Ethiopian barley sector. Foreign investments have triggered organizational innovations in the barley chains, notably the introduction of (new) POs, CFAs and PPPs. The thesis has discussed the structure and effectiveness of these organizational innovations in the course of upgrading the barley value chains. We have demonstrated, in a stepwise approach, the development, inclusiveness and impact of those innovations, and discusses the challenges that need to be addressed to improve their efficiency, to serve the demands of supply chain partners, and to guarantee institutional sustainability.

At a higher level, the thesis contributes to the debate on food policy and inclusive value chain development in SSA. The need to tackle poverty and food insecurity has dominated the research agenda for agriculture in SSA. In pursuit of integrated solutions, many approaches have been used to increase productivity and the

performance of food markets. In this regard, this thesis forwarded promoting and supporting organizational innovations for local food chain transformation and smallholders integration. We also identified avenues for new research on food value chains, including (1) new research is needed to improve our understanding of the impact of rapid urbanization on local value chains in African food systems in general and Ethiopia in particular; (2) the need to expand our understanding of CFAs in facilitating smallholder engagement in upgrading activities and supply chain innovations, follow-up research on other products (grains, vegetables, and dairy) than malt barley could generate useful comparisons and thus allow wider generalization; (3) more research is needed on the tension between inclusion and efficiency of POs in the same country and other SSA countries; and (4) further investigation is needed how organizational innovations can help to build resilient food supply chains and thus contribute to food security in SSA.



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## **Author profile**

Delelegne Abera Tefera (MSc., Development economics, Wageningen University and Research) is a PhD student in Management Studies Group. He got his BA degree in Economics from Hawassa University, Ethiopia. In December 2013, He started his PhD research under the larger development project “Innovative business models on high-value crops in a farmers’ based crop rotation in Ethiopia” which is a consortium among Solagrow Plc, Terrafina microfinance (TMF), SNV-Ethiopia (SNV), and Wageningen University and Research. His PhD research focuses on the transformation process in food supply chains in developing and emerging economies context. In particular, how organizational innovations facilitate modernization of domestic food chains and the implications of this for rural development. Before starting his PhD research, Delelegne worked at Hawassa University as a lecturer and researcher. He acquired skills in quantitative and qualitative research. He is familiar with various econometric models for quantitative data analysis and management. His research interest cover horizontal and vertical coordination in agri-food chains, circular economy, supply chain innovation, and development economics (impact evaluation). He can be reached at [gdele06@mail.com](mailto:gdele06@mail.com).



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**Completed Training and Supervision Plan**



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<b>Name of the learning activity</b>	<b>Department/Institute</b>	<b>Year</b>	<b>ECTS*</b>
<b>A) Project related competences</b>			
<i>'The Empirics of Economic Organizations in Agrifood Supply Systems'</i>	WUR and University of Perugia, Italy	2013	1
Farming systems and rural livelihoods: vulnerability and adaptation	WUR and Hawassa University, Ethiopia	2013	3.5
Writing a PhD research proposal	WASS	2014	6
Advanced Econometrics (AEP60306)	WUR	2014	6
Advanced Supply Chain Management (ORL-31306)	WUR	2014	6
IBM-Ethiopia project meetings	SNV, Addis Ababa, Ethiopia	2015	1.5
Research methodology, topic to thesis proposal	WASS	2014	4
Food value chain research: Understanding Inter-Organizational Relationships	WASS	2017	1.5
<b>B) General research related competences</b>			
Introduction course for new PhD	WASS	2014	1
<i>'Efficiency and inclusiveness of producer organizations in rural Africa: is there a trade-off?'</i>	WASS PhD day	2017	1
<i>'Enhancing Coordination in Malt Barley Supply Chains: A Case Study-Ethiopia'</i>	IFAMA conference, Aarhus, Denmark	2016	1
<i>'Agricultural Cooperatives in Ethiopia: A Review of Evolution, Functions and Impact'</i>	National conference on Cooperative, Ethiopia	2015	1
MST Research Meetings	MST, WUR	2016-17	2
Qualitative Data Analysis	WASS	2017	2.5
<b>C) Career related competences/personal development</b>			
Information literacy including endnote introduction	WGS	2014	0.6
Techniques for writing and presenting a scientific paper	WGS	2016	1.2
Data Management planning	WGS	2017	0.4
Cooperatives and producer organizations (BEC 53306)	WUR	2014	
<b>Total</b>			<b>40.2</b>

\*one credit according to ECTS is on average equivalent to 28 hours of study load



## **Colophon**

The research described in this thesis was part of the development project called “Innovative business models (IBM) on high-value crops in a farmers’ based crop rotation in Ethiopia” executed by Solagrow Plc, Terrafina microfinance (TMF), SNV-Ethiopia (SNV), and Wageningen University and Research (WUR). It was financially supported by the Ministry of Foreign Affairs of the Netherlands under the Facility for Sustainable Entrepreneurship and Food Security (FDOV-12/ET/09).

Additional funds for the completion of the thesis writing have been provided by Management Studies Group (MST), Wageningen.

Publisher: Digiforce/Proefschriftmaken.nl, Vianen