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Investment Opportunities in the Ethiopian Dairy Sector

TRAIDE Ethiopia



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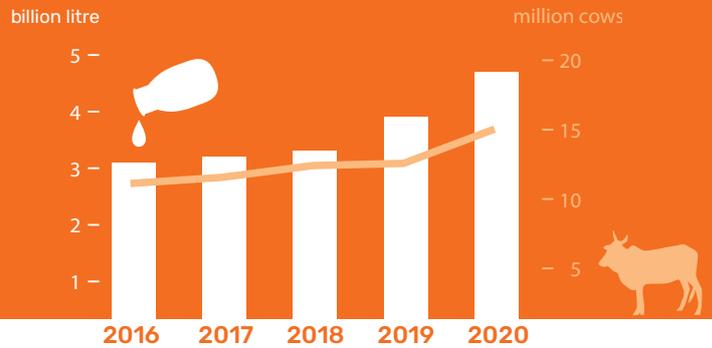
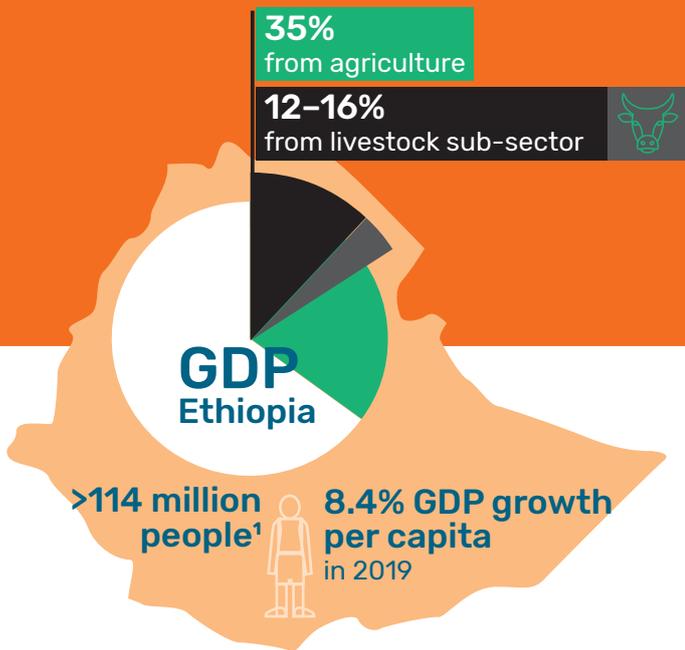


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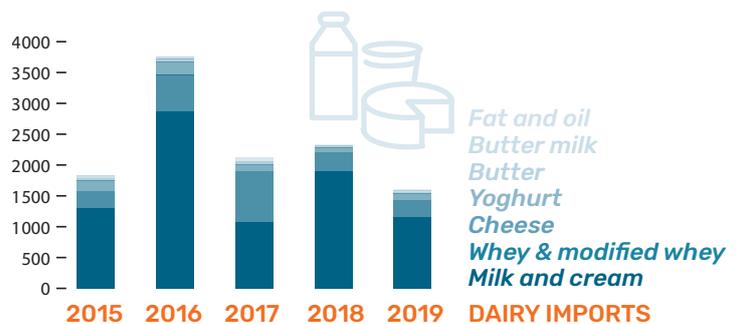
Fact sheet Ethiopian Dairy sector

2021 August



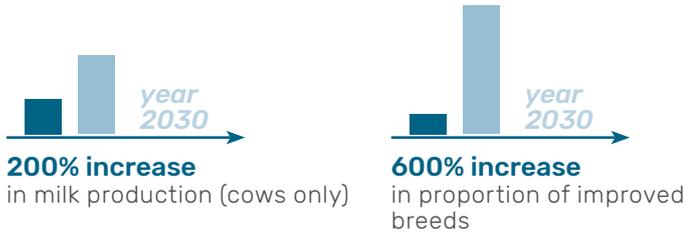
Total milk production (in billion litre) and number of milking cows (in million)

DAIRY IMPORTS TREND

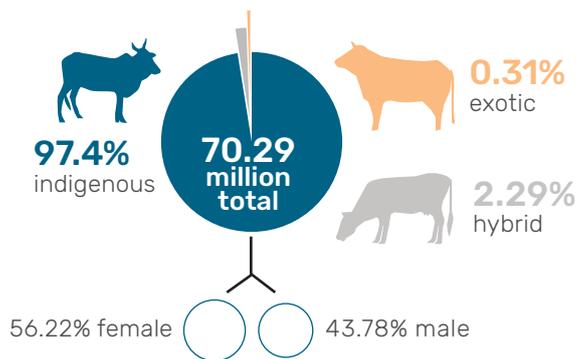


DAIRY IMPORTS averaged ~US\$14.5 million per year

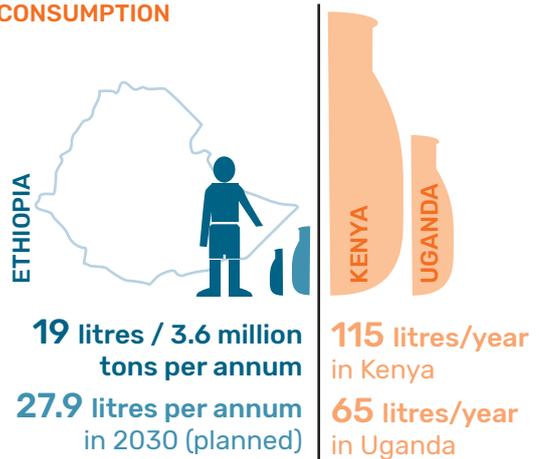
GOVERNMENT OBJECTIVES BY 2030



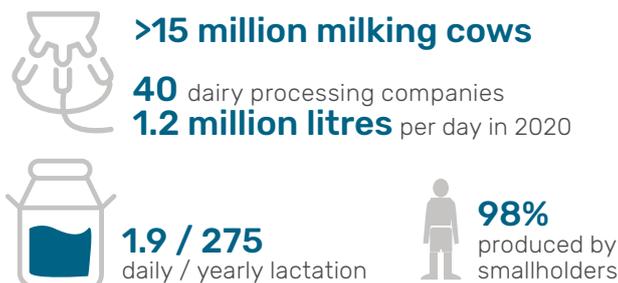
ETHIOPIAN CATTLE POPULATION



MILK CONSUMPTION



MILK PRODUCTION AND MILKING COWS IN ETHIOPIA



OPPORTUNITIES

- Feed and fodder production
- Improving genetics, AI services and animal health
- Commercial dairy farms
- Innovations in cool-chain logistics
- Supply of machinery and equipment
- Introduction of products with Improved shelf life
- Dairy exports

¹ According to WB 2020 statistics

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1. General overview

1.1 THE ETHIOPIAN CONTEXT

With over 114 million people, Ethiopia is the second most populous nation in Africa. The country has experienced double-digit economic growth over the past decade, and is one of the fastest growing economies in the region. Despite the harmful impacts of COVID-19, the country still has an impressive GDP growth per annum (averaging 9.4% between 2010 and 2020) (World Bank, 2020). This growth has led to increased household spending as the Government of Ethiopia (GoE) strives to reach lower-middle-income status by 2025.

The fast growth of Ethiopia will lead to an increased demand for consumer goods, including dairy products. Currently, total national consumption of milk is 3.6 million metric tonnes per year and is expected to double by 2030. Currently, Ethiopian agriculture is dominated by smallholders, and 95% of milk produced is processed and marketed through informal market systems (Ndambi *et al.*, 2018). There is a significant mismatch between the demand and supply of dairy products as well as many inefficiencies. These dynamics present significant business opportunities for those dedicated to identifying and addressing these gaps. This business opportunity report presents an overview of the sector and highlights opportunities and challenges for interested investors.

1.2 GOVERNMENT PRIORITIES FOR THE DAIRY SECTOR

The Ethiopian dairy sector is a strategic priority for the Government of Ethiopia (GoE). The government aspires to attract more (foreign) private sector investments that can address business opportunities, contribute to the development of the sector, and have a positive impact on nutrition and food security (Ministry of Agriculture, 2020).

The Ministry of Agriculture (MoA) plans to increase dairy production to 10.4 billion litres, from cows exclusively (i.e. 100% increase), by 2030. To achieve this, the GoE has identified the following priorities for its 10-year plan (Ministry of Agriculture, 2020):

1. Increase the total quantity of milk production from 4.69 billion litres to 11.8 billion litres by 2030 (i.e. including cows, goats and camels).
2. Improve animal husbandry by developing the quality, quantity and accessibility of fodder and feed. Reduce the quantity of smallholders' milk cows from 11.5 million to 9 million, and increase the use and adoption of more commercialised production systems.
3. Increase the quality, variety and productivity of livestock. Specifically, increase the proportion of improved breeds from 2.7% to 17%.
4. Improve animal health through improved genetics and improved quality of, and access to, health services.

1.3 MAIN STAKEHOLDERS

The major stakeholders in the Ethiopian dairy industry are dairy farmers and consumers. Traders (small and large) also play a significant role in getting dairy products from the point of production to consumption. Another influential player is the GoE, specifically the MoA, the Agricultural Transformation Agency (ATA), the Ethiopian Institute of Agricultural Research (EIAR), the Ethiopian Meat and Dairy Industry Development Institute (EMDIDI) and the Ethiopian Food and Drug Authority (EFDA). Influential private actors includes business associations, such as the Ethiopian Cattle Breeders Association, Ethiopian Milk Producers and Processors Association, and Ethiopian Animal Feed Industry Association.

The MoA, other ministries and regional bureaus are responsible for formulating policies and establishing agricultural infrastructure and facilities. They are also in charge of capacity building and the provision of regular technical back-stopping and follow-ups to individual producers and producer organisations.

Banks and microfinance institutions play an important role in providing finance to entrepreneurs and investors in the dairy industry. The Development Bank of Ethiopia (DBE) offers loans to nationals and foreign investors with an equity-to-loan ratio of 25:75 and 50:50, respectively (as per an interview with DBE). Moreover, investors can obtain 50% debt financing from the DBE and the Commercial Bank of Ethiopia (CBE). Insurance companies (e.g. Ethiopian Insurance Company (public) and Nyala Insurance (private)) insure live animals, provided that owners have veterinary health certificates for their animals.

Several NGOs provide technical, theoretical and practical support and training to facilitate and support the sector. This support is accessible throughout the value chain for small-scale farmers, as well as commercial entities (Yilma *et al.*, 2017). Leading NGOs and government agencies working in dairy include SNV Netherlands Development Organisation, U.S. Agency for International Development (USAID), Land O'Lakes, Mercy Corps, Department for International Development (now superseded by Foreign, Commonwealth and Development Office), Bill and Melinda Gates Foundation and World Bank. The International Livestock Research Institute (ILRI) is among the non-governmental organisations (NGOs) working on research of the dairy sector. An overview of key institutions and stakeholders in Ethiopia can be found in Appendix 1.



2. Major trends in the Ethiopian dairy sector

2.1 THE DAIRY VALUE CHAIN

The livestock sector is responsible for a considerable portion of the national and agricultural GDP (12%–16% and 35%, respectively). This sub-sector accounts for about 30% of total agricultural employment. Ethiopia’s agro-ecology is conducive for dairy production and farmers are traditionally involved in dairy production.

The dairy, meat and live animal industries are core components of the Ethiopian livestock sector. Ethiopian dairy is predominantly traditional, with 98% of milk produced by smallholder farmers (Ayza *et al.*, 2020). Around 85% of the milk is consumed at household level, while only 7% is marketed (Getabalew *et al.*, 2019). Dairy products in the country are sold through informal and formal market systems.

Informal market – this market system involves farmers, traders and retailers who are not formally registered, with trading that is not well recorded. In the informal market, milk may pass from producers to consumers directly or through two or more market agents. It also involves the delivery of dairy products (fresh milk, butter, yoghurt and cottage cheese) to consumers by small-scale traders or retailers.

Depending on the region and production system, 78% to 95% of (marketed) milk is absorbed by informal market structures to reach final consumers (Agentur für Wirtschaft und Entwicklung, 2019). The traditional marketing of dairy products, especially traditional butter (around 70%), dominate the Ethiopian dairy sector (Abebe *et al.*, 2020). The remaining milk is either sold raw or processed traditionally to make yoghurt or cottage cheese (*ayib*). Some of these products are sold by collectors and resold by formal outlets, such as traditional restaurants and retail shops in urban and peri-urban areas.

Formal market – this supply chain consists of formally registered/licensed entities, and also includes smallholder farmers. This formal supply chain accounts for 2.5% to 7.5% of the total national dairy market (Ndambi *et al.*, 2018). It is centred in and around Addis Ababa and other regional urban centres. The direct relation between urban areas and the formalised market system can be seen by taking the North Shewa area (north of Addis Ababa) as an example, where the formal milk chain constitutes about 53% of production, and the informal market about 47% (Ndambi *et al.*, 2018).

INFORMAL VS. FORMAL MARKET SYSTEMS

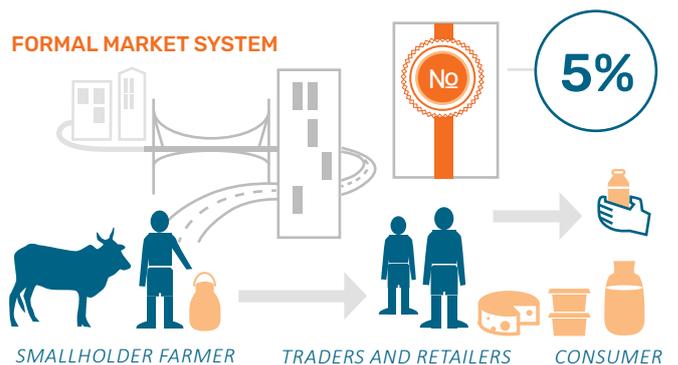
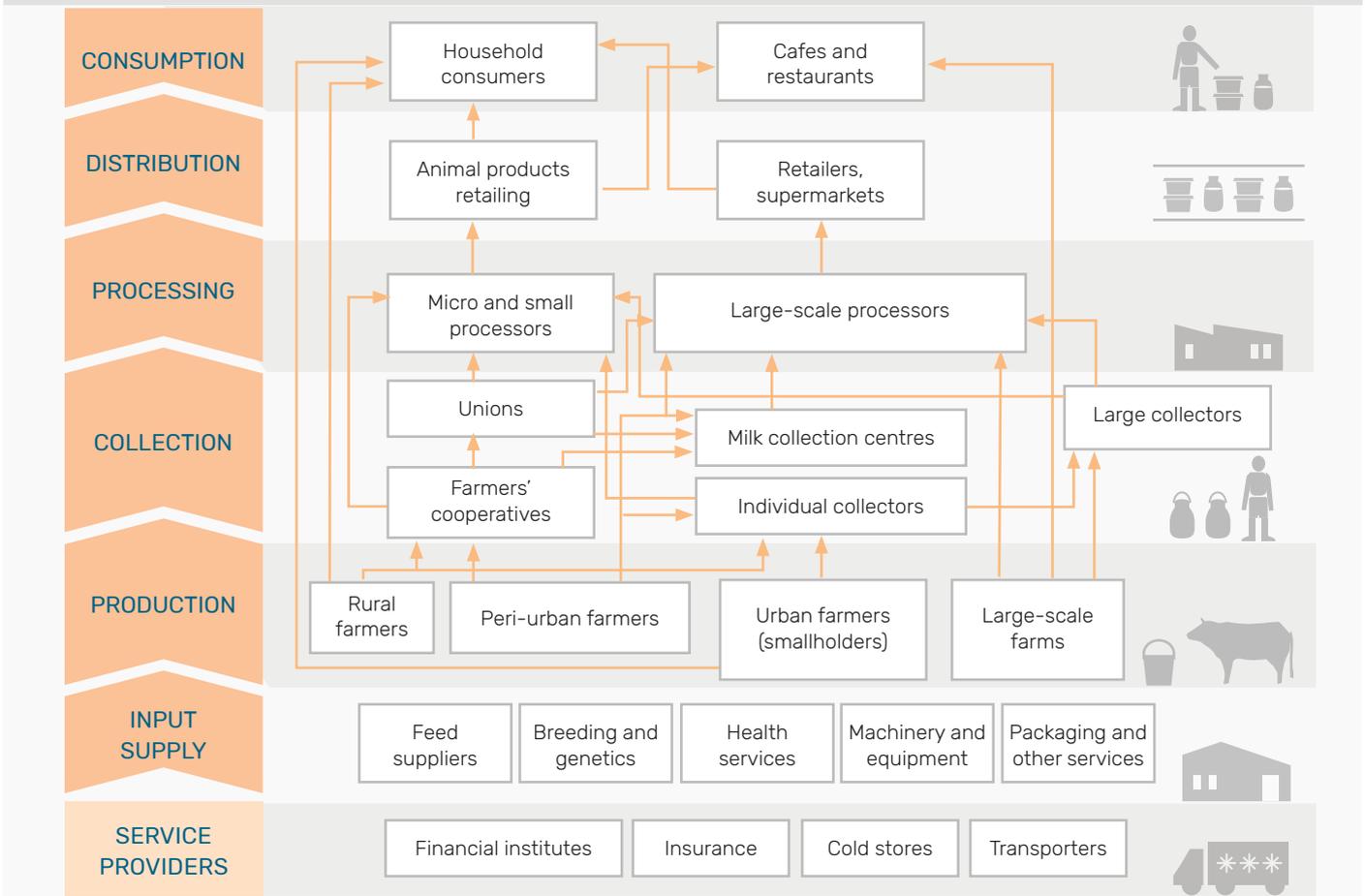


Figure 1. ETHIOPIAN DAIRY VALUE CHAIN



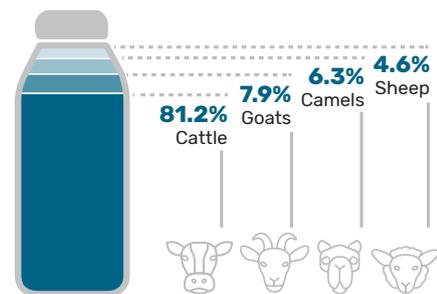
The value chain map in Figure 1 represents the flow of domestic dairy products and services. Import and export flows of dairy products are not included. These are described in section 2.5: Marketing and consumption.

SHARE OF TOTAL NATIONAL ANNUAL MILK OUTPUT, 2019. SOURCE: CENTRAL STATISTICAL AGENCY, 2019; MERCY CORPS AGRIFIN, 2019

2.2 PRODUCTION

Cattle population and breeds

According to the Ethiopian Central Statistical Agency (CSA), Ethiopia has 70.29 million cattle (43.78% male/56.22% female), with over 15 million milking cows. Cattle contribute the largest share of the total national annual milk output (81.2%), followed by goats (7.9%), camels (6.3%) and sheep (4.6%) (Central Statistical Agency, 2019; Mercy Corps AgriFin, 2019). Over 60% of the cattle in the country are located in the Ethiopian highlands (>1,500 metres above sea level). Around 97.4% of the total cattle population are indigenous breeds; the remainder are hybrid (2.29%) and exotic breeds (0.31%) (Central Statistical Agency, 2020). Most of the cattle in Ethiopia are of Zebu breed (local). Exotic breeds (e.g. Holstein Friesian and Jersey) have increasingly been imported and cross-bred with indigenous breeds for better milk yields (Kassa, 2019). Cross-breeds and high-grade breeds, varying in their exotic gene level, are mostly found within research institutes, cooperatives, and small- and large-scale commercial dairy farms.



Farming systems

There are four types of dairy farming systems in Ethiopia.

Mixed crop-livestock system: This system dominates milk output, encompassing about 65% of the total milking cows, and produces around 72% of the national annual milk output. Most producers use crop residue and open grazing as a source of feed. This farming system is typical of the highland areas (i.e. Amhara, Oromia, SNNP and Tigray). Milk producers are geographically dispersed, leading to collection difficulties.

Pastoral/agro-pastoral system: This farming system is mostly used in the lowlands of Ethiopia (<1,500 metres above sea level). The sector is prone to water and feed shortages, along with high disease pressure. Cattle settlement in pastoral and agro-pastoral areas is also widely dispersed, with associated collection challenges.

Urban and peri-urban small-scale production system: This system is mostly used in and around major towns of the Ethiopian highlands. Dairy farmers are typically small and medium-sized with improved dairy stock and shelters. They typically engage in stall feeding with feed that mostly consists of agro-industrial by-products and/or purchased roughage.

Urban and peri-urban production farmers often have limited or no access to grazing land, feed or fodder. They mainly focus on producing and selling fluid milk. Generally, those who operate in this production system have better access to inputs and veterinary services, and engage in more intensive and commercial management systems. This system accounts for over 50% of the cross-breeds and high-grade breeds (Getabalew *et al.*, 2019).

Commercial system: This system is characterised by specialised and market-oriented dairy operations in and around Addis Ababa and other regional capitals using exotic, high-grade or pure breeds. The farms typically have a holding size of 6 to 10 hectares, with the smallest having around 15 cows and the large ones exceeding 150 cows. These producers use specialised inputs such as improved genotypes, artificial insemination, forage production, improved housing, concentrate feeding and veterinary care (Dinka, 2019). This system accounts for less than 2% of national dairy production.

Main production areas (milk clusters)

According to a study by Wageningen University, there are 14 clusters of milk sheds in Ethiopia (four each in Oromia, Tigray and Amhara, and two in SNNP), classified according to current production situation, environmental conditions for cows (heat stress), feed and fodder production and availability, market access, expansion in milk volume, and access to inputs and services (Ndambi *et al.*, 2018).

With regard to the population of improved breeds within these clusters (see Appendix 3), North Shewa and South and West Shewa – Shambu in Oromia have 19%; SNNP – Hawassa has 13%; Amhara region has 5.3%; and Tigray region has 2.1%. In terms of milk production, fluctuation is observed in all clusters, owing to the seasonality of feed and fodder availability across the milk shed. Figure 2 shows the areas of these clusters. Based on the above milk cluster classification, the rank and corresponding volume produced by each cluster are depicted in Table 1. The clusters are listed as per their ranks reached according to a grading system. The grading was done (as per Ndambi *et al.*, 2018) based on the scoring of the above stated factors. The production data was aggregated from the Central Statistical Agency (2020).

Figure 2. DAIRY CLUSTERS IN ETHIOPIA. SOURCE: NDAMBI ET AL., 2018

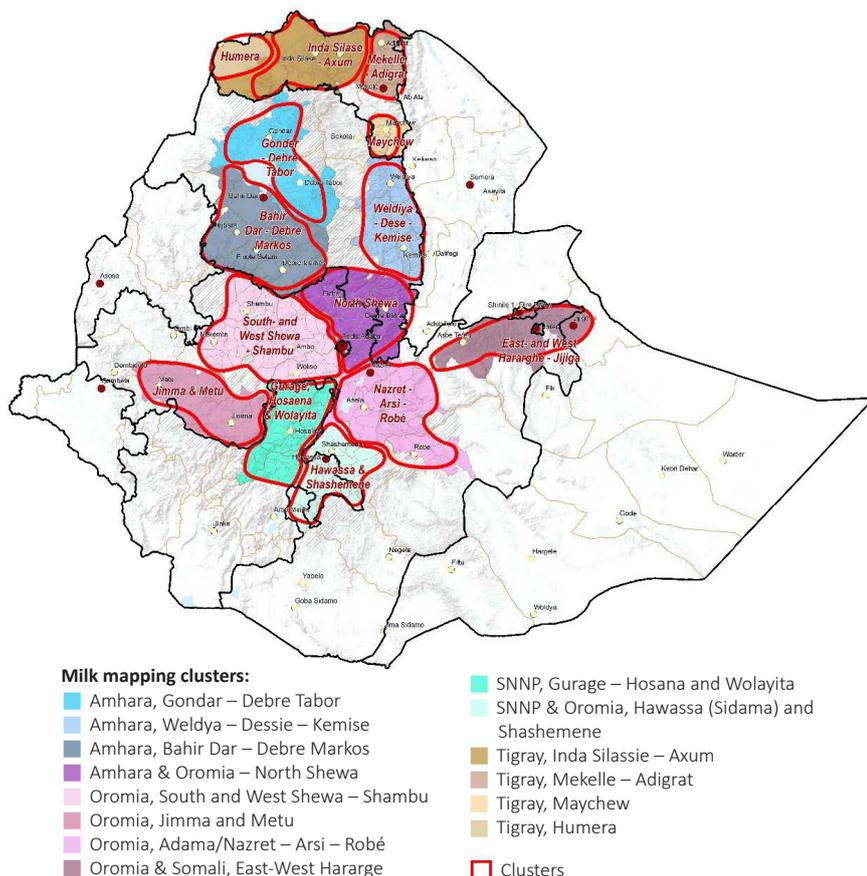


Table 1. RANK AND VOLUME OF MILK PRODUCED UNDER EACH OF THE 14 MAJOR CLUSTERS (MILLION LITRES). SOURCES: NDAMBI ET AL. (2018) AND CENTRAL STATISTICAL AGENCY (2020)

No.	Milk cluster	Annual production volume
1	North Shewa	100.4
2	Adama/ Nazret – Arsi – Robé	447.9
3	South and West Shewa – Shambu	78.3
4	Hawassa (Sidama) and Shashemene	416.4
5	Bahir Dar – Debre Markos	199.6
6	SNNP, Gurage – Hosana and Wolayita	222.8
7	Gondar – Debre Tabor	100.6
8	Inda Silassie – Axum	79.5
9	Mekelle – Adigrat	41.3
10	Humera	37.6
11	Jimma and Metu	176.1
12	East & West Hararge	162.4
13	Weldya – Dessie – Kemise	155.3
14	Maychew	20.8

Milk production quantities

The total Ethiopian milk production is estimated at 4.69 billion litres (Central Statistical Agency, 2020). Smallholder dairy farmers – typically owning between one and five cows of local breed – dominate the country’s dairy production. The annual milk yield of these cows is typically 300 litres per head, and they lactate (on average) only 200 days per year. This is significantly lower than neighbouring countries. To illustrate, cows in Kenya have a yield of 2,021 litres per annum.

In Ethiopia, 97% of milk is produced by indigenous local breeds that are well-adapted to the local environment, but have very low productivity. The remaining 3% of milk comes from exotic pure or cross-breeds (Yilma *et al.*, 2017). Rural smallholder producers typically milk their cows manually, using a (plastic or wooden) bucket as a container, and store the milk in plastic jars or clay pots. This milk is used for personal consumption or taken to the local market. The urban/peri-urban farmers also use similar methods (85%) (Ndambi *et al.*, 2018). Commercial farms, on the other hand, have modern milking facilities but use relatively simple tools and equipment.

Domestic cow milk supply has been hampered by drought, over-grazing, and a lack of good-quality and consistent feedstock. Over the past decade, the annual growth of milk production has been modest, although the past two years have shown significant year-on-year increases (see Figure 4). When looking at the compound annual growth rate (CAGR) calculated over a decade, the cattle population in Ethiopia as grown by 3.8%, while milk production has lagged behind at 3.4%.

2.3 COLLECTION AND AGGREGATION

Smallholder milk producers in peri-urban areas, and around the main milk sheds, sell to farmers’ cooperatives or to small- or large-scale collectors. In some cases, an arrangement is made directly with a processors. Cooperatives then sell to their respective unions or sell directly to processors. In an interview with the Ethiopian Milk Producers and Processors Association, it was highlighted that most of the formal (and to a large extent the informal) market collection of milk takes place around main roads. Milk produced and marketed off-road has little access to the market, hence producers typically process it into cottage cheese (*ayib*) or butter. There is poor road coverage in much of Ethiopia, therefore the majority of milk produced in remote areas will not make it to the formal market system.

Individual milk collectors (i.e. milk hawkers) collect milk directly from local farmers. Generally, milk is collected in tin cans without cooled storage facilities. Small-scale collectors generally only perform visual and scent inspections, and their paid price per litre of milk varies strongly throughout the country (i.e. US\$0.34 to US\$0.70 at the time of research). They subsequently aggregate and resell this milk to processors, retailers (e.g. cafes, restaurants and hotels) and consumers.

Cooperatives collect milk from their member farmers at milk collection centres (MCCs), or at their offices. At these collection hubs, test kits are increasingly used to test milk quality (e.g. fat content, temperature, bacterial content, adulteration). There are about 180 primary dairy farmers’ cooperatives in the country. Ninety-six are part of six dairy cooperative unions. These cooperatives and unions create milk market outlets for their member producers, and also provide them with dairy farm inputs (Yilma *et al.*, 2017). They then sell it to collection centres, small- or large-scale processors and, in some cases, to retailers. Some MCCs have their own cooling tanks and can be owned by cooperatives/unions, or private (Wageningen Livestock Research/SNV, 2020).

Figure 3. COMPARISON OF AVERAGE DAILY AND ANNUAL LACTATION. SOURCE: FOOD AND AGRICULTURE ORGANIZATION, 2019

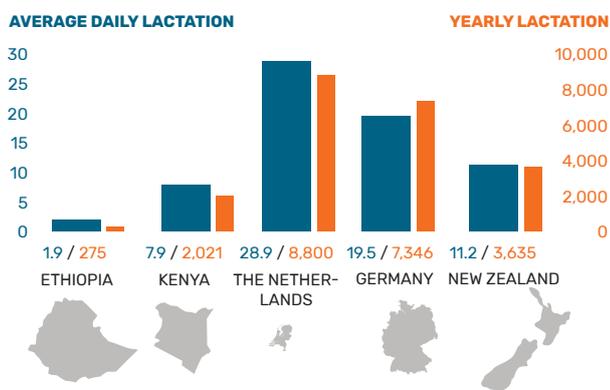


Figure 4. TOTAL MILK PRODUCTION AND NUMBER OF MILKING COWS, 2016–2020. SOURCE: CENTRAL STATISTICAL AGENCY, 2016–2020



2.4 PROCESSING

There are over 40 dairy processing companies in Ethiopia, with a total production capacity of 1.2 million litres per day (SNV in 2021). Since 2010, the number of processors (from 18 to 40) and the volume of processed milk (from 150,000 litres to 350,000 litres) have more than doubled.² These processors are currently operating at only 28% of their maximum production capacity. They process a mere 2.6% of the annual milk production of 4.69 billion litres. This small proportion can mainly be attributed to the poor quality of the supplied milk, caused by poor handling, absence of cooling facilities, unstable power supply (Gebreselassie, 2020), as well as the low supply of milk within the formal system. A representative of the Ethiopian Milk Producers and Processors Association indicated that the shortage in supply is mainly related to the collection trend of processors around main roads, while off-road producers struggle with the lack of access to market, as milk collectors do not reach remote areas. Discussions with processors (both local and international) revealed that the processors address this major supply challenge by using the following solutions: supplying feed to smallholders around their area in return for collecting the milk; setting up their own collection centres to check and pay for quality; and setting up a wide range of supply systems. One company disclosed that milk quality is a major issue, where even the processed milk, when tested in their facilities, is not always up to standard.

Processors collect their milk from MCCs, cooperatives and unions, private milk collectors and/or individual farmers. They produce fresh milk, pasteurised ultra-heat-treated (UHT) milk, fermented milk, fruit flavoured (UHT) milk, cream, butter (i.e. used to make bread, cosmetics, table, and cooking butter), cheese (e.g. gouda, mozzarella, cottage cheese, provolone, smoked, ricotta, fontina, feta, and cream cheese), and yoghurt (natural and fruit flavoured). Pasteurised milk is packed in 500 ml plastic pouches, yoghurt in plastic cups (150 ml, 250 ml and 500 ml), and butter is packed using plastic film and foil.

An overview of large-scale processors and their capacities is presented in Appendix 2.

2.5 MARKETING AND CONSUMPTION

Consumption patterns

The current per capita consumption of milk in Ethiopia is only 19 litres per year. This is very low compared to neighbouring countries such as Kenya (115 litres) and Uganda (65 litres). This low consumption pattern can partly be ascribed to the religious fasting practices of the country's Ethiopian Orthodox Church (43% of total population). A significant proportion of Ethiopian Orthodox Christians do not consume animal products (dairy, meat and eggs) for almost 200 days per year. Dairy consumption is also impeded by the high cost, insufficient supply, and limited promotion of nutritious diets.

Table 2. OVERVIEW OF CURRENT LOCAL DAIRY PRODUCTS AND PRICES IN THE FORMAL MARKET. SOURCE: CONSULTANTS' MARKET ASSESSMENT

Dairy product	Unit	Current price in US\$
Pasteurised milk	1 litre	1.10
UHT milk (plain)	1 litre	1.65
UHT milk (plain imported)	1 litre	3.91
UHT milk (flavoured)	1 litre	1.78
UHT milk (imported)	1 litre	3.22
Yoghurt (plain)	1 litre	1.40
Yoghurt (flavoured)	200 ml	0.40
Cottage cheese	1 kg	3.80
Sliced cheese	200 g	3.10
Imported cheese	200 g	8.37
Table butter	100 g	3.02

Addis Ababa has the highest per capita consumption in the country, averaging around 52 litres of milk per year, while inhabitants in smaller cities consume less than 30 litres per year on average. Pasteurised milk and powdered milk are the most consumed products in the formal markets of Addis Ababa. Projections do indicate significant growth opportunities associated with the growth in per capita income and change in consumer behaviour. Average per capita consumption is expected to grow to 27.9 litres per annum (Ministry of Agriculture, 2020). However, it is worth noting that even in urban areas, including the capital city, informal milk supply is high for middle- and low-income households. This preference for raw milk, aside from the price incentive, stems from the notion that pasteurised milk may be diluted and unhealthy.

Marketing and distribution

Demand for dairy products is currently met mainly through domestic production, supplemented by imports of processed dairy products. Consumers purchase dairy products from neighbourhood kiosks and supermarkets. They also directly consume dairy from food service providers, such as cafes and restaurants. Supply of the various dairy products occurs through formal and informal markets, which are often interwoven. Most milk (78% to 95%) is sold through the informal market. Urban/peri-urban farmers and collectors sell their produce directly to consumers and food service providers.

Processed milk in the formal market is mostly distributed and sold in towns and cities, through small kiosks, supermarkets and wholesalers. Processing factories are allowed to sell wholesale quantities of milk. Some of these companies deliver to wholesalers and retailers (e.g. kiosks and supermarkets) using cold trucks. Some wholesalers also directly collect from processors and further distribute at the retail level. Retail shops selling solely animal products are also suppliers of dairy products to consumers.

² Calculation based on a comparison between data in Land O'Lakes (2010) and SNV (2021) – see Appendix 2 for current data.

Figure 5. TYPES OF PRODUCTS AND AMOUNT IMPORTED IN A YEAR (IN '000 LITRE/KILOGRAM). SOURCE: ETHIOPIAN REVENUE AND CUSTOMS AUTHORITY (2015–2019)

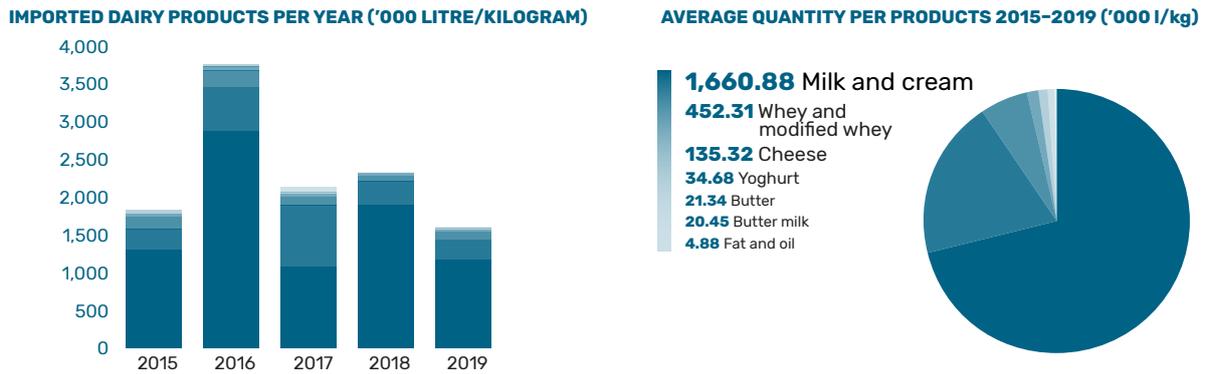
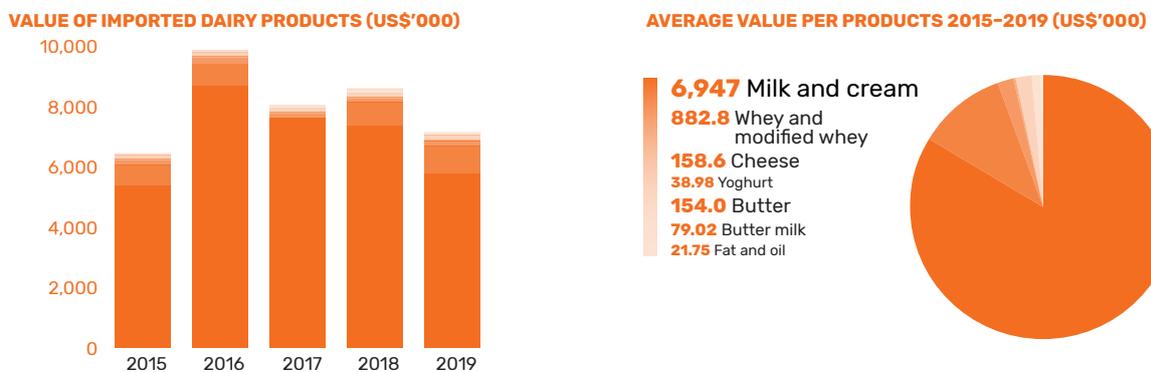


Figure 6. VALUE OF IMPORTED DAIRY PRODUCTS IN US\$'000. SOURCE: ETHIOPIAN REVENUE AND CUSTOMS AUTHORITY (2015–2019)



Due to significant shortages in the supply of milk, all parties compete for the limited quantities of milk. Buyers tend to use whatever milk is available and not select based on quality. The quality of produce is often compromised due to limited cool-chain facilities and dilution. Powdered milk is by far the most sold product compared to UHT, and is available throughout Ethiopia because of its ease of transportation and long shelf life (as observed from the consultants' assessment of outlets). A small volume of UHT milk is imported and locally produced by Sebeta Agro Industry, Family Milk, Bobo Agro Processing and JoJo Milk. The bulk of UHT is sold to high-end customers in Addis Ababa, Dire Dawa, Harar and Jijjiga. This is due to its high price of final goods resulting from the high cost of production and packaging (as per interviews with companies).

Imports

Ethiopia imports a significant amount of dairy products through importers/trading agents, wholesalers, supermarkets and dairy processing plants. Between 2015 and 2019, dairy imports averaged around US\$8.28 million per year.

Milk and cream (including powdered milk and UHT) made up about 70% of dairy import volume (see Figure 6), equating to around 85% of the total value of dairy imports. A distant second is whey and modified whey (16%). The third largest import segment is cheese. Ethiopia mainly imports powdered milk and cream from the Netherlands, New Zealand and Switzerland; cheese from Egypt, France and the Netherlands; and yoghurt from Spain, France

and Germany. The sharp increase in the overall import of dairy products in 2016, as seen in Figures 5 and 6, is expected to have been linked with the El Niño drought that affected the pastoralist areas of the country that year (Federal Democratic Republic of Ethiopia, 2018), creating a shortage in the milk supply, and thereby increasing the market for imported dairy products.

Exports

Formal exports of dairy products from Ethiopia are insignificant. The average annual export value between 2014 and 2018 was US\$150,000 (COMESA, 2019), almost all of which was exported to Somalia and Djibouti.

2.6 INPUTS AND SERVICES

Breeding and genetics

According to the MoA's 10-year plan, in 2020 there were 551 private, medium-scale, specialised dairy cattle breeding centres in the country, it plans to attract a further 500 in the next decade.

Artificial insemination (AI) services are provided by the National Artificial Insemination Center (NAIC) sub-centres, the Addis Livestock Production and Productivity Improvement Service (ALPPIS), and private AI technicians.

Reliable sources on the number of AI technicians in the country could not be found. Private AI service providers charge between US\$3.20 and US\$5.40 per service (as per an interview with a farm owner), while government institutes charge US\$0.13, with a 2.27 conception rate (Ministry of Agriculture, 2020). These service providers are not meeting demand due to the lack of availability of trained technicians, limited availability of genetic material, and challenges related to the inaccessibility of finance. In addition, there is also resistance from farmers to get better breeds, as other inputs – such as feed, vaccines and medication – are not readily available to complement the investment.

Ethiopia has 14 liquid nitrogen plants for the storage and transportation of semen and genetic material for AI. Two stations that produce elite, cross-breed bulls send semen to three semen collection centres (as stated in an interview with the Ethiopian Milk Producers and Processors Association). The bull breeding service is offered by private actors, and records show that there are five ranches that use genetically improved breeds.

Fodder and feed

The quantity and quality of feed supply is challenging for the Ethiopian dairy sector. In recent years, the price and supply of feed and fodder in the country has been a hindrance to the livestock sector, especially peri-urban, urban and commercial production. This challenge is mainly attributed to the increase in price of the two main ingredients, soybean and maize, as well as a shortage in foreign currency to import premix. The increase in price of the crops is linked with the increased export of soybean and increased demand for maize in the local market.

In rural Ethiopia, livestock are largely reared in an extensive range-based system that depends on the availability of pasture and water. This production system is constantly challenged by climate variability, grassland degradation, overgrazing, soil infertility, and an inadequate supply of highly productive fodder seed, cultivation equipment and water management. These constraints hinder the productivity of dairy cows.

According to a Feed the Future study, three fodder crops are outlined as a good fit for the different agro-ecological settings in Ethiopia: alfalfa, desho and Napier. To implement this, the study identified 17,720 square kilometres of irrigable land with shallow water wells (Srinivasan, 2020). While such initiatives and the GoE focus on enabling smallholders to produce fodder for themselves and their surrounding farmers, there are also a handful of commercial fodder producers in the country producing for medium- and large-scale farms. The MoA's 10-year plan (2020) states that there are eight fodder producers in the country. However, other reliable data sources could not corroborate the production capacity and status of these farms.

There are over 75 animal feed (pre-mix and formulated) importers, producers and distributors, most of whom are located in the Addis Ababa milk shed. Most of these feed industries are privately owned and 28 are farmers' unions (Bediye *et al.*, 2018). These processors produce animal feed for dairy (26.2%), poultry (56.2%), beef (14.3%), and other species (3.3%). The production capacity of these feed processors is not enough to meet local demand. Due to the shortage in feed and fodder supply in the country, export of these products is currently not allowed. However, there has been

ongoing discussions for allowing a certain proportion of production to be exported to enable companies to cover their expenses on imported inputs.

Animal health

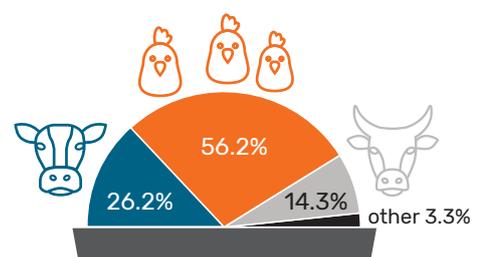
Veterinary services are mostly provided by the MoA and its bureaus, with only a limited number of private veterinarians and assistants. There is only one private veterinary drug producer (East African Pharmaceuticals Plc), and only one livestock vaccine producer (National Veterinary Institute (NVI)). The capacity of the two organisations is very low when looking at their product quality, quantity and diversity. The MoA puts the current reach of vaccination services at 64% (Ministry of Agriculture, 2020). Aside from the two local providers, there is one international company, EVA Tant, that supplies locally registered vaccines and drugs, and provides technical support (training). Also, companies such as Zoetis (USA) and MSD Animal Health (USA) have recently started providing animal health products and services for cattle. The sector is open for international investors to fill the supply gap. In an interview with the Ethiopian Milk Producers and Processors Association, it was stated that the availability of veterinary medicine and provision of health services are unreliable, and the quality of imported medicine is at times compromised. It was also stated that animal diagnostic and lab equipment, including necessary reagents, are barely available and accessible.

Equipment and machinery

Investments in harvesting, cooling, processing and packaging machinery are required to increase the productivity and quality of the dairy industry. Industry professionals indicate that there are only a handful of (domestic) companies that supply equipment and machinery for the dairy sector, namely farming equipment, quality control equipment, small-scale dairy processing equipment, laboratory materials and packaging inputs. Most of these inputs are imported by new investors during the setting up of their plant. Most equipment and machinery is imported from China, India and Turkey. In a few cases, domestic engineering facilities or Technical, Vocational Education and Training (TVET) centres produce simple equipment for smallholders and small businesses, mostly supported by development projects. The main challenges regarding equipment and machinery are:

- farm sizes are mostly small, hence farmers want to reduce production costs by reducing equipment costs
- a lack of awareness of the added value of having some equipment (e.g. quality testers)
- a lack of access to finance among the different actors of the value chain, to purchase facilities (Gebreselassie, 2020)
- a lack of availability of equipment maintenance services.

SHARE OF TOTAL ANIMAL FEED PRODUCTION (2018)



3. Challenges of the dairy sector

Dairy development in Ethiopia is constrained by many factors. These factors, in turn, present significant opportunities for investors and traders. The section below shows the challenges and the interventions required to address them. Many of these interventions entail the introduction and adoption of new technologies, and require sustainable private sector investments. Looking at the complete list, it becomes apparent that the Ethiopian dairy sector is in the early stages of development. This presents significant opportunities for companies with dedicated, long-term aspirations.

3.1 PRODUCTION



Challenges	Interventions needed
Strong (seasonal) fluctuation of milk production – caused by fodder shortages and feed management and rationing systems that do not match animal needs and productivity	<ul style="list-style-type: none"> • Production of fodder with irrigation • Establish commercial feed production • Establish good rationing management systems, as per the needs and purpose of the animals • Connect available feed resources (e.g. industrial by-products) with farmers • Conduct national feed inventory • Introduce other possible agriculture by-products, such as banana leaves, and leftovers from fruit and vegetable markets and sugar factories
Prevalence of disease pressures (e.g. blue tongue)	<ul style="list-style-type: none"> • Provide sufficient vaccines and medicines • Provide timely veterinary services • Provide technical support for timely identification of diseases
Low milk productivity – caused by limited adoption of breeds with high milk production capacity	<ul style="list-style-type: none"> • Increase the number of high-productivity breeds • Establish improved heifer reproduction businesses • Improve the genetics of animals by cross-breeding with exotic genetics • Improve the technical and logistical handling of genetic material by providing training and equipment to AI technicians and professionals • Put in place a holistic dairy system (including breed, feed, medication, technical service) • Import pedigree-registered semen and make it available to AI service providers
Lack of farm-level milking, storage and chilling equipment and facilities	<ul style="list-style-type: none"> • Stimulate improvements of milking, storage and chilling infrastructure at the farm level • Establish systems to ease access to finance for farmers and increase connections with suppliers
Low milk quality – caused by dilution, presence of contaminants, and overall storage practices	<ul style="list-style-type: none"> • Adjust feed ration to match animals' needs • Implement proper feed storage and milk handling to reduce microbiological and aflatoxin levels • Capacity building on hygiene and technical aspects of milk handling • Increase the adoption of affordable and efficient milk quality testing equipment

3.2 COLLECTION AND AGGREGATION



Challenges	Interventions needed
Limited number of milk collection centres. Centres are poorly equipped and geographically dispersed	<ul style="list-style-type: none"> • Establish collection centres near producers with a significant potential for increasing output • Train milk collectors on milk quality, system operations and customer (i.e. farmer) handling
Limited number and distribution of cooling tanks. Some are located in areas with insufficient supply volume, while others are defective due to the absence of trained maintenance technicians	<ul style="list-style-type: none"> • Introduce more cooling tanks at locations with adequate milk supply • Establish networks with collection centres and equip them with cooling facilities • Increase training to technicians on equipment maintenance and cleaning • Make servicing, maintenance and spare parts available
Absence of incentives for delivery of high-quality milk and associated competition with informal collectors and traders	<ul style="list-style-type: none"> • Establish attractive quality- and quantity-based incentives for milk suppliers • Establish fully equipped milk collection centres and/or dairy hubs that collect and test milk from local farmers • Communicate, educate and train producers about the relevance of quality parameters • Increase the regularity of milk collection • Establish automated, quality-based confirmation and payment systems • Facilitate market linkages and agreements between producers and buyers
Absence of (digitised) quality and quantity control systems	<ul style="list-style-type: none"> • Introduce and increase the use of quality control equipment • Implement a consistent and transparent system that builds confidence and trust among producers • Train collectors at the collection centres
Inadequate bulking and transporting systems and facilities	<ul style="list-style-type: none"> • Introduce and professionalise timely fleet management system, with insulated tankers • Select the right size of insulated tanker trucks for the right cluster for the volume of milk matches tanker capacity • Establish mechanisms to collect from off-road producers

3.3 PROCESSING



Challenges	Interventions needed
Access to (high-quality) milk	<ul style="list-style-type: none"> Establish milk collection centres and/or dairy hubs that facilitate milk collection and quality testing from local farmers Establish attractive quality- and quantity-based incentives and payments for milk suppliers
Poor product packaging and poor design	<ul style="list-style-type: none"> Increase collaborations with professional packaging companies Develop packaging that is appealing to customers Facilitate continuous consumer feedback and associated incremental product improvements
Limited points of sales with cooling facilities (harming the quality and reputation of processors)	<ul style="list-style-type: none"> Improve connections with points of sale Introduce (branded) cooling systems for retail outlets

3.4 MARKETING AND CONSUMPTION



Challenges	Interventions needed
Market driven by availability and price sensitivity, rather than by product quality and brand loyalty	<ul style="list-style-type: none"> Increase economy of scale and reduce cost prices, while maintaining quality Conduct market and pricing analyses Increase availability of different packaging sizes Ensure constant availability of produce Build brand loyalty through marketing efforts Professionalise quality assurance and quality management systems
Significant demand fluctuations – caused by fasting practices of the Ethiopian Orthodox Church	<ul style="list-style-type: none"> Invest in a broader range of products with a longer shelf life (e.g. powdered milk, cheese, UHT) Expand reach to areas where demand is not seasonal (e.g. predominantly Muslim areas of the South East)
Low diversity of product portfolio. Product portfolio does not meet customers' needs (e.g. flavoured milk, cream cheese)	<ul style="list-style-type: none"> Diversify the dairy product portfolio and introduce new products Experiment with consumer preferences Increase efforts related to awareness creation, branding and marketing
Difficult access to distant markets – caused by perishability and poor cold-chain logistics	<ul style="list-style-type: none"> Produce and market products with a longer shelf life (e.g. UHT) Invest in last-mile, cold-chain transport and logistics solutions
Some negative consumer perceptions of factory-processed products	<ul style="list-style-type: none"> Increase consumer awareness and enhance consumer trust Meet packaging and labelling requirements to comply with standards Stimulate product testing for consumers

3.5 INPUTS AND SERVICES



Challenges	Interventions needed
Limited production of high-quality fodder crops – caused by traditional farming practices, shortage of land, and dependency on rain-fed production	<ul style="list-style-type: none"> Increase and diversify local production of irrigated forage on more land Improve availability of inputs for forage production (e.g. seed multiplication) Raise awareness among farmers of the importance of fodder crops and associated business model of fodder crop production Increase market linkages between fodder producers and buyers
Limited production and availability of animal feed	<ul style="list-style-type: none"> Increase the number and distribution of animal feed producers Increase knowledge of correct formulation and composition of animal feed Improve awareness of productivity increase and related business model when providing animal feed to cattle Invest in last-mile distribution to increase availability of animal feed in rural areas Improve availability of, and access to, minerals and vitamins (premix) for the formulation of feed
Low coverage of extension services – caused by a shortage of skilled extension workers	<ul style="list-style-type: none"> Increase linkages with actors who provide extension services Train and equip service providers to deliver efficient services Establish systems (e.g. credit, information technology, geographic information) that facilitate the quality and quantity of provided services
Low availability and efficacy of AI services – caused by a shortage of genetic material, equipment and inputs, limited number of well-trained technicians, and low skills and awareness at farmer level	<ul style="list-style-type: none"> Build the necessary infrastructure for the delivery of AI services Improve the enabling environment by lobbying policy makers Establish a liquid nitrogen production facility Increase the supply of necessary inputs, specifically equipment related to the handling of semen Improve linkages with animal health service providers for screening of animal health
Animal health challenges – mostly caused by limited knowledge of disease pressures, low supply of vaccinations and medicines, and a shortage of veterinarians/low-quality veterinarian services	<ul style="list-style-type: none"> Increase local awareness of the effects of poor animal health and associated implications Build a network with veterinarians and health service providers Increase the quantity of animal health professionals and improve their knowledge and service level Improve the availability of, and access to, vaccinations and medicines, either by increasing access to foreign currency, or improving local production Promote recording mechanisms and disseminate information on disease pressures, outbreaks and required interventions Set up sustainable schedules for yearly vaccination and deworming programmes

3.6 CROSS-CUTTING CHALLENGES



Challenges	Interventions needed
Limited access to finance for domestic, small-scale and/or geographically distant actors	<ul style="list-style-type: none"> • Lobby financial institutions to consider the relevance of the dairy sector • Coordinate with finance institutes to ease access to finance for actors at all levels of the value chain • Capacitate and inform actors at all levels of the value chain regarding finance, procedures and business development • Lobby for the setting up of agriculture banks
Import challenges due to foreign currency shortage	<ul style="list-style-type: none"> • Strengthen sector lobby and collaborations with the GoE and financial institutions to ease access to foreign currency • Focus on opportunities related to import substitution • Introduce products with a longer shelf life. The export of some of these produce can generate foreign currency
Absence of modern and appropriate agro-logistics system and cooling chain systems	<ul style="list-style-type: none"> • Introduce improved cool-chain logistics systems and inputs • Stimulate cross-value chain collaborations and partnerships that address cool-chain challenges
Limited entrepreneurship and innovation within the dairy sector	<ul style="list-style-type: none"> • Enhance entrepreneurial skills through training, incubators and business development support services • Highlight challenges and opportunities to stimulate entrepreneurial interventions



4. Investment opportunities

The Ethiopian dairy industry presents many investment opportunities for dedicated investors. The growing population size of the country, urbanisation and income growth rates, limited supply and competition, changing consumption patterns and increasing consumption rates, all create significant opportunities for dairy development. This section presents a brief overview of the general opportunities.

4.1 OPPORTUNITIES IN PRODUCTION

Feed and fodder production

Commercial, irrigated forage production is needed to address shortages in animal feed supply. As such, there are many opportunities for companies that wish to invest in commercial forage production, and the supply and use of inputs (e.g. seeds). The country specifically requires drought-resistant fodder crops that match suitable ecological and environmental conditions (e.g. sorghum, soybean, bicolour pearl millet, teosinte, cowpea, berseem, oats, Napier, desho, lucerne/alfalfa and maize).

The 47 private actors and 28 cooperatives that operate in the production and/or supply of fodder and feed do not meet the huge demand in Ethiopia. The Ethiopian Meat and Dairy Industry Development Institute estimated a supply gap of 190,000 metric tonnes of concentrate mix per year. The MoA's 10-year plan describes the ambition to support investors interested in investing in the fodder and feed supply chain. Land and other facilities will be made available for investment plans that address the prevailing shortage of feed and low productivity of the livestock sector.

Commercial dairy farm establishment

Setting up commercial dairy farms is potentially a promising investment due to an unsatisfied and growing demand for high-quality milk. Dairy processors operate at less than 30% of their total production capacity due to a limited supply of high-quality milk. The development of dairy products with a longer shelf life (e.g. UHT milk and yoghurt) will only increase this competition. New, large-scale UHT investments have recently materialised and are already driving up prices. Adequate due diligence is required to identify favourable locations for commercial farms, most likely in the Ethiopian highlands.

AI services and animal health

Local cow breeds are genetically predisposed to produce very little milk and these local breeds dominate the landscape. The GoE is dedicated to attaining higher productivity and increasing milk production, as these are the main bottlenecks for the industry.

This presents significant opportunities for companies that supply elite genetic material, sexed semen, and embryo transplantation services. Providing

such AI services, of course, requires the right equipment and infrastructure (e.g. nitrogen, storage containers). To illustrate, liquid nitrogen is essential for providing high-quality semen. Currently, only the government produces and distributes liquid nitrogen (at US\$0.80 per litre) and is unable to meet local demand. This demand is likely to increase with the government's aspirations to replace the cattle population with superior breeds.

The above goes hand in glove with inputs and services for animal health. Accessible, high-quality and preventative health services will improve animal health and welfare, which in turn will increase productivity levels. Such services are largely absent, presenting significant business opportunities related to increasing the availability and quality of veterinary services (e.g. mobile veterinary clinics), improved access to medicines and vaccinations, and the supply of associated inputs.

Dairy cattle supply (heifers)

There is a large demand for cow breeds that have a high milk production. This presents excellent opportunities for producing pure or high-breed heifers and/or supplying embryos. In fact, the Food and Agriculture Organization (Brasero *et al.*, 2019) expects a supply gap of around 2 million heifers in the coming two decades. This is an urgent issue that can be addressed by supplying heifers.

Dairy farmers – especially those close to urban locations – want to purchase cross-breed or pure-breed cows, and are willing to pay a significant premium. To illustrate, cross-breed cows are sold for about US\$500, whereas pure breeds can sell for up to US\$2,000. Supplying pregnant heifers with a traceable pedigree to specialised commercial farms and ranches is another good opportunity.

4.2 OPPORTUNITIES IN COLLECTION, PROCESSING AND MARKETING

Dairy hubs, storage and chilled transport

There are many opportunities related to establishing dairy hubs and milk collections centres, taking the produce to the processors, and supplying associated equipment and inputs. These dairy hubs are needed for consistent and predictable purchasing from farmers, increasing collection volumes, ensuring milk quality, and for guaranteeing adequate storage and cooling conditions. These dairy hubs need cleaning and chilling facilities, quality control laboratories and equipment. The transportation of milk from the dairy hubs to processors also requires professional, chilled transportation. Opportunities also exist in the introduction of milk collection mechanisms from off-road areas. Investors can tap into these opportunities and can provide technical/automation solutions for the overall traceability and quality of milk.

Product development and diversification

The dairy industry needs product diversification, especially when it comes to dairy products with an extended shelf life (e.g. UHT milk, powdered milk and cheese). These products will be more resilient to demand fluctuations and can open new markets by reaching previously inaccessible customers throughout the country (e.g. due to unavailable cool-chain transport solutions). There are currently only four companies that have started to process UHT milk.

In particular, the production of milk powder is a huge opportunity. In the past five years, the majority of the country's imported 1,660 metric tonnes of milk and cream consisted of powdered milk, and the demand for such produce steadily grew at an average rate of 23%.

In addition, consumers have been shown to be open to new dairy products and flavours. To illustrate, Bobo Agro Processing and JoJo Milk have recently started to produce flavoured milk, which has become very popular among children, while Shola Milk has started a new packaging line for long shelf life milk.

Investors should also consider opportunities in the introduction of fortified milk, whey-based products (since a high volume is being discarded) and the bulk supply of pasteurised milk to cafes and restaurants at a lower price, given the lower cost of packaging.

Packaging solutions

Producing and supplying packaging equipment and material are other opportunities. Currently, only a handful of companies supply (plastic) packaging material to the dairy industry. The need for more (diverse) packaging solutions is likely to grow along with the industry.

Export opportunities

Somalia, Kenya, Sudan, Djibouti, Eritrea and South Sudan import on average US\$382 million worth of powdered milk per annum. This produce is mostly imported from countries such as India, the Netherlands and New Zealand. This highlights significant business opportunities related to Ethiopian-produced dairy products with a longer shelf life (e.g. UHT, cheese, and powdered milk). Such products could be sold to these surrounding countries at a competitive price range, earning foreign currency.

4.3 CROSS-CUTTING OPPORTUNITIES

Equipment and machinery

Dairy equipment, technology and machinery in Ethiopia are scarce, too expensive or too large-scale. This presents many opportunities for suppliers (e.g. small-scale and second-hand equipment, barn design, tractors and trailers, spare parts, milking and processing machinery, chilling storage facilities). Moreover, many companies face challenges related to the operation, maintenance and repair of their equipment. Small-scale dairy farmers are mostly interested in smaller solutions, along with tools and equipment that can easily increase production efficiency. Currently, a lot of the equipment is not locally available and must be imported. This leads to challenges associated with logistics and the availability of foreign currency. Investors could provide solutions for these challenges by, for example, providing refurbished, small-size equipment, supplying fool-proof solutions, or offering maintenance and automation services.

Technical advisory services

There is a lot of demand for technical expertise and support across the value chain. The growth projections of the dairy sector – and the associated development targets of the GoE – require technical expertise and services. There is limited local availability of such knowledge and services (e.g. AI and genetics). Service providers and consultancy firms can tap into this opportunity through a wholly owned subsidiary or a joint venture.

Financial solutions and services

The dairy industry requires inputs, equipment and machinery to start, prosper and expand. The industry is, however, plagued by limited access to finance and foreign currency, and therefore struggles to pay for these items and grow. Providing financial solutions is therefore a viable opportunity for (foreign) investors.

To illustrate, equipment leasing solutions could lead to the introduction and adoption of new machinery and technology. There are a number of domestic companies that are eager to expand their businesses, and are looking for venture capital.

BOX 1 – INVESTMENT INCENTIVES

Government incentives

The GoE aspires to increase investments in the dairy sector and provides several incentives for foreign investors.

- 8 to 15 years' exemption from income tax for investments in agro-industrial parks (differs by location).
- 2 to 6 years' exemption of income tax for investment outside of agro-industrial parks.
- Duty-free import of agricultural and irrigation equipment.
- Duty-free import of feed production inputs.
- Duty exemptions on the import of capital goods, construction materials, spare parts (with a value up to 15% of the total value of capital goods), motor vehicles required for investment, raw materials for the production of export commodities, and personal effects for residents in industrial parks.
- 0% tax on exports.
- Land access at premium rates with a lease period up to 30 years.

The MoA specifically plans to make available:

- 6,000 ha for feed and fodder (seeds) (max. 500 ha per investment)
- 14,000 ha for ranch development, in particular for lowland dairy investments (max. 500 ha per investment)
- 6 ha (per investment) for dairy cattle breeding.
- The MoA aspires to lobby other government offices on behalf of investors, in particular when they engage in fodder production, feed formulation, (high-quality) medical supplies, breed supplies, and fodder/feed seed supplies.

5. Appendices

APPENDIX 1: PUBLIC SECTOR STAKEHOLDERS

Some government institutions

Ministry of Agriculture (MoA)	The MoA works on accelerating agricultural production and productivity at all levels. One of its roles is enabling regional offices to implement the national Growth and Transformation Plan at the regional level. Through its regional bureaus, the MoA is also in charge of capacity building and the provision of regular technical backstopping and follow-ups to individual producers and producer organisations. For this purpose, it places extension service experts in livestock and crops in each district (<i>kebele</i>).
Ministry of Trade and Industry (MoTI)	The MoTI is responsible for sustained development and competitiveness in trade and industry. It performs the registration and regulation of trade and industry investments in the country, and governs relevant bodies such as the Ethiopian Standards Agency (ESA), Ethiopian National Accreditation Office (ENAO) and Ethiopian Conformity Assessment Enterprise (ECAE).
Ethiopian Investment Commission (EIC)	This body provides services such as issuing investment permits, issuing commercial registrations, and approving trade names to investments. The EIC is the entry point for foreign investments, although regional investment bureaus have autonomy over some decisions, so are also relevant bodies for investment.
Agricultural Transformation Agency (ATA)	The Ethiopian Agricultural Transformation Agency (the Agency or ATA) was established in 2010 with the aim of transforming the agricultural sector in Ethiopia by resolving systemic bottlenecks. It works to address the food security and economic growth agenda of the country by supporting existing public, private and non-governmental organisations. The agency works throughout the value chains of major agricultural sectors, including the dairy value chain.
Ethiopian Food and Drug Authority (EFDA)	The EFDA is an entity under the Ministry of Health (MoH), established to ensure the safety, quality and efficacy of food and health products in the country. The EFDA inspects, tests and certifies food products that are imported and produced in the country. It mainly inspects packaged foods, but not products under the informal market system or raw products. The EFDA has the mandate to terminate licences when products in the formal market do not fulfil national standards.

Research institutions

Various governmental and non-governmental institutions conduct research on the development of the dairy sector to bring change to and improve the livelihoods of farmers in a sustainable way.

Ethiopian Institute of Agricultural Research (EIAR)	The EIAR is a public institute responsible for conducting research in various agricultural agendas, in collaboration with regional research institutes and universities, to resolve bottlenecks in the sector and increase production and productivity. The EIAR has been working on addressing major challenges in livestock development, as well as setting national agendas to improve sector performance. It works on developing technologies associated with genetics, feed and health, among others, and disseminates proven technologies to farmers. Along with the MoA, it is also responsible for trialling and registering new varieties of seeds that come into the country.
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Regional agricultural research institutions

There are over 40 agricultural research institutions in Ethiopia, mainly in the four major regions of Oromia, Amhara, SNNP and Tigray. These research institutions collaborate with the EIAR on agricultural research conducted in their respective regions.

International Livestock Research Institute (ILRI)	The ILRI is an organisation under the UN that works to improve food and nutrition security. It works on boosting the economic growth of countries and reducing poverty by improving the production and productivity of the livestock sector to increase animal-source food. The ILRI supports the GoE, specifically, the MoA, research institutes and universities, as well as the private sector, towards achieving set growth plans.
Ethiopian Meat and Dairy Industry Development Institute (EMDIDI)	The EMDIDI is a government institute established with the objective to provide all-round support to the meat and dairy industry, and thereby accelerate technology transfer, achieve transformation, and enable the industry to be competitive at international level.

Non-governmental partners

Various national and international development partners play a significant role in dairy sector development by initiating projects that provide material and technical support to smallholder producers, dairy cooperatives and unions, the private sector, and relevant government institutions. The projects include:

Building Rural Income through Inclusive Dairy Business Growth in Ethiopia (BRIDGE) 2018–2023	Project implemented by a consortium of SNV Ethiopia and Wageningen University & Research (WUR), and fully funded by the Embassy of the Kingdom of the Netherlands in Ethiopia.
Partnership for Artificial Insemination Delivery (PAID)	Partnership between Land O'Lakes and the Bill and Melinda Gates Foundation, working on establishing efficient and effective private- and public-led channels that deliver AI and related services to improve dairy cattle productivity as a way out of poverty.
Resilience in Pastoral Areas (RIPA)	Project funded by USAID and implemented by two consortia covering northern and southern pastoral areas. Mercy Corps and CARE International cover the north; Project Concern International (PCI), GOAL and iDE cover the south. RIPA assists pastoral and agro-pastoral farmers to address the underlying causes of climate change in the production systems of livestock farmers, food security and inclusive economic growth.
Livelihood Resilience Programme	World Bank project, in collaboration with the GoE, backed by US\$70 million of grant and US\$280 million of credit, with the aim of improving the resilience and livelihoods of 2.5 million pastoral and agro-pastoral farmers over a five-year period (2019–2023).
Dairy for Development (D4D)	United Nations Industrial Development Organization (UNIDO) project that aims to develop the dairy sector, create more jobs, and reduce irregular migration in Amhara region. The project also aims to link producers with investments in agro-industry parks as suppliers of inputs.
Feed the Future Ethiopia Value Chain Activity	Project funded by USAID that aims to improve inclusive and nutrition-sensitive production of dairy, meat, live animals, poultry, chickpea, coffee and maize. To achieve this, it works on improving the market system, trade and the enabling environment in the four regions (Oromia, Amhara, Tigray and SNNP).

Associations

Business associations

Business associations in Ethiopia focus on solving problems related to dairy farm input supply and market outlets for their products. In brief, these organisations and their roles are as follows:

Ethiopian Dairy Cattle Breeders Association	An association for cattle breeders and experts consisting of 72 members. It provides networking, information and knowledge-sharing, and capacity development. It is currently being restructured.
Ethiopian Milk Producers and Processors Association	A membership-based association for private companies and entrepreneurs that produce and/or process dairy products. It has 32 members. Currently, the association is under collapse because of financial challenges.
Ethiopian Animal Feed Industry Association	An association established by private companies and entrepreneurs operating in the animal feed industry, owners, private dairy farmers and dairy cooperatives. Currently, it has 60 members. The objective of the association is to improve the quality and availability of feed to its members and livestock farmers.

Professional associations

Professional associations create platforms where professionals from various streams of the livestock industry gather annually to share their respective experiences. They also play a significant role in information dissemination by publishing proceedings, and research and policy recommendations, as outcomes of annual conferences. In Ethiopia, these organisations and their roles are as follows:

Ethiopian Society of Animal Production (ESAP)	An association of professionals working in animal production and related fields. It consists of researchers, policy makers, farmers and the private sector. It has over 500 registered members.
Ethiopian Veterinary Association (EVA)	The EVA was formed in 1976 by a group of professionals to improve animal health by advancing veterinary medicine professionals' contribution to improving animal production and productivity in Ethiopia.

APPENDIX 2: LIST OF PRIVATE DAIRY PROCESSORS

Below, we present an overview of all dairy processors active in Ethiopia. More information can be provided on request.

No.	Company name	Factory location (city)	Region	Processing capacity (litres per day)	Daily attained capacity	Products
1	Lame Dairy Plc (Shola)	Addis Ababa	Addis Ababa	160,000	90,000	Pasteurised milk, table butter, cheese, yoghurt, bottled products
2	MB Plc (Family Milk)	Addis Ababa	Addis Ababa	70,000	30,000	Pasteurised milk, UHT, yoghurt, cheese, table butter
3	Sebeta Agro Industry (Mama Dairy)	Sebeta	Oromia	70,000	35,000	Pasteurised milk, UHT, yoghurt, cheese, table butter
4	Bobo Agro Processing	Dukem	Oromia	60,000	30,000	Flavoured UHT milk
5	Elemtu Integrated Milk Industry S.Co.	Sululta	Oromia	60,000	20,000	Pasteurised milk, yoghurt, cheese, table butter
6	Holland Dairy	Bishoftu	Oromia	50,000	19,000	Pasteurised milk, plain and fruit-flavoured yoghurt, gouda cheese
7	Ruth & Hirut Milk Production & Milk Processing Plc	Chacha	Amhara	30,000	5,000	Pasteurised milk, yoghurt, cheese, UHT, table butter
8	Jojo Milk	Yirgalem	Sidama	30,000	13,000	Flavoured UHT milk
9	Nuredin Hassen Milk Processing*	Addis Ababa	Addis Ababa	30,000	–	Yoghurt, cheese
10	Etete Milk*	Sendafa	Oromia	24,000	–	Pasteurised milk, yoghurt, cheese, table butter
11	Selale Milk Processing Union*	Sululta	Oromia	24,000	–	Pasteurised milk, yoghurt, cheese
12	Seven D Food Factory Plc	Addis Ababa	Addis Ababa	24,000	2,000	Pasteurised milk, yoghurt
13	Almi Tekus (Almi Fresh Milk)*	Hawassa	Sidama	24,000	–	Pasteurised milk, yoghurt
14	Loni Agro Industry Plc	Sululta	Oromia	24,000	8,000	Pasteurised milk, yoghurt
15	Evergreen	Bahir Dar	Amhara	24,000	6,000	Pasteurised milk, yoghurt
16	Maza Dairy Farm and Processing (IDC)*	Muketuri	Oromia	24,000	–	Pasteurised milk, yoghurt
17	Misale Dairy*	Chacha	Amhara	24,000	–	Pasteurised milk, yoghurt
18	Happy Milk	Chacha	Amhara	24,000	5,000	Pasteurised milk, yoghurt, cheese, ice cream
19	Bekoji Wotete*	Bekoji	Oromia	24,000	–	Pasteurised milk, yoghurt, cheese, butter
20	Adama Wotete	Adama/Nazret	Oromia	24,000	5,000	Pasteurised milk, yoghurt
21	GAPE Plc**	Debre Markos	Amhara	24,000	–	Pasteurised milk, yoghurt
22	Enat Wotete	Addis Alem	Oromia	24,000	5,000	Pasteurised milk, yoghurt, cheese, ice cream
23	Helen Agro Industry (Selam Milk)	Chancho	Oromia	24,000	10,000	Pasteurised milk, yoghurt

No.	Company name	Factory location (city)	Region	Processing capacity (litres per day)	Daily attained capacity	Products
24	Lala Dairy	Teji	Oromia	24,000	8,000	Pasteurised milk, yoghurt, cheese, ice cream
25	Yohannse Ashenafi Milk Processing (Mulu Milk)**	Chacha	Amhara	24,000	–	Pasteurised milk, yoghurt
26	Zagaol	Sululta	Oromia	20,000	15,000	Pasteurised milk, yoghurt
27	Agar Agro Industry**	Sululta	Oromia	20,000	–	Pasteurised milk, yoghurt
28	Sosi Milk*	Butajera	SNNP	18,000	–	Pasteurised milk, yoghurt
29	Awash Melkasa Milk Processing (Fana Milk)	Awash Melkasa	Oromia	15,000	5,000	Pasteurised milk, yoghurt
30	Ada'a Dairy Cooperative	Bishoftu	Oromia	15,000	2,000	Pasteurised milk, butter
31	Selale Dairy Development Plc*	Muketuri	Oromia	12,000	–	Pasteurised milk, butter
32	Berta and Family Plc	Addis Ababa	Addis Ababa	12,000	6,000	Cheese
33	One-to-One International Business Plc (Lena Dairy)	Mojo	Oromia	12,000	4,000	Pasteurised milk, yoghurt
34	AJGG Dairy Products Plc*	Adigudom	Tigray	12,000	–	Pasteurised milk, butter, cream, yoghurt
35	Embet and Her Children Milk Processing	Bahir Dar	Amhara	10,000	5,000	Yoghurt, cheese
36	Yaya Milk	Ziway	Oromia	10,000	5,000	Yoghurt, butter, soft cheese (<i>ayib</i>)
37	Lasal Milk (Latica Cheese)	Meki	Oromia	8,000	5,000	Cheese
38	Jantekel Dairy Union (Fassil Milk)*	Gondar	Amhara	8,000	–	Pasteurised milk, butter, soft cheese (<i>ayib</i>)
39	Chuye Milk & Milk Products	Addis Ababa	Addis Ababa	8,000	2,000	Pasteurised milk, butter, soft cheese (<i>ayib</i>)
40	Life Agro Industry (Life Milk)	Sululta	Oromia	5,000	1,500	Pasteurised milk
41	Bokra Union (Bokra Milk)	Maychew	Tigray	5,000	500	Butter, yoghurt, cheese, milk
42	Mulu Dairy Processor	Mekelle	Tigray	2,000	500	Butter, yoghurt, cheese
43	Prime Milk	Bishoftu	Oromia	1,500	300	Cheese, butter
44	Fana Milk Processing Plc	Debre Birhan	Amhara	1,000	800	Cheese, butter
45	Azu Dairy	Bishoftu	Oromia	1,000	350	Cheese
Total				1,139,500	343,950	

* Company is not functional or has ceased production

** Company is setting-up and/or installing its equipment

APPENDIX 3: OVERVIEW OF FARMING SYSTEMS AND CHARACTERISTICS OF THE TOP 5 CLUSTERS: BASED ON FACTORS IN TABLE 1

Cluster	Farming system	Other characteristics
North Shewa	<ul style="list-style-type: none"> • around 80% mixed crop–livestock • around 20% urban and peri-urban • 0.5% specialised commercial 	<ul style="list-style-type: none"> • 53% of milk supplied through formal market • 19% of cows are improved breed • 1 liquid nitrogen plant • Good infrastructure • Conducive agro-ecology for dairy • High concentration of feed processing plants
Adama/Nazret – Arsi – Robé	<ul style="list-style-type: none"> • 80% mixed • 18% urban/peri-urban • 2% specialised commercial 	<ul style="list-style-type: none"> • 1 liquid nitrogen plant • 1 genetic improvement ranch • High milk consumption • Rapidly increasing population and urbanisation • Conducive agro-ecology
South and West Shewa – Shambu	<ul style="list-style-type: none"> • 95% mixed • 5% urban/peri-urban • 0% specialised commercial 	<ul style="list-style-type: none"> • 1 liquid nitrogen plant • 1 semen collection centre (bull dam farm) • 1 genetic improvement ranch • 19% of cows are improved breed • Poor infrastructure and market • Availability of high-quality and volume of agro-industrial by-products • Presence of 1 university and research institute working on dairy
Hawassa (Sidama) and Shashemene	<ul style="list-style-type: none"> • 93% mixed • 4% urban/peri-urban • 3% agro-pastoralist • 0% specialised commercial 	<ul style="list-style-type: none"> • 13% of cows are improved breed • 1 milk processing plant • 4 feed processing plants • 2 research centres working on forage • 1 nitrogen plant • 1 semen collection centre (bull dam farm) • 73 milk collection centres • High number of milking cows with high yield • Conducive agro-ecology
Bahir Dar – Debre Markos	<ul style="list-style-type: none"> • 85% mixed • 14.5% urban/peri-urban • 0.5% specialised commercial 	<ul style="list-style-type: none"> • 1 liquid nitrogen plant • 1 semen collection centre (bull dam farm) • 1 genetic improvement ranch • 2 feed processing plants • 2% of the milk goes to the formal market • 2 processing plants with 60,000 and 30,000 litres capacity, respectively

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