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*Review*

## **A glance at Mozambican dairy research**

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**The Mozambican dairy industry landscape is not well known because the research about it presents numerous inconsistencies which are possibly due to miscommunication between scholars, entrepreneurs, the government and other actors, besides major events such as the civil war and policy changes and overall lack of coordination. This study aimed to catalog and relates the major studies and findings in Mozambican dairy research, contextualize them historically, analyze the implications and provide hints for future researchers. Dairy research seemed intimately related to the industry's development, and it has been dependent on the country's sociopolitical changes and opportunities. Social and economic studies are more abundant, perhaps because the dairy industry is emerging, thriving to stand out in a very competitive environment, but there are also studies in applied sciences, especially microbiology and chemistry. There are promising directions to follow such as the improvement of herding techniques (e.g., feeding, disease control), multidisciplinary synergies or exploration of traditional dairy products such as masse. Also, it would be important for institutions to share their research through electronic platforms, even the information published prior to the existence of the worldwide web.**

**Key words:** Mozambique, dairy, research.

### **INTRODUCTION**

It seems even arguable if there is a dairy industry or not in Mozambique. On one side, Zvomuya (2009) described this sector as “virtually non-existent” and some authors agreed through a chain of cross-references (Johnson et al., 2013; Vernooij et al., 2016), while on the other hand Castel-Branco (2003) classified it as an “emerging agricultural industry”. Whatever the point of view, there are several smallholder dairy farms, at least 8 milk-processing companies (Mahomed, 2017; Vernooij et al.,

2016; Zvomuya, 2009) throughout the country, several markets selling the domestic milk (Mahomed and da Silva Nunes, 2018; Zvomuya, 2009) and perspectives to export dairy products (Zvomuya, 2009). Thus, there is a value chain on which several people depend and it deserves some attention. Furthermore, there seems to be an increasing interest in the matter.

Alberro (1980) called for the need to produce more animal protein in tropical developing countries almost 40

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years ago but even now it has been difficult in Mozambique because the most productive cows are not well adapted to tropical settings. Johnson et al. (2013) agreed and added that a 16-year post-independence civil war also prevented the dairy industry from developing. Thus, it is necessary to study how the milk production could be improved. The country has very little research about dairy manufacturing and its industry (Mahomed and da Silva Nunes, 2018; Zvomuya, 2009). A body of multidisciplinary academic work has been accompanying the thriving dairy sector, describing its status or seeking for solutions and improvements (Mahomed and da Silva Nunes, 2018; Vernooij and Wilschut, 2015).

There were some bursts of considerable research but they do not seem to be planned as long-term projects. As result, the current knowledge is fragmented in contextualized pieces from certain places and periods, sometimes inconsistent or even conflicting (Vernooij et al., 2016; Vernooij and Wilschut, 2015). Future researchers will need a concise catalog showing how each study on the Mozambican dairy manufacturing is located within the *zeitgeist* considering the country's historical, social, economic and scientific intricacies. This article aims to provide a comprehensive view of the current dairy research in Mozambique, trying to explain how it took its shape, its impact on the current state of knowledge, and which directions could be taken in the near future.

The article will start by presenting the country's geographic features because there are several references to cities and provinces, and also to sociopolitical issues. Thereafter, it will describe how the dairy industry evolved throughout the country's history, and finally describe how the research has been carried out and how it contributed to the present knowledge on the Mozambican dairy manufacturing.

## GEOGRAPHIC FEATURES

The Republic of Mozambique (Figure 1) is a South-eastern African country bordering Mozambique Channel with a coastline of 2,470 km (Central Intelligence Agency (CIA), 2013; Instituto Nacional de Tecnologias de Informação e Comunicação (INTIC), 2006). The geographic coordinates are 18°15' S and 35° 00' E (Central Intelligence Agency (CIA), 2013). The country is surrounded by Tanzania (north), Malawi and Zambia (northwest), Zimbabwe (west), Swaziland (south) and South Africa (southwest) (Instituto Nacional de Tecnologias de Informação e Comunicação (INTIC), 2006). The total area is 799,380 km<sup>2</sup>, being 786,380 km<sup>2</sup> of land and 13,000 km<sup>2</sup> of water (Central Intelligence Agency (CIA), 2013). The climate is tropical and subtropical humid (Central Intelligence Agency (CIA), 2013; Instituto Nacional de Tecnologias de Informação e

Comunicação (INTIC), 2006) and it has fertile soils, especially in the northern mountainous areas near the Zambezi River (Encyclopædia Britannica, 2013).

The total population is estimated at 23.9 million people (World Bank, 2013). According to United Nations Children's Fund (UNICEF) (2003) and Canadian International Development Agency (CIDA), 2013), about 69% live in rural areas. Though it had one of the African highest annual economic growth rates (6.8-7.6%) in the past decade, a civil war (1977-1992), and natural calamities among other issues are the reasons why the country still depends on 40% of foreign assistance for its annual budget (Bertelsmann Stiftung, 2012; Central Intelligence Agency (CIA), 2013; World Bank, 2013). The GDP is 12.9 billion US dollars and it comes from agriculture (29.8%), industry (23%) and services (47%) (The Economic and Policy Analysis Unit (EPAU), 2012; World Bank, 2013). The main exports are cashew products (US\$ 21 million), prawn (US\$ 42 million) and manufactures (US\$ 34 million) (The Economic and Policy Analysis Unit (EPAU), 2012; World Bank, 2013) but there are other commodities such as aluminium, electricity, tobacco, sugar, cotton and timber (The Economic and Policy Analysis Unit (EPAU), 2012; United States Agency for International Development (USAID), 2009).

The main export partners are Netherlands (36.9%), South Africa (14.6%), Portugal (3.4%) and China (2.5%) (The Economic and Policy Analysis Unit (EPAU), 2012). The local cashew industry used to be the World leader with 35-40% international market share but it had a downsizing basically because of inefficiencies during a major economic reform (McMillan et al., 2002; World Bank, 2006). Yet, Große-Rüschkamp and Seelige (2010) reported a growth from 0.5 to 3.25 million tonnes from middle 1980s to 2007.

## HISTORICAL CONTEXT

It is necessary to have an idea about the evolution of the Mozambican sociopolitical context in order to better visualize the research directions in the dairy industry. The country has undergone several changes since the colonial era, independence, civil war, establishment of a democratic system and harmonization with the Millennium Declaration (José, 2005; Kates et al., 2005). These changes led to economic readjustments and certainly affected all sectors of production, including research and development.

The Portuguese effectively occupied Mozambique soon after the Berlin Conference (1884–1885) and the defeat of the Emperor Ngungunhane (1895). Since then, they controlled the production. According to Raikes (1984), the dairy industry grew considerably just before the independence (1950-65) because the major cities were growing and attracting people from the metropolis, demanding "high-income foodstuffs" such as wheat flour, meat and dairy. A network of supply chains developed



Figure 1. Mozambique. Source: Geographic Guide (2018).

rapidly, enhanced by the participation of South African farmers and firms. However, the war of independence (1964-74) and its aftermath certainly destabilized the sector.

The post-colonial government (1975-89) discouraged the private sector because the country was under a Marxist-Leninist orientation with one party, and all major decisions were under central rule. Even education and research should comply with the country's priorities, with little flexibility to develop. For instance, the Government ceased some departments of the only university at that time (Eduardo Mondlane). This setting certainly discouraged research in any field and international collaborations, especially from countries under a different regime.

In 1987, Mozambique changed its priorities to get

support from the International Monetary Fund (IMF) and the regime changed to democratic. The resulting project was designated as the Economic Rehabilitation Program, under which the Government allowed citizens to purchase most of its properties and stimulated entrepreneurship (Mosca, 2008; Vieira, 2005). According to Vernooij et al. (2016), most dairy farms were privatized between 1994 and 1997. The state also developed strategies to attract foreign investment and collaborations such as transference of technology, capacity building and assistance. The academia also expanded, private schools and research centers opened, providing means for some research to take place. The situation became even more favorable after the peace treaty, signed on October 4<sup>th</sup>, 1992. Yet, there is very little information on the Mozambican dairy industry during 1990s. Perhaps

the most relevant is the overview by Faftine (1995) on the use of cows in smallholder farming systems presented in Ethiopia, 1995. This shortage of information is possibly because: the governance was under transition, drawing most attention to production instead of research; priority areas were fisheries and cash crops such as cassava, maize and peanuts; there was no investment for the dairy industry; there was little technical or academic expertise and technology related to dairy production; the new open market promoted competition, and assessments were made between institutions under professional secrecy.

The new millennium came with a new worldwide sociopolitical framework, partially because of the Millennium Development Goals (MDG), and now the Sustainable Development Goals (SDG) (Kates et al., 2005). As response, Mozambique developed the Plan of Activities to Reduce Poverty (PARP) (Castel-Branco, 2012), facilitating the introduction or expansion of projects able to address the goals, especially the combat against poverty, hunger and disease. There were also strong incentives for education. A real locally based dairy industry started to take shape in this era: South African branch of Parmalat SpA opened a facility in Maputo Province (Slabbert, 2008), Brendon Evans inaugurated Gouda Gold in Manica province (Zvomuya, 2009), Land O' Lakes start collaborating with dairy farm smallholders (Mahomed and da Silva Nunes, 2018) and several dairy plants took off throughout the country (Vernooij et al., 2016). Some research accompanied the establishment of such firms, most related to economic viability. Furthermore, dairy research is likely to become more active in Mozambique because there is an increasing number of research centers, universities and polytechnic institutes with food science programs (Cambaza et al., 2018).

## EARLY STUDIES

There was an extensive research on the Mozambican dairy production during the colonial era. Pereira Martinho (1956) presented the results in his book called *Some Aspects of the Livestock Problem in Mozambique*, with details such as the cow types, their productivity and distribution throughout the territory, owners' ethnicities and how they treated the cows. According to him, cows were less abundant in Mozambique compared to the surrounding territories, most farms were located at the southern area, and the native cows were not as productive as Friesians. Achá et al. (2004) believe this is due to abundance of tse-tse flies (*Glossina* spp.). Landim, the preferred local type, was crossed with European breeds, originating considerably productive cows. For instance, Landim x Friesian was able to produce 3000 L in 300 days in the 4<sup>th</sup> or 5<sup>th</sup> lactation, and Landim x Jersey could produce 2000 L for a similar period.

Some post-colonial studies are available in David Lubin Memorial Library of the Food and Agriculture Organization of the United Nations (Food and Agriculture Organization of the United Nations (FAO), 2018b). They covered different aspects of dairy production and how to improve it. The readily accessible literature has very little information on how these studies were conducted and even their results. However, it is possible to grasp the state of research and where it was heading.

Alberro (1980) kick-started the post-colonial research in 1980 by comparing the productivity between Holstein, Dutch and Africander x Friesian heifers. The two former started producing milk earlier, and yielded more for a longer period than Africander. The following year he described the management, feeding and behavior of Friesian dairy herds in the coastal belt of Mozambique (Alberro, 1981). In 1984, a group of scientists presented studies on reproduction of Mozambican dairy cattle in the 10th International Congress on Animal Reproduction and Artificial Insemination, Illinois, United States. Diaz (1984) talked about abortion and death, Rocha and Diaz (1984) about artificial insemination, and Thompson about microbial flora in the cervical mucus of dairy cows. The same year, Raikes (1984) mentioned dairy production in his article on how policies are affecting the food industry in Mozambique.

Another important study was published by Alinder and Ingevall in 1985. After a soil survey in the country's southern region, they conceived an irrigation scheme for a dairy farm. The same year, Maputo City hosted the Seminar on Animal Production, where de Vries (1986) and Diaz (1986) presented their progress on dairy research. The former proposed the introduction of rice straw in dairy cattle's diet and the latter suggested some improvements for the dairy cattle production in Mozambique.

The studies mentioned in this part of the work were focused on the cattle's health rather than dairy quality or safety. This was possibly because the country was still attempting to re-establish the industry after the Portuguese left with key manufacturing resources. Dairy production relied on large farms with exotic animals, modern equipment, special feedstuffs, drugs, and a timely arrival of supplies and services (Raikes, 1984). Furthermore, the country was struggling to implement post-colonial policies and under a civil war from 1977 to 1992 (Coelho, 1998; Johnson et al., 2013; Seibert, 2003).

## RECENT STUDIES

Among recent documents worth mentioning about dairy production in Mozambique, the ones on Table 1 are enough to cover the most relevant information. Other studies are either related or do not seem as pertinent; however, they will be mentioned when or if necessary. The major documents on dairy food in Mozambique are

**Table 1.** Major recent publications describing dairy production in Mozambique.

Year	Author	Document type	Subject	Focus
1995	Faftine (Faftine, 1995)	Proceeding	Economics	Farm management
2003	Castel-Branco (Castel-Branco, 2003)	Journal article	Economics	Industry analysis
2004	Achá et al. (Achá et al., 2004)	Journal article	Microbiology	Animal health
2008	Slabbert (Slabbert, 2008)	Magazine article	Agribusiness	Interview (entrepreneur)
2009	Zvomuya (Zvomuya, 2009)	Magazine article	Agribusiness	Interview (entrepreneur)
2011	Rungo (Rungo, 2011)	Dissertation	Chemistry	Milk quality
2012	Zucula (Zucula, 2012)	Dissertation	Chemistry	Milk quality
2013	Schutte (Schutte, 2013)	Dissertation	Microbiology	Milk quality
2014	dos Anjos, et al. (dos Anjos, Tivana, da Cruz, and Kagande, 2014)	Journal article	Animal production	Cassava as cow feed
2015	Ouana (Ouana, 2014)	Dissertation	Chemistry	Butter quality
	Johnson, et al. (Johnson et al., 2015)	Journal article	Gender studies	Farm management
2016	Chagunda, et al. (Chagunda et al., 2016)	Journal article	Agribusiness	Farm management
	Vernooij, et al. (A. Vernooij et al., 2016)	Consultancy report	Agribusiness	Industry analysis
2018	Mahomed and Nunes (Mahomed and da Silva Nunes, 2018)	Journal article	Agribusiness	Business plan

mostly journal articles but there are also magazine feature articles, proceedings, and academic dissertations, project reports, among others. Most cover agribusiness, economics or social sciences but few also feature natural sciences or multidisciplinary studies. The frequent focus on farm management is perhaps due to the recent strong incentive to entrepreneurship in Mozambique, especially for agriculture (Ahlers et al., 2013; Davis et al., 2008). Former President Armando Guebuza introduced a fund to develop small and medium-sized enterprises in the countryside to stimulate development and decentralize the economy (Weimer, 2012), accessible for any citizen who presented a mid-long term sustainable plan (Orre and Forquilha, 2012; Vala, 2007). The following discussion will first focus on economics and the social studies, and then natural sciences.

### Economic and social studies

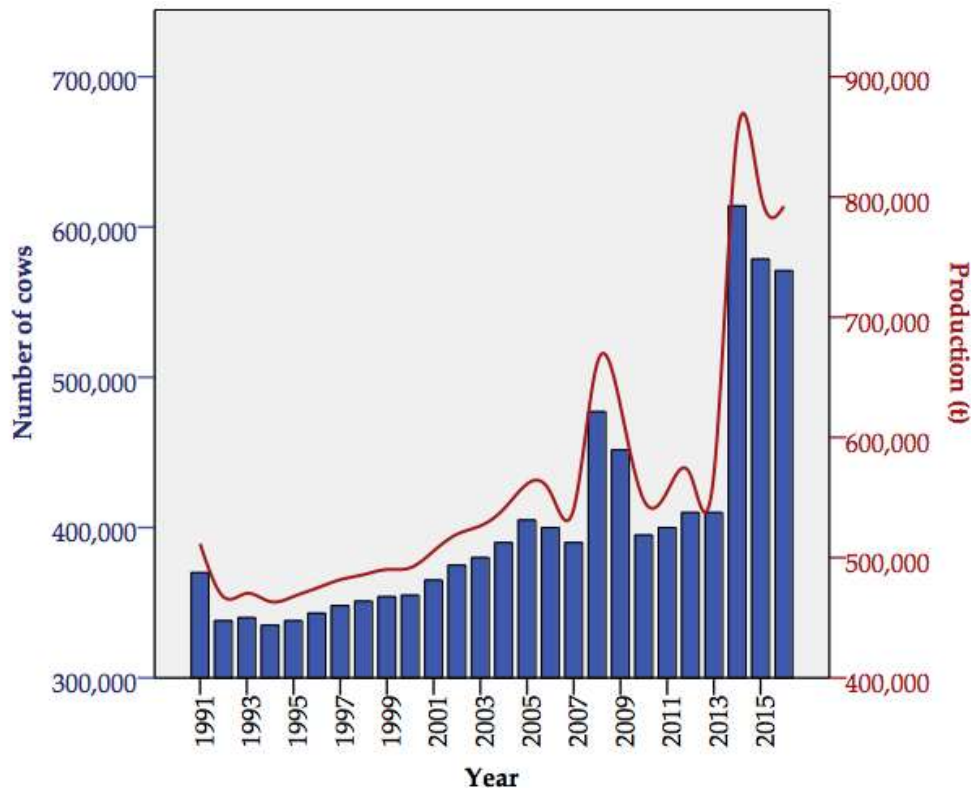
Olga Faftine (1995) can be considered the first scholarly authority describing the dairy industry after the peace treaty (1992) and establishment of the first democratic Government (1994). In summary, she confirmed the predominance of cattle in the country's south and center and provided a glance on the changes during the civil war. According to her, the number of cows declined from one million to around 200,000 in 1992 and milk production from 10 million to 1 million liters per year. However, it is reasonable not to consider Faftine's analysis as part of the most recent dairy research because she published her document when the Government was following the Program for Economic Rehabilitation rather than the current Plan for Poverty Reduction. Furthermore, the flood in 2000 affected

several farmers throughout the country's south and center (Benfica et al., 2000), many lost their goods and had to be reallocated, affecting the area's agricultural landscape. Yet, the country kept most agricultural policies and several aspects still apply (Zvomuya, 2009) or can facilitate the understanding of the current situation.

The United Nations (UN) (Food and Agriculture Organization of the United Nations (FAO), 2018a) has records on the number of dairy cattle and milk production in Mozambique since 1991 (

Figure 1). According to the database, the number of dairy cows seems to have increased from perhaps lower than 300,000 herd to almost 600,000, and there were two leaps of a considerable proliferation: 2008 and 2014. Raimundo Diomba, Manica provincial governor, also stated this trend when he said that milk market was expanding as response to consumer demand (Zvomuya, 2009). However, UN's values seem too high for the values reported by Faftine (1995) and Vernooij et al. (2016) and low for Zvomuya (2009). For instance, Vernooij et al. (2016) said the annual milk production is 82,000 metric tonnes annually, according to the Emerging Markets Analysts Report published in 2014, but the author recognizes that "exact figures on milk production in Mozambique are scarce and often conflicting". The differences are possibly because information technologies have been improving and facilitating services such as census and statistics, and UN regularly updates its database. Furthermore, part of the milk produced locally is sold informally (Vernooij et al., 2016), and part of it is potentially underreported.

Milk production showed a very similar trend to the number of herd, increasing from around 500,000 to 800,000 tonnes. It suggests that yield did not change



**Figure 1.** Number of cattle and milk production in Mozambique from 1991 to 2016. The bars represent the number of head and the red line represents the variation in the quantity of milk. t = tonnes. Based on UN.

considerably. Indeed, a Kolmogorov-Smirnov one-sample test of the yield provided by UN (Food and Agriculture Organization of the United Nations (FAO), 2018a) showed non-significant variation over time ( $p = 0.96$ ), with the confidence interval from 13846 to 13859 hectoliters per cow annually. In this case, both Faftine (1995) and Zvomuya (2009) presented “humbler” statistics, with values below 80,000 tonnes. The quantity of milk produced in Mozambique seems reasonable if compared to other African countries. For instance, while Kenya and Ethiopia show records of over a million tonnes, Madagascar, Uganda and Tanzania present values close to Mozambique’s (Muriuki and Thorpe, 2001). Yet, Zvomuya (2009) said milk consumption is very low even for the quantity produced. According to the author, the average Mozambican consumes only 5.7 L of milk annually, and it declined from 9.1 L in 1990. For the sake of comparison, he said the world average is 79 L per capita.

Ten years later, Castel-Branco (2003) published the following relevant article considering that Faftine actually described facts up to 1992. He wrote about Mozambican economic growth in general, mentioning the dairy production in few instances as example. He classified dairy manufacturing as an emerging agricultural industry

because it heavily relies on imported products in late stages of processing. Indeed, two interviews published in the Dairy Mail Africa subsidize Castel-Branco’s line of thought. Slabbert (2008) interviewed Parmalat’s chief executive officer (Theo Hendrickse), and identified this company as the leading dairy factory in Mozambique. The author said that the country’s branch has been considerably profitable, even when Parmalat was facing a crisis worldwide. But Zvomuya (2009) said the company does not produce or refine raw milk, instead Parmalat imports all inputs including packaging material and powdered milk and sells as ultra-high-temperature (UHT) processed milk. Mahomed and da Silva Nunes (2018) identified Gouda Gold and Land O’ Lakes as the largest dairy manufacturers relying solely on local raw material and delivering finished products. Table 2 shows these and other major dairy producers in Mozambique.

The processing plants in Maputo import their material, partially processed, focusing their activity more on the final steps, packaging and branding (Fauvet and Mosse, 2003; Zvomuya, 2009). Assuming that cattle farms are more abundant in the country’s south and center (Achá et al., 2004; Faftine, 1995), it would be reasonable to expect the companies of Maputo to use local raw materials, as it is the Mozambique’s most

**Table 2.** The major dairy manufacturers in Mozambique and their product features.

Province	Company name	Dairy input	Main products
Maputo	Parmalat	Imported	Fresh milk, cheese
	Protal	Imported	Condensed milk, cheese
Sofala	Copolate	Local	Fresh milk
Manica	DanMoz	Local	Fresh milk
	AgroMaco	Local	Fresh milk
	Gouda Gold	Local	Fresh milk, cheese
	Land O' Lakes	Local	Fresh milk
Nampula	Rafza Rostongy	Local	Fresh milk

Adapted from Vernooij et al. (2016), Mahomed and Nunes (2018), and Zvomuya (2009).

southern province. However, the area is strategically located near South Africa, the Maputo-Witbank road facilitates circulation between both countries (Horne, 2006), South Africa has relatively low cost high quality milk (Department of Agriculture, 2012), more stable and predictable price fluctuations (Brännäsa and Machavaab, 2015; Hassan and Simone, 2013), and the local supply might not be enough for demands of Parmalat and Protal. Furthermore, historical reasons should be also considered. Parmalat was introduced in Maputo through the South African subsidiary (Slabbert, 2008; Zvomuya, 2009) and it certainly had already an established supply chain, entering Mozambique especially to sell the milk and derivatives. Protal also commenced as an import-export firm for condensed milk and processed cheese (Fauvet and Mosse, 2003).

Fidelis Zvomuya interviewed the founder of Gouda Gold, Brendon Evans, providing valuable insights about the Mozambican dairy industry in 2009 (Zvomuya, 2009). The entrepreneur described the industry as “virtually non-existing” until he went to Mozambique as a refugee from Zimbabwe’s regime in 2002, and established in Manica Province with only 20 cows from the originally over 200. His radical view perhaps refers to the absence of coordinated enterprises covering the entire dairy production chain consistently responding to market’s demands. Evans was a pioneer in this sense by opening the first cheese-manufacturing factory in Mozambique, inaugurated in May 2007 and built to meet international and European Union standards, and the Guidelines of the International Labor Organization (ILO). The company has Dutch partners such as Scherjon Dairy Equipment and Advance Consulting Haarl, and the Private Sector Investment Program (PSI), formerly known as PSOM. These organizations provided assistance, equipment and loans to support Gouda Gold.

Land O’ Lakes managed an initiative called Manica Smallholder Dairy Development Program (MSDDP) from 2008 to 2012 to rebuild the Mozambican dairy industry

and increase smallholder farmers’ income as milk producers. The cooperative claims to have doubled the number of dairy cows and tripled the volume of milk produced in Manica (Land O’ Lakes, 2016a). The company has plenty of information on the program at its website (Land O’ Lakes, 2016b) but there are also some scholarly documents on the topic. For instance, Johnson et al. (2013, 2015) published two papers, both focusing on the female contribution for the success of the initiative. According to them and Zvomuya (2009), the United States Department of Agriculture awarded Land O’ Lakes a Food for Progress Project grant to support dairy farmers from Manica Province. The company used USD \$6 million to provide 400 dairy cows to local farmers and to finance artificial insemination. After a survey in 125 households in 2011 and 150 in 2012, Johnson et al. (2015) found that: men owned most assets such as lands and cows but they frequently shared with their wives, still keeping the control over the revenues; the participation in the program increased the farmers’ income and access to nutritious food, regardless if the assets were managed by men or women; men tended to reinvest the revenue in assets to improve the business while women spent most of it improving the household quality of life. In any case, dairy business seemed to increase farmers’ income and promote the participation of women in the labor force, thus empowering them.

In 2016, Chagunda et al. (2016) published another study related with MSDDP, though this was about the initiative in Mozambique and four other countries from Sub Saharan Africa: Kenya, Tanzania, Malawi and Zambia. They shared valuable insights about Mozambique. For instance, they described the average land size per smallholder (3.88 ha), the use of cassava roots and leaves to feed cattle, and the cross-breeding between the ingenous zebu cattle and Holstein-Friesian.

Vernooij et al. (2016) published a report on livestock development in the Zambezi Valley, also in 2016. It incorporates findings by Vernooij and Wilschut (2015),



available since the previous year at the Wageningen Centre for Development Innovation database. It is arguably the most detailed and updated Mozambican dairy value chain analysis to date and a good introductory reference for future researchers on the topic. They identified four processing plants (already explained in Table 2), that described the daily production as 2,000 L in Chimoio and 1,100 L in Beira. They described some constraints for farmers such as limited market access, low productivity because of limited husbandry skills, lack of nutritious feed or suitable breeds for milk production, reproduction issues and disease, besides the fact that the most productive dairy cows are adapted to temperate climates (Alberro, 1980, 1981). Furthermore, Vernooij et al. (2016):

- i) Identified the main actors in the value chain: the Government, a dairy cooperative in the city of Beira, non-governmental organizations (NGOs) and smallholders;
- ii) Described the production in quantity and volume per province, some initiatives including Manica Smallholder Dairy Development Program;
- iii) Dairy cow feeding and reproduction;
- iv) Analysis of strengths and weaknesses.

Mahomed and da Silva Nunes (2018) published an analysis of viability for the establishment of a new dairy factory in Mozambique. Their article summarizes Mahomed (2017) dissertation. They focused on Maputo, Beira and Nampula because these are the country's major cities and the study was market-oriented. They provided unique insights about the consumer's point-of-view, discussing about perception on the price per liter, dairy purchase habits and patterns, milk substitutes, and a projection on dairy demand. Considering these variables, the market seems viable for the implantation of a dairy manufacturer. This result subsidizes what the governor of Manica said (Zvomuya, 2009), though Mahomed's studies were in different areas of the country. Moreover, their article is the only one about the Mozambican dairy industry including butter among the products. This is a very important point because butter is arguably perceived as the most popular dairy product in Mozambique (Ouana, 2014; Rose et al., 2002), eaten by virtually the entire population as part of the breakfast, accompanying bread or boiled cassava roots and black tea (Rose et al., 2002). Most authors did not include butter possibly because most butter is imported from South Africa and many people consume margarine as a substitute because of its lower price, and margarines might have very little dairy among its ingredients (Merriam-Webster, 2018).

Yet, value chain analysis so far mentioned condensed milk, but the local population consumes it frequently, uses it for baking and knows very well the manufacturers. The most widely known manufacturer is Protal, the country's major dairy company before the arrival of

Parmalat (Fauvet and Mosse, 2003). The enterprise predates independence and remained active through all sociopolitical changes. It commenced in 1956 when the industrialist Jaime Cardoso sold his Hotel in Beira and set up a dairy import-export company in Lourenço Marques (now Maputo City). He imported condensed milk, competing directly with the Nestlé brand Cruz Azul. Later, his firm merged with Protal, founded in 1968 (Zucula, 2012). The company has approximately 70 workers, most engaged in production and packaging. Their main products are condensed milk under the brands "Protal" and "Blue Crown", and Belarosa processed cheese. This story conflicts with Zvomuya (2009) claims about Gouda Gold as the first cheese manufacturer, but maybe the author meant "first primary producer", as Protal imports its raw materials. The only research on Protal was published in two dissertations of chemical studies (Schutte, 2013; Zvomuya, 2009) and a biography of Carlos Cardoso (Fauvet and Mosse, 2003), a deceased influential journalist. The dissertations will be next examined.

So far, the social and economic studies of Mozambican dairy research seems to be increasingly intense as the sector also develops, especially the smallholders. Most research was associated with Manica Smallholder Dairy Development Program but new initiatives will possibly trigger further research. For instance, the papers published by Faftine (1995) and Castel-Branco (Castel-Branco, 2003) were not really focused on the dairy industry; it is mentioned as an example to illustrate their particular arguments towards concerns not related to dairy, while the latest studies (Mahomed and da Silva Nunes, 2018; Vernooij and Wilschut, 2015) were assessments of dairy value chain in the country. Mahomed and da Silva Nunes (2018) evaluated the economic viability to install a new dairy factory in Mozambique. They concluded that it was feasible because the few companies available do not fully cover the market.

### **Natural and applied sciences**

Research on natural or applied sciences seemed frequently related to the social and economic counterparts, sometimes as a component of the others. It happened through synergies, such as cases in which companies and research institutions joined efforts to analyze dairy production but each organization acted according to its own expertise or interests. For instance, Eduardo Mondlane University (UEM) collaborated with other organizations such as University of Zimbabwe (dos Anjos et al., 2014), Wageningen University and Research (Vernooij et al., 2016), Future Farming Systems Group and other institutions (Chagunda et al., 2016). Even within UEM, different faculties have collaborated, exploring different aspects of dairy production. Thus,

there will be some references to the works described previously. The studies will be presented according to subjects rather than a chronological order for the sake of thematic coherence, starting by the biological studies and then covering the chemical analyses.

Here we will first cover the study by dos Anjos et al. (2014) who analyzed the potential of cassava to be integrated in dairy cattle diet as an affordable energy source, as this practice had been introduced in some tropical countries. Feeding trials using cassava hay showed a dry matter intake (DMI) of 3.2% of the body weight (BW) and digestibility of 71%. Other benefits were low feeding cost if compared to maize-based feed, anthelmintic and therapeutic effect due to the presence of tannins. This study is related to the one by Chagunda et al. (2016) mentioned earlier about how to improve the productivity in dairy farms. These authors mentioned many other examples supporting the use of cassava as a viable alternative to lower dairy production cost.

Ten years earlier, Achá et al. (2004) actually published the first major post-war scientific study on dairy farming. They screened calves 1241 for diarrhea, aiming to analyze the prevalence and etiology. The calves belonged to 8 farms throughout the country. The prevalence was low (5%) but relatively high in two farms (13 and 21%). Among the calves with diarrhea, 11% were positive to *Campylobacter jejuni*, 2% for *Salmonella* spp. and 40% to K99 adhesin, indicating the presence of enterotoxigenic *Escherichia coli* (ETEC). Some sources described a different pattern of prevalence (Mukhtar et al., 2015; Olaogun et al., 2016) at which ETEC is more frequent, followed by *Salmonella* spp. and less frequently *C. jejuni* and *Clostridium perfringens*. Achá et al. (2004) said the unusual abundance of *Campylobacter* might have been related to outbreaks in some farms. This seems to be a promising research direction. For instance, the authors could have searched for the true cause of the differences with other studies; they could have included other microorganisms or parasites, analyze the impact of disease on the farms' productivity or much more. However, this study apparently had no follow-up.

In 2013, Schutte published another microbiological study as a masters dissertation at the University of Stellenbosch, South Africa. The author's focus was on the microbial flora of traditionally fermented milks in Sub-Saharan Africa, including a drink called *masse* from Mozambique. *Masse* is a beverage prepared through spontaneous fermentation of raw milk. It has a sour taste and a considerably dense consistency, similar to yogurt. Schutte (2013) detected *Leuconostoc* in 68% of the samples (average 2000 cfu/ml). The author did not study the safety as the interest seemed to turn to organoleptic properties. *Masse* and other African traditional fermented milks have more diversity in microorganisms when compared to commercial fermented milks, meaning that they possess very rich florae with potential to provide new properties to foods commercially available. This was

a very innovative and necessary line research, though it is advanced for an industry still striving to exist in Mozambique. Yet, as it is a local traditional drink, people already have the know-how to produce it. Furthermore, the country could gain some competitive advantage by legally protecting as traditional knowledge or under geographical indication through the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (Helfer, 2004).

Finally, there are studies on dairy chemical properties, all licentiate dissertations from the Faculty of Sciences, Eduardo Mondlane University. The first was published by Rungo (2011), who developed a set of protocols for experiments on chemical engineering. His dissertation catalogs major processes to analyze the quality of condensed milk, such as fat extraction and quantification of sucrose. This study did not contain any novelty because it was not meant to, but it is among the few scholarly documents mentioning Protal as a major dairy company in Maputo City. However, it was not merely focused on dairy production as the author interviewed and reviewed processes from several chemical industries. Zucula (2012) was the only one who specifically studied condensed milk processing by Protal, providing the only Mozambican scholarly description published till date about dairy's full analytical process for quality control and assurance, including the chemical, microbiological and organoleptic components. Ouana (2014) evaluated the quality of Tulip butter and two margarine brands (Rama and Flora), all imported but widely consumed locally. According to the author, the values were within the Codex Alimentarius limits for acidity, iodine, fat, volatile substances and impurities insoluble in ether. A unique aspect of this study is the attention to butter and even margarine, perhaps the most important but "underrated" dairy products in Mozambican academic circles, possibly because they bear little resemblance to the raw material. Curiously, yogurt also seems underrated.

## CONCLUSIONS AND RECOMMENDATIONS

It was an exaggeration to say that there is virtually no dairy industry in Mozambique. Castel-Branco gave perhaps the most accurate description by saying that it is an emerging agricultural industry, lacking some elements to be fully established and using mostly local input. There is a market and value chain, modestly defined. What the Mozambican dairy industry needs is proper leadership and collaboration to face numerous challenges including "almost unfair" foreign competitors. One successful example was the Manica Smallholder Dairy Development Program. It would not have been possible without the investment for sure, but part of its success was certainly due to a well-coordinated plan of activities and allocation of resources. Furthermore, the government should issue

and enforce policies encouraging large companies to prioritize the milk locally produced over imports, and build infrastructures to collect milk from the smallholder dairy farmers.

Regarding dairy research, it is emerging likewise. Scholars might be facing difficulties getting funding because priorities are turned toward cash crops and other food industries more developed such as fisheries or poultry. Yet, there seems to be increasing production interest on dairy in Mozambique, together with the incentives for entrepreneurship and a larger number of research facilities, opportunities and experts. Hopefully, each case of success will spread optimism among actual and potential stakeholders and maybe the country will be able to better deal with the external competition.

There are also different research directions, all promising. Perhaps the most important is not to stop any project in the middle or stimulate follow-ups. The academic departments or research centers should design projects with mid- or long-term impact, and also collaborate more by creating multidisciplinary synergies able to study the dairy production from different perspectives. There are a few industry analyses and studies on applied sciences. Academia and research centers should encourage students, young researchers and entrepreneurs to pursue dairy industry quests and bring solutions to each challenge. For instance, it would be advantageous if the country could explore the potential of traditional dairy products and start an all-new industry, gaining competitive advantage.

Above all, there are probably various documents like the ones in the Library of the Food and Agricultural Organization, existing only in physical format. This is probably because they were issued prior to the expansion of electronic resources such as the worldwide web. These documents would be an asset to researchers if available online. Even if such documents seem outdated they can bring unparalleled insights, able to provide a more accurate picture about the dairy production landscape in Mozambique.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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*Review*

# **Malt barley commercialization through contract farming scheme: A systematic review of experiences and prospects in Ethiopia**

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**In Ethiopia, smallholder commercialization and integration into the market has been one of the policy directions. Though Ethiopia managed to raise economic growth recently, there is languished pace of agricultural commercialization. This study investigates malt barley commercialization process through contract farming scheme, and its experience, effect and prospects in Ethiopia. A systematic review system was employed. Now contract farming is evolving in Ethiopia, while the motives for promoting contract farming may vary by actor, this study focuses on the role of contract farming scheme in malt barley commercialization. Foreign investors took up the beer companies and upgraded their working capacity leading malt demand by 83%. Malt barley contract farming scheme was introduced by Heineken brewery to ensure local sourcing of malt. Recently, Heineken managed sourcing malt barley from 10,200 contracted farmers in Arsi Zone and later on, Diago and Dashen breweries joined malt barley contract farming. Current malt demand is 50,000 ton while local sources cover only 50% of it. Contracted famers gained a 10% high price advantage than the non-contracted counterparts. Given barley gene pool resources and favorable production agroecology, booming beer industries and growing malt demand imply malt barley production prospect is promising and attractive. However, the innovative firm-farmer integrations need to curb the following challenges: side selling, late payment, limited access to improved varieties, weak capacity of cooperatives and unions in discharging proactive intermediary roles. Therefore, public agencies and private partners need to work towards scaling out and up malt barley innovations and commercialization to realize sourcing all required raw materials from local sources.**

**Key words:** Malt barely, commercialization, contract farming, economic growth, Ethiopia.

## **INTRODUCTION**

Commercialization of smallholder agriculture is widely considered as one of the most effective means of dealing with poverty in developing countries like Ethiopia.

Existing literatures document evidences that ascertain commercialized farms contribute significantly to the livelihoods of rural households in sub-Saharan African

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countries and elsewhere (Muriithi and Matz, 2014). Commercialization aim is attained by altering subsistence level of production to highly market-oriented level (Barrett et al., 2012). However, studies suggest that agricultural commercialization is a complex mode of implementation. The perception that commercialization of smallholders to help in reduction of poverty at the household level is supported by the literature (Bellemare, 2012; Maertens et al., 2012). Commercialization of high-value export crops and income have been found to be positively associated with African cases of Madagascar, Senegal and Kenya (Maertens et al., 2012). Still, the relationship between commercialization and welfare of smallholder household are not fully understood and the findings are not always in agreement with each other (Maertens et al., 2012), which is possibly due to the difficulty in identifying the causal relationship empirically.

Several factors affect commercialization of agriculture; moreover, commercialization pathways play crucial role. Recently, contract farming and outgrowers schemes are being presented as a route through which farmers can engage in agribusiness and commercial agriculture (Sitko and Jayne, 2014; Smalley, 2013). In this regard, in Ethiopia, there were a couple of attempted models of commercialization such as Economic Growth Corridors and large scale commercial farm initiatives with limited success stories. Ethiopia is pursuing strategies, plans and programs anticipating agricultural transformation by employing mechanisms for instance agricultural commercialization clusters, contract farming and outgrowers schemes on selected commodities as agribusiness incubation approaches in the potential areas of the country (ATA, 2016). On basis of systematic review of published and unpublished recent literatures on various commercialization models in the country, this paper attempted to critically investigate malt barley commercialization process, experience and prospects through contract farming scheme in Ethiopia. Accordingly, in this study, the following objectives were pursued to: assess smallholder commercialization schemes employed and progresses in Ethiopia; examine the role of malt barley contract farming scheme in commercializing malt barley through firm-farmer integration, and identify effects and prospects of malt barley contract farming scheme and cast light for further study and documentation.

## THEORETICAL PERSPECTIVES OF CONTRACT FARMING

Transaction cost economics (TCE) assumes that market actors suffer from bounded rationality and are opportunistic (self-interested with guile); they can deceive, lie, cheat and steal (Prowse, 2012).

Consequently, participation in a market entails costs before the transaction is concluded and are incurred in

finding the right partner, negotiating terms, and finding other information about the exchange. Costs are also incurred after the transaction for monitoring of performance and covering losses; these costs are referred as *ex ante* and *ex post* transaction costs, respectively.

Transaction costs are influenced by the characteristics of the transaction, product and environment within which transactions occur (Bhattarai et al., 2013). These are asset specificity, frequency and uncertainty as the three most important characteristics of transactions that alter the cost of engaging in an exchange. An agribusiness firm incurs very high transaction costs when engaged in informal markets in developing countries where quantity, quality and regularity in delivery are unpredictable due to high levels of environmental and behavioral risk (Da Silva and Rankin, 2013). These uncertainties discourage investment in assets required to add value to products. The seasonality and perishability of agricultural products also increases the complexity of transacting, particularly when markets require specific quality standards and credence attributes in products. Complexity increases transaction costs by increasing the uncertainty of supply, by increasing information and monitoring costs, by increasing the need for assets that have little value in alternative uses, and by increasing the cost of renegotiating incomplete contracts *ex post* (Bhattarai et al., 2013).

At the same time, smallholders face high transaction costs when selling their products in thinly traded informal markets where reliable information is scarce and marketing costs are high due to poor physical and legal infrastructures. They also face high transaction costs in their efforts to procure inputs. The recent proliferation of mandatory food safety and quality standards to meet customer requirements in global markets has added to the high unit transaction, compliance and marketing costs confronting individual farmers who trade small quantities (Da Silva and Rankin, 2013). Under these conditions, firms and farmers have an incentive to engage in relational contracts to bulk up volumes traded and to reduce the uncertainty that increases transaction costs and diminishes investment in value-adding assets (Prowse, 2012).

## Debates on the role of contract farming in rural development

In an extensive review of the political economy of contract farming in Africa, Oya (2012) positions contract farming as a site of ideological contestation in debates on the development of capitalism in rural areas. For Oya (2012), discussions on contract farming cannot be separated from broader debates about the role of small farmers in development. He argues that so called neo-populist writers view contract farming as "one of the

preferred institutional devices to make the smallholder path to development viable in contemporary developing countries in the context of globalization. This politically popular view has permeated into World Bank policies that, as noted above, strive to find a place for (entrepreneurial) smallholders in corporate agriculture without challenging the corporate global agri-food system. But here lies the crux: it is apparent that in many cases, contract farming schemes have only been sustainable under conditions of monopsony power, where a company is the only buyer for many small farmers with scarce alternative livelihood and income generating options (Oya, 2012).

There is, therefore, a contradiction between neo-liberalism's commitment to free markets as the best path to small farmer welfare on the one hand, and contract farming as an institutional innovation that may only work for agribusinesses under conditions of less or no market competition (Oya, 2012). Oya's contribution also tackles the role of contract farming in agrarian transitions, however he criticizes Little (1994) for their over-deterministic view of the inevitability of contract farming relations expanding under globalization. Oya (2012) argues that there is no evidence of a distinct 'contract farming path' in agrarian transition, and instead suggests that "contract farming may contribute to processes of social differentiation and capitalist development *already* under way, in conjunction with several other forces, specific to time and place". This points to an important argument of the agrarian political economy literature: that the benefits of contract farming will likely accrue to those farmers with higher levels of pre-existing resources or capital, particularly those with access to off-farm income sources (Zhang, 2012).

In a review of contract farming in China, Zhang (2012) argued that understandings of the interactions between small farmers and contract farming must be placed in the context of local political economy, including access to alternative options for different social groups. While quantitative studies in China, focusing on the microeconomic effects of contract farming, have found evidence of positive income effects, Zhang (2012) argued that such findings lead to oversimplified understandings of contract farming as 'pro-poor'. Instead, when analyzed within broader patterns of agrarian change, contract farming in China loses much of its appeal for small farmers, and is better understood as an activity of last resort for households who have watched state support in agriculture erode over the past three decades.

### Empirical studies on contract farming

Existing studies on contract farming comprise mainly qualitative and quantitative studies implying variable effects. Under this study, the quantitative studies explored. Among the quantitative studies, Bellemare

(2012) study in Madagascar found that contract farming had a significant positive impact on total household income, net household income, income net of contract farming, income per adult equivalent and household income from livestock. Bolwig et al. (2009) also found that a contract farming arrangement with certified organic coffee farmers in Uganda increased gross revenue and net profit from coffee. Narayanan (2014) compared the CF profits of four commodities with profits from alternative markets using cross-sectional survey data in India's Punjab state. She found variable impacts of contract farming not only across schemes (with different crops and firms) but also between farmers within a particular scheme. Miyata et al. (2009) argued that profit from the contracted crop would tend to overstate the impact of contract farming arrangement on household wellbeing as the contract farming arrangement might draw labour and other resources from the household's other income generating enterprises. Instead, they used total household income per capita as their indicator of impact and found that contract farming arrangements with green onion and apple growers in China had positive impacts on per capita household income.

However, a study in India by Singh (2002) suggested that the positive early impact of contract farming on households and the local economy (through higher farm employment) could be short-lived due to unsustainable promotional prices and subsidies from firms, and the erosion of benefits when perceived power imbalances discouraged continued participation. Michelson et al. (2012) studied contract farming arrangements between supermarkets and vegetable and fruit growers in Nicaragua using historical data spanning eight years and concluded that the CFAs did not benefit small farmers. They found that farmers contracted by domestic supermarkets were receiving the same mean prices paid by traditional markets. While international supermarkets provided insurance against volatile prices, farmers were paid disproportionately low mean prices. However, the same contract farming arrangements were credited with increasing annual household income and investment in productive assets as compared to non-participants in the area (Michelson, 2013). No evidence of positive impact was found on investment in consumer durables or on the land holdings of participating farmers.

Masakure and Henson (2005) identified four groups of incentives or benefits of contract farming arrangements as perceived by contract farmers in Zimbabwe's high value vegetable export sector. The first group, labelled 'market certainty' included guaranteed markets, minimum prices and the provision of inputs and transport. The second group labelled 'indirect benefits', included skills that could be applied to other crops and the use of contract farming arrangements as a stepping stone to other projects. The third group related to higher incomes, and the fourth to intangible benefits such as prestige. Higher incomes and related benefits from participation in



contract farming arrangements have been attributed to higher yields from greater use of specialized inputs and technical support, higher quality products and better access to premium markets (Bolwig et al., 2009; Miyata et al., 2009).

Savings from low transaction costs arising from guaranteed input and output markets, clearer quality criteria and transparent measurements of volume and quality were also identified as a source of these benefits (Bolwig et al., 2009; Narayanan, 2014). Most studies on the impact of contract farming on participant households provide complementary information on factors affecting participation. In Western Kenya, it was found that the average size of farms contracted to supply a large sugar company had decreased over time (Casaburi et al., 2014). This suggests that farmers with relatively smaller farms were able to join and were not forced out of the contract farming arrangement once its processes had been honed. In China, Miyata et al. (2009) found that participation in a number of apple and onion contract farming arrangements was influenced by labour availability, distance from village heads and possession of agricultural equipment. Resource endowments and agriculture's share of household income were important determinants of participation in Uganda's SIPI certified organic coffee contract farming arrangement (Bolwig et al., 2009). In India, participation in vegetable contracts was found to be biased in favour of larger farmers and farmers that achieved higher yields (Narayanan, 2014; Singh, 2002). Gender, age, agricultural experience, participation in cooperatives, land endowments, working capital, number of days that farmers do not work for cultural reasons, level of entrepreneurial and business skills, and attitude towards risk were significant determinants of participation in Madagascar CFAs (Bellemare, 2012). On the inclusiveness of CFAs, Barrett et al. (2012) commented that very few farmer, household or farm characteristics have been found to consistently affect participation in contract farming arrangements. Ruth et al. (2017) disclosed that contract farming arrangement and outgrower farming are employed as models of commercialization alternative to large scale farms that displace stallholder farmers from their areas farms.

## BARLEY PRODUCTION AND PRODUCTIVITY

Market shares of barley in Africa are concentrated in three countries- Morocco, Ethiopia and Algeria- accounting for 87% of the total barley production in the continent. Despite being one of the top three barley producing countries, Ethiopia's barley value chain appears to have substantial potential for improvements and, given growing local demand, harnessing this potential will have a lasting impact on improving the well-being of smallholder farmers. Ethiopia is the second

largest producer of barley in Africa next to Morocco, accounting for about 26% of the total barley production in the continent (FAO, 2014). In 2013/14, about 4.5 million smallholder farmers grew barley on more than 1 million *meher* hectares of land (CSA, 2014) that covers 92 to 95% of production when the smaller *belg* rains support the remaining 5 to 8% of the annual production (Tefera, 2012). For the cultivation of barley, well-drained soils are favorable in comparison with other crops, they can handle higher levels of soil salinity. CSA (2014) also specified that each farmer cultivates barley on 0.23 hectares land. The total production has been increasing steadily over the past decade- it has increased from 1.1 million metric tons in 2003/4 to 1.9 million tons in 2013/14, which is equivalent to an annualized growth rate of 6% per year. The growth in production appears to have been driven largely by yield growth, as yield growth (about 5%) is far larger than the area growth of 1% during the same period. However, the barley sub-sector continually falls far behind other major cereals. The average annual production of barley over the last decade is estimated at 1.5 million tons, which is less than half of other major cereals. In terms of volume, the share of barley in total cereal production has dropped from 12% in 2003/4 to only 9% in 2013/14. Similarly, of the total land allocated to major cereals, the share of barley has declined from 13% in 2003/04 to only 10% in 2013/14.

At aggregate level, barley yields in Ethiopia are greater than that of the continent-wide average, its average yields are significantly behind Kenya and South Africa and far behind much of the developed world (FAO, 2014). During the past decade, barley yields in Ethiopia have averaged 1.43 tons, which is less than half of barley yields in both Kenya (3.26 tons/ha) and South Africa (2.93 tons/ha). In high-performing countries of the developed world such as France, Germany and the Netherlands, average barley yield is over 6 tons per hectare. Thus, despite recent growth in the sub-sector, barley yields in Ethiopia remain significantly lower than global and regional averages.

The current productivity level presents both opportunities and challenges. There are reasons to be optimistic because the average yield in 2014 (1.87 tons/ha) was far below the yield achieved (4 ton/ha) in research station trials (CSA, 2014). Increasing yield to 3 tons per hectare (Kenya has achieved higher rates) can result in a host of benefits to the country. Such an increase in yield can potentially make the country a net exporter, improve farmers' income, generate local employment, and reduce pressure (over mining of soil nutrients) on the land. The second reason to be optimistic is that Ethiopia exhibits large spatial variations in barley yields. For instance, in the 2013/2014 *meher* season, average barley yields in Oromia were 2.17 t/ha, which is 16% higher than the national average and much higher than the yields in other regions in the country. Spatial yield and productivity variability is believed to emanate

from the fact that barley farmers in Ethiopia have not fully adopted modern inputs like fertilizer and modern seeds that help boost production (CSA, 2014).

### **Barley marketing systems**

Rashid et al. (2015) reports that until recently, barley has only a small amounts of marketed surplus (commercialization) implying that the barley sub-sector was largely subsistence in nature. Statistics from the CSA reinforce this position showing that home consumption ( $\approx 64\%$ ) and seed use ( $\approx 20\%$ ) account for more than 80% of total barley production in the country (CSA, 2014) less than 20%.

Given the current state of the market fundamentals, that is, infrastructure, institutions and information actors perform an important market function, namely product aggregation. Majority of these traders are also smallholders who conduct commodity trade as a secondary business. Therefore, the surpluses generated through trading ultimately contribute to improving well-being and food security. Despite huge public emphasis on farmers' organizations, it was found that cooperatives appear to play a minimal role in the barley value chain. Less than half a percentage of marketed barley passes through cooperatives, which has little influence on the cooperatives revenues. In 2014, 230,000 tons of barley was marketed; and only 920 tons were marketed through a cooperative, majority of which was malt barley. Assuming a margin of 10% and a unit price of 10,000 Birr per ton, cooperatives made about 920,000 Birr or 46,000 US dollars, which is miniscule given the size of the market (Rashid et al., 2015). In related issues focusing on malt barley, it was found that cooperatives marketed 6% of the surplus (Alemu et al., 2014).

### **EVOLUTION OF MALT BARLEY CONTRACT FARMING IN ETHIOPIA**

Despite the rich barley germplasms and second production capacity of the country in Africa, breweries in Ethiopia used to import more than half of their malt barley requirements (Nick, 2014; Tarekegn, 2016). Recently, following the expansion of breweries in the country, malt processing factory, breweries, farmer organizations, research organizations, etc., had been working jointly to engage barley producers in malt barley production (Nick, 2014; Rashid et al., 2015; Tarekegn, 2016). As a result, between 2003/04 and 2013/14, the number of smallholders growing barley increased from 3.5 million to 4.5 million; yields increased from 1.17 to 1.87 metric tons per hectare; and total production grew from 1.0 in 2005 to about 1.9 million tons in 2014 (CSA, 2014). However, Ethiopia produces mostly food barley, with its share estimated to be 90% (Alemu et al., 2014), and remains

significantly deficient in malt barley (Table 1).

As a result of the discrepancy in food and malt barley, Ethiopia has generated a surplus of food barley, but the net import bill for malt barley jumped from 240,000 US dollars in 1997 to 40 million US dollars in 2014. Another reason to encourage contract farming in the malt barley sector is therefore to substitute imported barley and save foreign currency (Kifle, 2016), as it is estimated that if the trend of importing barley continues, Ethiopia's malt barley import bill will be around 420 million US dollar by 2025 (Rashid et al., 2015). In Ethiopia, demand for malt barley increased due to establishments of new beer industries by foreign breweries, privatization and upgrading of old breweries and country's increase in beer consumption (Molla, 2016). Under the control of the Privatization and Public Enterprises Supervisory Agency (PPESA) all these state-owned breweries have been privatized during the period of 1998-2011. While Brasseries et Glacières Internationales (BGI) acquired St. George's brewery, Heineken became the second foreign brewery owner as it acquired both the Harar and Bedele breweries. The British company Diageo Plc currently owns the Meta Abo brewery.

Currently, Ethiopia has experienced one of the fastest increases of beer consumption in recent years, with consumption rates steadily rising from 15 to 20% every year since 2011 (Molla, 2016). Growing evidence suggests that the demand for malt barley has accelerated this fast due to an increase in income. Households switch from domestically brewed beverages such as Tella and Areki, which are based on sorghum, maize and other grains, to bottled beer which is based on barley (ATA, 2016; Molla, 2016). Despite the increase in demand, the barley sector continually falls far behind other major cereals, both in terms of cereal production and total land allocation. In addition, barley has experienced the least yield growth as compared to the other top cereals (Rashid et al., 2015). There are also several bottlenecks which are specific to the malt barley value chain. First, there is a huge gap between demand and allocation. Currently, the demand is 270,000 metric tons of which only 42,000 metric tons can be allocated. The gap can be attributed to lack of malting capacities of the two malt factories. Secondly, only 4% of the farmers received good barley seeds in 2013. This access rate is the lowest among all cereals.

Heineken developed a program of local sourcing to assure a long-term and reliable supply of agricultural material needed for its breweries across Africa. Currently, Heineken sources 45.8% locally, but the beer company's aim is to source 60% of the agricultural raw material from African farmers by 2020. Local sourcing is a key component of Heineken's strategy of partnering for growth in Africa which involves financially empowering farmers and their communities in which the company operates. According to Heineken, local sourcing also "makes good business sense [as] we reduce our

**Table 1.** Average cereal production, areas covered and yield, by crop (2003/04-2013/14).

Crops	Production (million tons)				Area cultivated (million hectares)				Yield (tons)			
			Average				Average				Average	
	2003/04	2013/14	2003/04-2013/14	AGR (%)	2003/04	2013/14	2003/04-2013/14	AGR (%)	2003/04	2013/14	2003/04-2013/14	AGR (%)
Cereals	9.00	21.58	15.01	9.10	7.00	9.85	8.79	3.50	1.29	2.19	1.68	5.40
Tef	1.68	4.41	2.97	10.20	1.99	3.02	2.51	4.30	0.80	1.47	1.16	6.30
Barley	1.08	1.91	1.51	5.90	0.92	1.02	1.01	1.00	1.17	1.87	1.49	4.80
Wheat	1.61	3.93	2.68	9.30	1.11	1.61	1.47	3.80	1.45	2.45	1.80	5.40
Maize	2.54	6.49	4.30	9.80	1.37	1.99	1.76	3.80	1.86	3.25	2.40	5.70
Sorghum	1.74	3.83	2.88	8.20	1.28	1.68	1.59	2.80	1.36	2.28	1.78	5.30

Source: (CSA, 2014).

exposure to vulnerabilities of the market (long delivery lead times and volatile prices), shorten the supply chain and reduce transportation, which of course lowers our costs and carbon footprint” (Levy, 2014). Additionally, Heineken wants to promote private sector approaches that are environmentally friendly, socially just and economically sustainable (Heineken, 2013).

Heineken’s local sourcing approach in Ethiopia is implemented by means of the CREATE project. In 2013, Heineken signed a Memorandum of Understanding for a 4-year malt barley programme together with the Dutch ministry of Foreign Trade and Development Cooperation, the NGO EUCORD and two Ethiopian Government institutes which are the Agricultural Transformation Agency and the Ethiopian Institute of Agricultural Research (Heineken, 2013). Heineken and the Dutch ministry committed to invest 2.72 million US dollars to increase food security, improve the livelihoods of 20,000 smallholder farmers and reduce reliance on imports by developing local barley production and connecting farmers to Heineken’s supply chain in Ethiopia (Levy, 2014). The so called CREATE programme runs from 2013 to 2017 and the main reasons why it was set up were the high demand for an adequate supply of good-quality malted barley and to substitute 20,000 MT of imported barley by locally produced barley. The latter reason in specific is important since the Ethiopian government wants to substitute imported barley to save foreign currency (Kifle, 2016). According to Heineken, the project further aims to expand the value of the malt barley business for the region and develop the end-to-end process of growing malt barley in Ethiopia by means of improving access to markets, seeds, pesticides, credits (contract farming schemes) and market information; providing agricultural trainings; establishing long-term partnerships between producer groups, intermediaries and agro-processors; and establishing marketing groups, such as seed-producing cooperatives and nucleus farmers.

Later on, besides Heineken, Assela Malt Factory

(AMF), Diageo and Dashen breweries had been engaged in contract farming to ensure supply of malt barley from different areas (Alemu et al., 2015). AMF and Heineken had contract arrangements both with unions and also with primary cooperatives, whereas Diageo was engaged only with cooperative unions. The performance of the contracts in terms of the proportion of actual supply from the amount agreed up on indicates AMF has better performance with unions where it managed to receive about 97% of the quantity stated in the agreement, whereas Diageo received about 52% and Heineken received about 38% of the volume under the agreement with the unions (Alemu et al., 2015). On the other hand, the quantity supplied by the primary cooperatives was only about 46% for AMF and about 49% for Heineken of the quantity stated in the agreement.

Now sourcing malt barley from domestic production is 55%. Moreover, the malt cultivation practice has been adopted across the major potential areas of the country. That is, a percentage of malt contribution in region basis is: 70% Oromia, while about 30% is obtained from Amhara and the other regions in the country (Holtland, 2017). Nowadays, a great number of farmers are participating in malt barley production, which implies farmers are shifting their production decision from production to own consumption to targeting markets which is the essence of smallholder agricultural commercialization through contract farming arrangements and this study seeks to investigate smallholder agricultural commercialization undertaken through malt barley contract farming schemes as case study to draw conclusion and forward implication for scaling up or scaling out the schemes further.

### **Contract farming scheme as mechanism of smallholder commercialization**

Harnessing Africa’s agricultural potential to make Africa’s farmers more productive, efficient, entrepreneurial and well-off generally lies in the commercialization of

agriculture along business models (Diwan et al., 2013). There is a long history of attempts to encourage commercial agriculture across much of sub-Saharan Africa. But commercial farming has taken different forms—varying in scale as well as in institutional arrangements, labour regimes, and livelihood outcomes with fluctuating political significance in different places and times (Ruth et al., 2017). Past efforts in the colonial period have included the establishment of private estates and contract farming (Collier and Dercon, 2014) and in the period of immediate post-independence developmentalism also state-owned and managed estates. Outgrower arrangements, too, are a model that has been encouraged across diverse crops—cocoa, cotton, tobacco, sugarcane, coffee and tea, as a means of integrating smallholder family farmers into commercial, and often transnational, value chains (Oya, 2012; Baglioni, 2015).

There is a growing body of recent empirical literature, based on case-studies from around the world that documents contract farming has been taken as model for smallholder commercialization. However, most of this evidence comes from high-value supply chains, mostly fruits, vegetables and products from animal origin destined for export markets or supermarket retail in urban high-value market segments (Barrett et al., 2012; Diwan et al., 2013; Ruth et al., 2017). Also, there is very few evidence on potential roles contract farming schemes play in commercialization process of smallholders farmers in general malt barley contract farmers in particular in Ethiopia. In recent years, contract farming and outgrower schemes have received renewed attention, prompted by concerns about the negative impacts of large-scale land acquisitions through purchases or leases by largely foreign agribusinesses (Oya, 2012). These schemes are often presented as a route through which smallholder farmers can engage with agribusiness and commercial agriculture, and are now increasingly viewed as alternatives to large-scale land acquisitions (Matenga and Hichaambwa, 2017). Yet as recent research has shown whether agricultural investments and initiatives generate quality employment, sustained monetary income, enhanced and diversified rural livelihoods, and more vibrant local economies, depends on farming models and local conditions that underpin their unfolding, including land relations and labour regimes (Ruth et al., 2017).

## **ACTORS OF MALT BARLEY CONTRACT FARMING SCHEME**

Diverse actors from public, private, civil society and NGOs take part in the malt barley value chain development. The main activities of the key actors including AMF, Heineken, Diageo, FOs, farmers, research organizations, and traders concisely presented

under this section.

### **Assela Malt Factory (AMF)**

AMF is a state firm with a monopoly in producing malt (Alemu et al., 2015). AMF performs a double role: toll malting on contract and malting its own supply of barley, which it sources from smallholders (Holtland, 2017). It is the sole buyer of malt barley, as well as the sole supplier of malt to brewers. It sets the prices for both barley grains and malt. AMF has been forced to import Danish malt barley in the last two years as local supply met respectively 75 and 55% of their total demand in the 2012/2013 and 2013/2014 cropping seasons (Kulumsa Agricultural Research Center (KARC, 2013). In order to get more control on the supply of malt barley the AMF has started a new strategy by contracting smallholder farmers. The AMF has signed for 2014/2015 contracts with four cooperative unions; including Galema (Bekoj'i), Raya Kejewa (Kofele) and Uta Wayu (Kore). The contract with the Galema cooperative union covers a production area of 1,600 hectares. In total, 2,000 hectares have been contracted. The AMF provides a 7% premium price on top of the market price. As part of the contract, the AMF provides contracted smallholder farmers with DAP fertilizer on credit. Besides fertilizer, the AMF is also interested in distribution of improved seeds on credit. However, the AMF noted not to be able to get access to improved seed and therefore the contracted smallholders farmers make use of own malt barley seeds.

### **Heineken**

The CREATE project designed by Dutch brewing company Heineken to bring the supply of local malt barley on European quality standard level and create a reliable supply chain (Nick, 2014). The sourcing strategy of Heineken is focused on different entities in order to be able to include different types of smallholder farmers. The diversified sourcing strategy includes focus on nucleus farmers, Hundee malt barley producer and supplier cooperatives, multipurpose primary cooperatives, informal groups and even commercial/state farms. Important elements of the contracts with the different entities involved in smallholder farming include delivery of improved seeds on credit, provision of a 5% premium price on top of the market price (Assela, Shashemene and Kofele) and different payment modalities. Heineken has developed new improved malt barley cultivars: *Grace and Traveler*. Based on farming pilots, especially *Traveler* resulted in improved productivity levels. *Traveler* is therefore now being multiplied to be able to guarantee supply to all contracted smallholder farmers in the 2014/2015 cropping season. For this season, Heineken supplied, based on agro-ecology and availability, *Holker*

and *Traveler* improved malt barley seeds. Due to lack of sufficient seed, contracted smallholder farmers in particular West-Arsi did not receive initial promised *Sabini* improved malt barley seed (KARC, 2013). Payment modalities are an important element of the contracts as Heineken considers it as an important tool for giving room for speculation to smallholder farmers. The contract offers the following three payment modalities: (1) 100% payment on the day of delivery based on the latest market price. (2) 80% payment on the day of delivery and the remaining 20% based on the market price of February 15. Smallholder farmers will receive the remaining 20% plus the increase or decrease due to market changes. (3) 80% payment on the day of delivery and the remaining 20% based on the market price of April 9. Smallholder farmers will receive the remaining 20% plus the increase or decrease due to market changes. This option is only open for deliveries after February 15. All three payment modalities are based on a market price including a 5% premium. Market prices will be determined based on a market assessment of a committee consisting of representatives from both Heineken and the contracted supplier. Nick (2014) and Holtland (2017) report the above payment modalities as suitable both for firm-farmer. Alemu et al. (2015) reported contradicting idea that farmers engage in side selling due to late payment settlement.

### Diageo

Diageo launched in 2012/2013, their new malt barley sourcing strategy in the form of a pilot in cooperation with the Melka Awash cooperative union (Sebeta) (Holtland, 2017). Since 2013/2014, this project has been expanded to Arsi and West-Arsi. In total, 6,000 farmers (3,000 hectares) have been contracted from five cooperative unions. The goal of Diageo is to realize a productivity of 28 quintal/hectare. NGO Technoserve plays a facilitating role in this project by providing, among others, accounting/bookkeeping, marketing, and good governance trainings to multipurpose primary cooperatives. In addition, Technoserve provides agronomic trainings to smallholder farmers focused on soil, disease and post-harvest practices.

According to Alemu et al. (2015), the contracts by Diageo comprise of a full package, which include providing improved seed (Holker), DAP/NPS fertilizer, urea fertilizer, fungicides, pesticides, and herbicides. In addition, the package comprises crop insurance for input expenses coverage. All these inputs are provided on credit basis to the smallholder farmers. Diageo faced this year, however, problems of the ability to supply improved seed. Since no improved malt barley seed has being supplied by the OSE, Diageo was forced to use certified-2 (C2) seed. This seed is a leftover from last year of the ESE. Because of unclean seed, Diageo will expect lower quality of supplied grain. Besides the obliged package,

Diageo is also offering the possibilities to smallholder farmers to use optional elements as mechanization rent, soil testing and crop insurance for output. Sandra (2016) identified that Diageo has four grading standards depending on variety purity, moisture content, color, grain size, 1000 grain seed weight and protein content and associated payment mechanisms. Based on the grade level farmers get a premium of 20, 15, 10 or 5% on top of the market price. The market price is being determined by a commission consisting of the woreda agricultural office, woreda cooperative promotion agency, cooperative union, Technoserve and Diageo. The price is being determined by taking into account the prices of the AMF, Addis Ababa market and local markets (Holtland, 2017), while Nick (2014) and Alemu et al. (2015) also emphasized that the brewery company Diageo also works closely with multipurpose primary cooperatives.

### Collectors and traders operations

Based on a barley value chain study conducted by the Rashid et al. (2015), traders can be divided into different levels based on their characteristics and operations. Local traders (nucleus farmers) are smallholder farmers that have a trading function. Collectors are local traders that collect malt barley grain from surrounding smallholder farmers directly after harvesting. By purchasing for relative low prices, local traders are able to speculate on the market, while they store supply at their own household. In addition to local traders, KARC identified small traders. These traders commonly have a trade license but not a warehouse. Their operations can be characterized by same day procurement from smallholder farmers as well as marketing to larger traders during market days. During these market days, they trade on average in 2-5 quintal of malt barley grain. Small traders can use their own financing and weighing balance for procurement of malt barley grain but may also work as commission agents for larger traders. Commission agents are commonly accused of cheating with the weighing balance (Nick, 2014). There are also, larger traders that collect from small traders, local traders, and commission agents and afterwards store up to 1,000 quintal in their own warehouse (Watabaji, 2016). After storage, malt barley is being supplied by the larger trader directly to the malt factories or other processors. Large traders are known for their strong ability to identify quality levels of malt barley. They are commonly accused of blending low with high quality grains as they are aware of the Assela Malt Factory quality standards (KARC, 2013).

### Seed multiplication cooperatives

Several primary cooperatives and unions in Ethiopia undertake seed production contract farming with farmers (Alemu and Bishaw, 2016). In Arsi and West-Arsi zones,

several seed multiplication cooperatives are available. For instance, in the Lemu Bilbilo woreda, 11 seed multiplication cooperatives are located. Malt barley contract farming required ensuring access and use of improved varieties, as a result, the Heineken and Diago contracted seed multiplication with farmers (Heineken, 2013). The objective of these cooperatives is focused on seed production by multiplying basic seed in Certified-1 seed. The seed multiplication cooperatives are working on a contract farming basis as they receive foundation seed from companies and supervised by seed regulatory bodies (Alemu et al., 2015). Cooperative members sign for acceptance of foundation seed supply and consequently commit themselves to deliver after harvesting. Recently, the seed multiplication cooperatives have also started to sign direct contracts with private entities, for example, Heineken. The seed multiplication cooperatives set their market prices with a committee comprising of representatives of the cooperative, agricultural office, cooperative promotion agency and the ESE. A premium price of 15% on top of the market price is being provided to members for their supply.

### **Multipurpose primary cooperatives or unions**

There is a renewed interest from donors, governments and researcher institutions in producer organizations as an institutional vehicle to improve smallholder agricultural performance, particularly through improved market participation (Fisher and Qaim, 2012). Ample evidences have been documented on the fact that membership to such organizations is considered to increase the level of technology adoption, yield, market participation and economic benefit to farmers as well as promote their general welfare (Delelegne et al., 2016). Since recent years, more and more multipurpose primary cooperatives are being encouraged by cooperative unions and the government to start output marketing activities (Abate et al., 2013). In a broad sense, there are two different marketing modalities applied in the form of a commission-based model and a 50/50 risk profit sharing model. These different models have in particular implications on market price determination, revenue models and responsibilities. Several multipurpose primary cooperatives and cooperative unions such as Galema and Raya Kejewa unions are engaged in contract agreement with Diageo, Heineken and/or the AMF for facilitation of input and output market (Alemu et al., 2015). The unions have several primary cooperatives and farmers under themselves as recipients and supplier of different inputs and malt barley as output with predefined volume and desired quality standards.

### **Farmers**

Smallholder farmers are motivated to be linked to agro-

industries because this reduces market uncertainty and provides higher income and better access to inputs, knowledge and services (USAID, 2012). Accordingly, in 2014/15 cropping season, Heineken contracted 10,200 farmers. In total, 23,000 farmers are involved in contract farming schemes; about half of all market-oriented malt barley producers are in Arsi and Bale zones (Holtland, 2017). Diageo has contracts with 6,100 farmers.

### **Research**

Intensification of crop production and productivity, poverty alleviation and realizing food security depends on access and use of improved technologies like improved varieties. Enhancing firm-farmer profit margin also determined by size of yield obtained each acreage. Frequently, the average yield of major crops in general and malt barley in particular is lower than that of the other major producers in Africa (CSA, 2014). Two new game changer malt barley varieties with the potential to triple average yield in Ethiopia have been released by the Holetta Agricultural Research Center as a result of decades of research collaboration with the International Center for Agricultural Research in the Dry Areas (ICARDA). The two varieties, HB1963 and HB1964, can yield up to 6 tons per hectare (t/ha) as opposed to the average yield of 2 t/ha in Ethiopia (Figure 1).

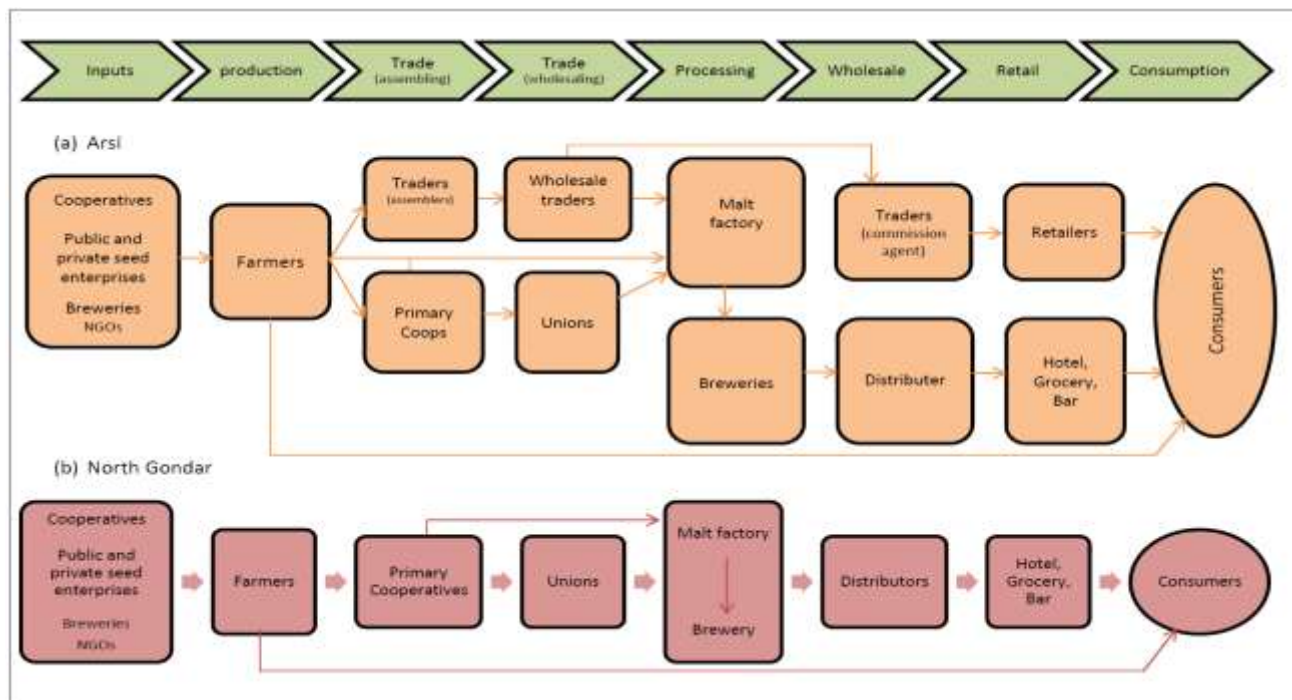
### **Effects of malt barley contract farming scheme**

As Oya (2012) noted, there is scarce evidence of how significant contract farming will be for future livelihood trajectories, and how contract farming may shape future patterns of differentiation and agrarian change in the Global South. There is little or no information on effects of participation in malt barley contract farming scheme or the commercialization of malt barley in Ethiopia. These questions are particularly relevant for the Ethiopian context, where contract farming driven agricultural commercialization is both a relatively new phenomenon and a focus of rural development policy.

Studies on potential effects of malt barley contract farming scheme in Ethiopia (Nick, 2014; Alemu et al., 2015; Samuel, 2016; Sandra, 2016; Holtland, 2017) reported that the firm-farm contract arrangement has among others, the following advantages to partners in the business.

### **Enhancing of input access and reliable output market with increased income for farmers**

At least, three kinds of inputs are considered critical in the studied contract farming schemes: improved seeds, extension services and credit (Alemu et al., 2015). Until recently, farmers depend on local varieties of *Holker* and



**Figure 1.** Actors in malt barley value chain in Ethiopia. Source: Rashid et al. (2015).

*Sabini* for 30 and 35 qt/ha yield capacity, respectively. In 2016, game-changers two varieties, HB1963 and HB1964, yielded up to 6 tonnes per hectare (t/ha) as opposed to the average yield of 2 t/ha released. The varieties also offer excellent malting quality, making them attractive buys for the malting and brewery industry, thus allowing smallholders to use the new malt barley as a cash crop and generate income from it. In addition, Heineken has developed new improved malt barley cultivars: *Grace and Traveler*. Based on farming pilots, especially *Traveler* resulted in improved productivity levels. *Traveler* is therefore now being multiplied to be able to guarantee supply to all contracted smallholder farmers in the 2014/2015 cropping season. The new varieties introduced enhance options of available varieties with better productivity capacity to raise producers' income through yield gain than local varieties (ICARDA, 2016).

As Alemu (2015) revealed, the main services contracted farmers benefit are related to agricultural extension, credit and cooperative based input provisions. In terms of access to general extension service, there was no statistically significant difference in terms of access to extension service among farmers with different market behavior and almost all cooperative member farmers reported that they meet development agents to get any extension advices. Similarly, 96.7 and 91.7% of the respondents had got extension advice on malt barley production and marketing, respectively.

With regard to income, Holtland (2017) analyzed cost

of malt barley, wheat and pea production computing cost incurred for purchase of new or local varieties, fertilizers, herbicides and fungicides. He observed that revenue for malt barley is higher than wheat and pea production. Furthermore, the introduction of two improved new varieties allowed farmers to get 10 qt/ha yield than the local, with an average yield of 45 and 50 qt/ha, while the maximum for local varieties is 30 and 35 qt/ha for Holker and *Sabini*, respectively. The yield gain gives an additional income of over 10,000 ETB/ha.

### Firm

In the 2014/15 season, Heineken collected 6,471 tons of malt barley, of which 5,184 tons came from smallholders in this contract farming scheme (Holtland, 2017). This is respectively 14 and 11% of all the malt barley marketed in Arsi and Bale. It was 94% of the target, and the quality of the produce was better than in previous years. The firm delivered the malt barley to AMF, which processed it for a malting fee. The commissioned malt was still considered as part of the quota that the firm is entitled to, based on its market share.

### Commercialization of malt barley and import substitution

Traditionally, barley farmers used to consume 50% of the

malt barley they plant. Recently, as Nick (2014) reports, barley farmers become market oriented, they prefer to produce malt barley primarily as cash crop, where 61.3% of the harvested malt barley is being commercialized on the market, while 29.5% is being used for household consumption. When we focus on utilization levels at regional level, important differences arise. Smallholder farmers from the multipurpose primary cooperatives under the Galema union in Bekoj'i (Arsi) commercialize 82.3% of their harvest while this is 47% by the smallholder farmers around Kofele. Farmers in West-Arsi focus more on wheat for commercialization purposes as respectively 73.9 and 39.1% is being sold in the market by farmers of respectively, Wamagne and Burka Misooma multipurpose primary cooperatives.

Given the active engagement of public, private, NGOs, FOs in malt barley value chain development and scaling out of malt barley production in wider areas, commercialization of malt barley also moves forward. For instance, there is high intensification of malt barley production in Arsi and West Arsi zones, which together produce about 70% of the country's marketed malt barley; some 40,000 smallholders produce over 50,000 tons annually (concept and practice book author referenced ). On average, they grow half a hectare of malt barley with a yield of 27 qt/ha. They sell half of their production; the rest is for home consumption. Similarly, Amare et al. (2016) reported that as a kind of wider scaling out campaign, 46,000 farmers provided with improved malt barley varieties and the Regional Agriculture Office financed the associated costs. Farmers in Amhara region are expected to supply the malt barley to Gondar Malt Factory which is part of the Dashen Breweries in Ethiopia. There is growing body of documentation on indicators of commercialization, for instance, Steven and Sam (2016), Getaw and Atle (2015) and Poulton (2017) concluded that the status of commercialization of a given commodity can be measured and explained by marketed surplus and area allocated to marketable commodity. By the same token, malt barley is being commercialized fast in Ethiopia as well.

Between 2003 and 2012, beer consumption grew by 15 to 20% annually, and this growth is forecast to continue for several years (Amare et al., 2016). That is driving the contract farming scheme to source local malt barley supply to fast growing beer industry in Ethiopia. When several state-owned breweries were privatized in 2010, international brewers were eager to enter the attractive Ethiopian market. Brewers doubled their capacity between 2013 and 2016 (Molla, 2016). Currently, there are 6 breweries with total capacity of about 10 million hectolitres per annum. This requires well over one hundred thousand tons of malt barley per year. All efforts of firm-farm partnership until recently enabled sourcing 30% of the total malt barley requirement while the rest is covered by importation (Alemu et al., 2015). This implies

that given the suitable malt barley production potential in Ethiopia, important coordinated works are expected towards the intensification of malt barley production needed in the future to fully exploit growing demands for malt market and realize import substitution from domestic source enhancing farmer income saving foreign currency requirement at large.

## **CHALLENGES AND PROSPECTS OF MALT BARLEY CONTRACT FARMING**

There is a rapidly growing body of literature that documents positive effects of contract farming schemes on sub-Saharan Africa, for instance income growth, increased farm productivity, creation of employment opportunities, female empowerment and poverty reduction (Getaw and Atle, 2015). However, neither contract farming schemes nor commercialization of smallholder agriculture can be frictionless processes; which implies cannot be panacea for all sorts of agricultural production systems. Likewise, along the operation of malt barley contract farming arrangement or malt barley commercialization, the following challenges have been identified.

Alemu et al. (2015) reported some of the challenges in malt barley contract farming in Arsi and West Arsi. In general, there is a positive trend in actors' behavior to follow their operations as per contract agreement; however, farmers mention delayed payment. The main challenges faced by SHA in promoting contractual arrangement between unions and AMF was highly linked with the limited competition in the market as lack of alternative market outlet, that is, there is perceptions of AMF as exercising monopsony market power (Holtland, 2017). While AMF stressed the challenges of under volume supply and poor grain quality, importantly, Alemu et al. (2015) related the drivers of the challenges to the following key issues:

1. Unclear relation between unions and their respective member cooperatives
2. Unclear relationship between primary cooperatives and their respective member farmers
3. Systematic engagement of local traders
4. Lack of independent quality assessors for price setting
5. Need for technical backstopping and its cost implication
6. The need to involve wider stakeholders to implement contract arrangements (seed enterprises, extension offices, trade and market development offices, seed laboratories, etc)

Alemu et al. (2015) and Watabaji (2016) revealed the performance of the contracts in terms of the proportion of actual supply from the amount agreed upon indicating that AMF has better performance with unions where it



managed to receive about 97% of the quantity stated in the agreement, while Diageo received about 52% and Heineken received about 38% of the volume under the agreement with the unions. On the other hand, the quantity supplied by the primary cooperatives was only about 46% for AMF and about 49% for Heineken of the quantity stated in the agreement. This really indicates the relatively huge gap between the volumes stated in the agreement and actually supplied, which is a very good indicator of the challenges in contract enforcement linked with side selling activities of member cooperatives for the unions and member farmers for the primary cooperatives.

Malt barley contract farming is a new phenomenon to Ethiopia. Scaling out and up the innovations towards new potential areas and other commodities depend on a number of factors including physical, socioeconomic and policy factors. Scaling-out and scaling-up of contract farming are important for both the firm and farmers. For breweries and AMF, scaling-out as well as scaling-up are important to procure all required volumes of malt barley from local sources to utilize its processing capacity, infrastructure and manpower. Scaling-out and scaling-up however have their own advantages and disadvantages. Scaling-out spreads supply risk, while scaling-up may increase it. For farmers, scaling-out offers market opportunities to new entrants, while scaling-up enables existing contract farmers to augment their income.

The malt barley contract farming scheme now covers about hundred thousand farmers in several villages and districts mainly in Oromia and evolving in Amhara regions. AMF, major brewers Diageo and Heineken are seeking to boost local barley production with the eventual aim to source domestically 100 and 60% of raw materials respectively, by two years (ATA, 2016). Firm farm integration potential not exhaustively utilized as local sourcing is only 55% successful. Scaling out such endeavors towards other high value commodities demands strict food safety and quality standards, traceability issues and requirements that are not well adopted by majority of farmers in Ethiopia.

Accordingly, there is clear prospects of malt barley subsector development in Ethiopia. Clusters of malt barley production under laid out in Oromia and Amhara Regions. For instance in Oromia region, the cluster envisions generating annual revenues of 81 million US dollars by 2020, through domestic sales of malt barley grain, malt and beer in the country (ATA, 2016). Import substitution of malt barley products are estimated at 43 million US dollars, with 50% processing happening within the cluster and 50% through contractual agreements with processors in Addis Ababa and surrounding cities.

Increasing farmers' use of improved inputs is therefore critical to this endeavor, with targets set at an increase of nearly 400% within five years. This is expected to contribute to increases of 24% in the average yield per hectare and 165% in the amount of marketed barley. Ultimately, this will lead to a growth in total revenue of

over 450%. To realize the full potential of the cluster, priority interventions already under implementation include building agro-processing capacity; ensuring steady supply of farming inputs; and strengthening the contract farming framework and enforcement mechanisms for agreements between farmers and malting factories.

## CONCLUSIONS AND POLICY IMPLICATIONS

The study investigated emerging trends of contract farming scheme to be adopted as one of the potential pathways for smallholder commercialization in the country. Common indicators of commercialization such as market orientation, participation in both inputs and outputs, expansion of cultivation areas, and adoption of technologies (varieties, fertilizer, etc.) are observed along malt barley contract farming scheme. Following beer companies privatization and enhanced working capacity, and malt demand increased by 83%. As result, malt barley contract farming scheme introduced by Heineken/chord to ensure local sourcing of malt barley by integrating large number of farmers to the value chain.

The malt barley contract farming scheme observed as driver of smallholder commercialization showcase of firm-farmer integration and agricultural transformation in the country. This is due to the fact that contract farming is an emerging institutional innovation in Ethiopia linking farmers to reliable market, open access to inputs, technology and advisory services that lead to improved productivity, production and income. Specifically, malt barley contract farming scheme is an innovative platform harboring public private partnership, the malting industry managed to secure 55% of the requirement from local sources. Contracted farmers take a 10% higher price for malt barley than non-contracted food barley producer counterparts due to high yielding varieties productivity advantage from same parcel of land, similarly malt factories are integrated and benefiting from processing local raw material.

Studies on recent progress of malt barley contract farming scheme in Ethiopia report the following finding. The findings include: thousands of farmers are contracted to Heinken, Diago and Dashen breweries and Asella and Dashen malt factories; farmers positively responding to malt barley market signals, farmers are motivated to profit maximization, areas under malt barley cultivation growing, considerable areas are specializing in malt production using emerging comparative advantages. These phenomena occurring in the malt barley value chain leads to make certain important conclusions in terms of the smallholders' market orientation, participation both in input and output markets and growing income imply that malt barley is commercialized to considerable level.

However, there are still some challenges in the organization and operation of the contract farming schemes; along fulfilling malt barley requirement from

local sources. Astonishingly, the impact of farm-farmer business integration reported to be very high for farmers while the impact on the firm is high but at high costs. That benefit imbalance was reported from the firm side that local malt barley production cost is higher than importing costs. Sustaining the success of malt barley firm-farmer business scheme, depends on strengthening performances of the interfaces of the intermediaries such as primary cooperatives, unions, microfinance institutions, research institutes, agricultural offices, donors and facilitator projects operating between farmers and the firm. It was observed that primary cooperative, unions, etc, perform at different capacity, some at remarkable level while others fail to perform desired role accordingly.

### **Policy implications**

The following implications are in particular of interest to upstream and downstream stakeholders including public actors in charge of enabling smallholder commercialization process, breweries, malting industries, primary cooperatives, cooperative unions and NGOs and farmers.

#### **Raise awareness level of farmers about contract farming scheme**

The majority of the multipurpose primary cooperatives are unexperienced in marketing activities. Awareness among members about the possibilities and potential benefits to supply to the multipurpose primary cooperative is relatively low. Training should, therefore, be provided to members concerning marketing operations and the potential of receiving dividends in the case of increased marketing activities. Capacitate farmers to exercise their proper market choice, and once their market contract made with malting industry actors maintaining trusted relationship, will be the basis of sustainable relationship.

#### **Enhancing the capacity of farmer organizations (primary cooperatives and unions)**

Farmers organization, that is, the cooperatives and unions are playing pivotal role in firm farmer linkage. The cooperatives and unions are existing in different level of capacity. Some deploy competent staff and logistics, and office arrangements while others do not. Thus, upgrading working capacity of farmers' organization is the basis of bargaining power of farmers and sustainable partnership. Monitoring, evaluation and learning; and auditing and accountable systems need to be established.

#### **Improving price setting and payment modalities**

One of the challenges posed by farmers is delay of

payment time, the other challenge posed by firm's side is side selling. As price variability and payment lag give rise to side selling, proper time of price settlement is required from the firm, breweries and malting industry accordingly.

#### **Exercising appropriate incentive and sanction system**

In contract relationship, either one or both fail to fulfill contracted agreement. In order to encourage those trusted actor and discourage those who default, they need to be properly treated by formulating formal legal systems.

#### **Developing comparative advantage**

Commercialization can be enhanced through further specialization as per the natural agro-climate niche of malt barley production. Thus, the commercialization scheme should focus on increasing the volume of production (productivity) in general and the level of surplus production in particular. This implies the need to intensify the current extension and market support programs with programs that can expand households' production frontier by enhancing access and options of modern inputs and technologies to allow farmers gain by raising productivity yield per unit of land while firms are able to source raw material at fair real price in win-win relationship both for producers and firms in sustainable manner.

### **CONFLICT OF INTERESTS**

The author has not declared any conflict of interests.

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