FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Juice Company in Adamma town, April 2022 Photo Credit: Aschalew Wondie

FEED THE FUTURE

BUSINESS DRIVERS FOR FOOD SAFETY

Cooperative Agreement No. 720BFS19CA00001

FOOD SAFETY SITUATIONAL ANALYSIS OF THE BEEF AND FRUITS AND VEGETABLES SUBSECTORS IN ETHIOPIA

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Contents

List of Acronyms

ATA	Ministry of Agriculture and the Agricultural Transformation Agency
BD4FS	Business Drivers for Food Safety
CSA	Central Statistics Agency
ETB	Ethiopian Birr
FES	Food Enterprise Solutions
FSSA	Food Safety Situational Analysis
GFBs	Growing Food Businesses
HH	Household
Kg	Kilogram
MoALR	Ministry of Agriculture and Livestock Resources
MoH	Ministry of Health
MoTI	Ministry of Trade and Industry
PLC	Private Limited Company
Qtl	Quintal (100Kg)
SNNP	Southern Nations, Nationalities and People
USAID	United States Agency for International Development

Executive Summary

The Feed the Future Business Drivers for Food Safety Project (BD4FS) is a USAID-funded, multi-country effort to improve food safety among local businesses. Food Enterprise Solutions (FES), who implements BD4FS, works alongside micro-, small-, and medium-sized food businesses to co-design and implement incentive-based strategies to accelerate the adoption of food safety practices. By engaging businesses and other stakeholders in the food system, BD4FS aims to promote a culture of food safety and increase awareness about food safety issues and best practices.

As part of the BD4FS project, FES conducted a Food Safety Situational Analysis (FSSA) in Ethiopia based on secondary data sources and primary research from 49 small- and medium-sized food businesses in the beef, fruits and vegetables, and poultry subsectors located in the Rift Valley corridor running from Addis Ababa to Hawassa. The objectives of the FSSA were to 1) map the food safety landscape within the Southern Cluster Zone of Influence of Ethiopia, with a focus on meat and fruits and vegetables subsectors; 2) identify the key constraints faced by Growing Food Businesses (GFBs)[1] to adopting better food safety practices; and 3) help in developing a strategy and provide a point of reference for engagement and co-design of food safety improvement activities with GFBs in Ethiopia.

Ethiopia's major meat slaughterhouses are in the study area, primarily in the towns of Dukem, Bishoftu, and Modjo. The FSSA identified the following food safety concerns for the beef sector in the study corridor:

- Absence of a robust food safety system for primary producers that supports on-farm risk-based meat hygiene and zoonoses control programs.
- Lack of temperature control during transport of meat products from slaughterhouses to local markets.
- Inadequate equipment and infrastructure, such as cooling facilities and access to clean water, limiting processors' ability to implement hygienic and sanitary practices.
- Inconsistent implementation and documentation of food safety standards (such as HACCP and ISO 22000) at local slaughterhouses.
- Lack of knowledge and training on hygiene, food safety, and monitoring by food handlers at all nodes of the meat supply chain.

In addition to beef, the area selected for the FSSA is a powerhouse for commercial fruits and vegetables production, with smallholders supplying produce to the regional towns as well as the Addis Ababa market. Although the sector is changing with the increasing sophistication and segmentation of the consumers in the urban centers, the study identified the following major food safety issues:

- Inadequate handling of fruits and vegetables during harvesting, transportation, and storage result in a high ratio of damaged and rotted produce.
- Lack of access to safe marketplaces, inadequate municipal drainage systems, and lack of secured places for temporary storage of waste result in poor sanitation and high risks of contamination with wastewater, mud, and dust.
- Limited knowledge about food safety and the feasibility and benefits of investing in it by processors and retailers, as well as consumers.
- Limited levels of sanitation among workers at processing, transportation, retail, wholesale, and storage facilities.

Though poultry was not a central focus of the study, the team had opportunity to interview two processors. These interviews supported the secondary research that shows that the lack of slaughtering, marketing, and cold storage services are major causes of market loss for small- and medium-sized poultry farms. Slaughtering of small-scale broilers is conducted in the backyard without legal licenses and in poor hygiene conditions. The study also noted that poultry products without labels went to some supermarkets, and business owners were not willing to give information about their poultry suppliers' names. In addition, major food safety issues in the value chain include lack of veterinary support to maintain the flock health, poor hygienic conditions in slaughterhouses, and lack of staff training about food safety.

1. Background

Food contaminants, whether biological, chemical, or physical, undermine the health and wellbeing of hundreds of millions of people across the globe each year. Inadequate food handling practices and poor infrastructure across supply chains increase health risks to consumers and compromise the nutritional value of perishable foods. In addition, they contribute directly to the root causes of pre-consumer loss and waste in the overall food system. The Feed the Future Business Drivers for Food Safety

[1] A Growing Food Businesses is a small- to medium-sized enterprise that seeks to expand based on a business model that incorporates food safety practices

Project (BD4FS) is a USAID-funded, multi-country effort that works alongside micro-, small-, and medium-sized food businesses to co-design and implement incentive-based strategies to accelerate the adoption of food safety practices of businesses in local food systems. This approach adds to the USAID knowledge base about strategies and methodologies for business-level assistance in food systems strengthening, developing best practices and lessons learned, and generating success stories from working with entrepreneurs in the effort to improve food safety. Stakeholder engagement will also raise national awareness around the issue of food safety and lay the foundation for the promotion of a "culture of food safety" among all actors in the national food system.

The U.S. Government's Feed the Future initiative has introduced various food systems, markets, and food security efforts, and is now beginning to focus on food safety. The BD4FS program is one of such initiatives being implemented in Ethiopia. The BD4FS Food Safety Situational Analysis (FSSA), focused on perishable nutrient-dense foods sectors, will be used as a basis for engagement and co-design of food safety improvement activities with selected GFBs.

Study area and subsectors

FES organized a team of experts with backgrounds in food safety, market systems, small enterprise development, and monitoring and evaluation for the Ethiopia FSSA. The team collected primary data across the USAID Feed the Future Southern Cluster Zone of Ethiopia, including parts of the Rift Valley from the outskirts of Addis Ababa to Hawassa towns to the South, to Adama town to the East (Figure 1). To conduct interviews, site visits, and field observations with local businesses, the team traveled to Bishoftu, Modjo, Adama, Meki, Ziwaye, Shashemene, Wondogenet, and Hawassa towns. The study team selected the beef and fruits and vegetables subsectors as the focus of this FSSA due to their importance in local diets and local markets in Ethiopia. The study area is also the primary source of production for these subsectors. Further, beef and fruits and vegetables are important contributors to healthy diets and nutrition under the Feed the Future initiative, and findings from these subsectors are instructive for other food subsectors. Information from two major poultry slaughterhouses is also included in this FSSA.

Figure 1. Map of FSSA study area. Source: Google Maps

2. Approach

FES' framework for the BD4FS FSSA guided the analysis. The framework outlined how the desk review, which had been conducted prior to this assignment, complemented by FSSA interviews, field observations, and stakeholder engagement, can inform an iterative process of Discovery and Design for the Deployment of food safety interventions. Together with Documentation and Dissemination, this forms what BD4FS calls the 'D-5 Approach' in project implementation. A summary of the D-5 Approach is provided in Annex 1.

Study objectives

The FSSA describes the food safety landscape of perishable food supply chains in select geographical areas and production to consumption corridors in Ethiopia. The analysis then proposes market-driven and cost-effective solutions for managing food safety risks faced by GFBs. The objectives of the FSSA were as follows:

- Map the food safety landscape within the Southern Cluster Zone of Influence of Ethiopia, with a focus on meat and fruits and vegetables subsectors.
- Identify key constraints faced by GFBs to adopting better food safety practices, as well as potential motivators and business opportunities relevant to the GFBs.
- Propose commercially viable and technically sound solutions (interventions) for the specific GFBs.

Data collection tools and sources

The study team utilized several complementary data collection tools, described below, from both primary and secondary sources. The study began with a review of project documents from BD4FS, TechnoServe-implemented USAID Alliance for Inclusive and Nutritious Food Processing (AINFP) activity, GAIN-implemented USAID EatSafe activity, and other relevant study reports and research outputs from external sources. The study team collected primary data through interviews that they conducted at GFB premises.

The study team interviewed GFB owners and managers operating throughout food supply chains serving rural and urban markets in the study area. Participating GFBs represented producers, post-farm gate aggregators, transporters, processors, and retailers and exporters.

The team collected primary data from 49 food enterprises and supporting businesses located in Oromia and Sidama regions. The interviewed businesses are engaged in wholesaling, retailing, processing, and storage. As presented in Table 1, the enterprises are in towns of the Southern Corridor: Bishoftu, Modjo, Adama, Meki, Ziway, Shashemene, Hawassa Wondogent and Koka.

Table 1. Number and location of GFBs interviewed

Region	Location (towns)	No. interviewed	Meat	Fruits and vegetables	Poultry	All three sectors
Oromia	Bishoftu	13	5	6	2	
	Dukem	1	1			
	Modjo	5	5			
	Adama	4	1	2	1	
	Meki	2		2		
	Ziway	5		5		
	Shashemene	4		4		
Sidama	Hawassa	11	1	6		4
	Wondogent	3		2		1
	Koka	1		1		
Total		**49**	**13**	**28**	**3**	**5**

Report organization

The Findings section of the report discusses the market channels for each selected subsector, covering (1) market corridors, (2) end market system, (3) food safety practices, and (4) food safety risks and their underlying causes. The Conclusions and Recommendations section presents key drivers for food safety in each subsector, and potential solutions for BD4FS consideration.

3. Findings

3.1 Beef subsector

Livestock is an integral part of agriculture in the USAID Southern Cluster Zone of Influence of Ethiopia where the FSSA study focuses (Addis Ababa-Hawassa corridor). Countrywide, livestock accounts for about 45 percent of the total value of agricultural production and supports the livelihoods of many Ethiopians. More than 14 million households – or 70 percent of the population – keep livestock, and this proportion is also true for the study corridor.[2] The typical herd is small and includes 3 cattle, 3 goats or sheep, and few chickens. Due to technical, economic, and institutional constraints, livestock productivity is generally low.

The majority major meat slaughterhouses of the country are in the study area, primarily in the Dukem, Bishoftu, and Modjo towns (FAO, 2018). The favorable environmental conditions and market access in the study area contribute to the higher number of livestock per household relative to the country average.

Meat Shop in Modjo town, April 2022. Photo Credit: Aschalew Wondie

According to FAO (see Table 2 below), beyond providing food and other goods and services to the population, the livestock sector contributes about 10% to Ethiopia's total export earnings, 69% of which are live animal exports. The total supply of animal source foods in the country, including net trade, translates into a per capita consumption of 9 kg meat, 56 liters of milk, and about 4 eggs per year. Products from the beef subsector – beef and cow milk – contribute almost 80% of all meat and milk consumption. Market transactions are largely in urban areas as subsistence dominates in rural areas. Out of the 14 million households keeping livestock, at least 12 million own at least one cattle, which supports livelihoods through the provision of meat, milk, cash, draft power, hauling services, insurance, and social capital. Table 2 below summarizes the different cattle production systems in Ethiopia.

Table 2. Cattle Production Systems in Ethiopia

Production system	Short Description
Mixed crop-livestock (dairy and beef)	Subsistence farming concentrated in the mid- and high-altitude agro-ecological zones where cereals and cash crops are the dominant farm activities. Cattle are primarily kept supplying draft power, however milk is an integral part of production. Old oxen that retire from ploughing are commonly sold or conditioned and finished.
Pastoral/Agropastoral (dairy and beef)	Rangeland based livestock production system aimed at exploitation of the natural or semi natural vegetation via domestic animals, in particular ruminants. The main product is milk, and the main function of livestock is subsistence, although social and cultural functions are also important. Excess young male cattle are sold to highlanders, where they are used as draught oxen, or to feedlot operators.

[2] Food and Agricultural Organization of the United Nations, The Future of Livestock in Ethiopia Opportunities and Challenges in the Face of Uncertainty (Rome: FAO, 2019)

Urban/Peri-urban (dairy and beef)	Urban/Peri-urban dairy is an expanding production system largely found in the highlands and concentrated in the Addis Ababa milk shed area as well as around the regional capital cities where there is an adequate market for fresh milk. Smallholder farmers and landless households around urban areas fatten a few animals at a time. Fattening is mostly done after the oxen in the mixed crop livestock system have retired from farm work and ploughing in order to replace them with younger animals.
Dairy commercial	Specialized commercial dairy systems involving higher levels of investment are concentrated in the central highland plateau. In terms of scale of operation, the farms are classified as large-, small- or medium-scale. Being licensed farms with operational business plans, they are market oriented specifically targeting consumers in urban areas. The animals do not provide draft power, but their manure is used as fertilizer.
Commercial feedlots	There are more than 300 feedlots operating in Ethiopia, predominantly in East Shewa (Oromia). Animals are entirely confined in a yard with watering and feeding facilities for a finishing duration of 3-6 months.

Source: FAO 2018

3.1.1 Market corridors for beef

The Ethiopian meat and live animal value chain consists of input suppliers, producers, collectors, fatteners/feedlots, middlemen, cooperatives, traders, live animal exporters, butchers, hotels, and individual consumers (diagramed in Figure 2). The country has considerable opportunities for production and sales of livestock and meat due to its strategic location, favorable climatic conditions, countrywide livestock ownership, and increasing domestic and global demand for meat products. However, the large number of parties involved in the supply chain with limited capacity to implement hygienic practices pose major challenges in the effort to assure food safety in the meat value chain (described in Figure 2).

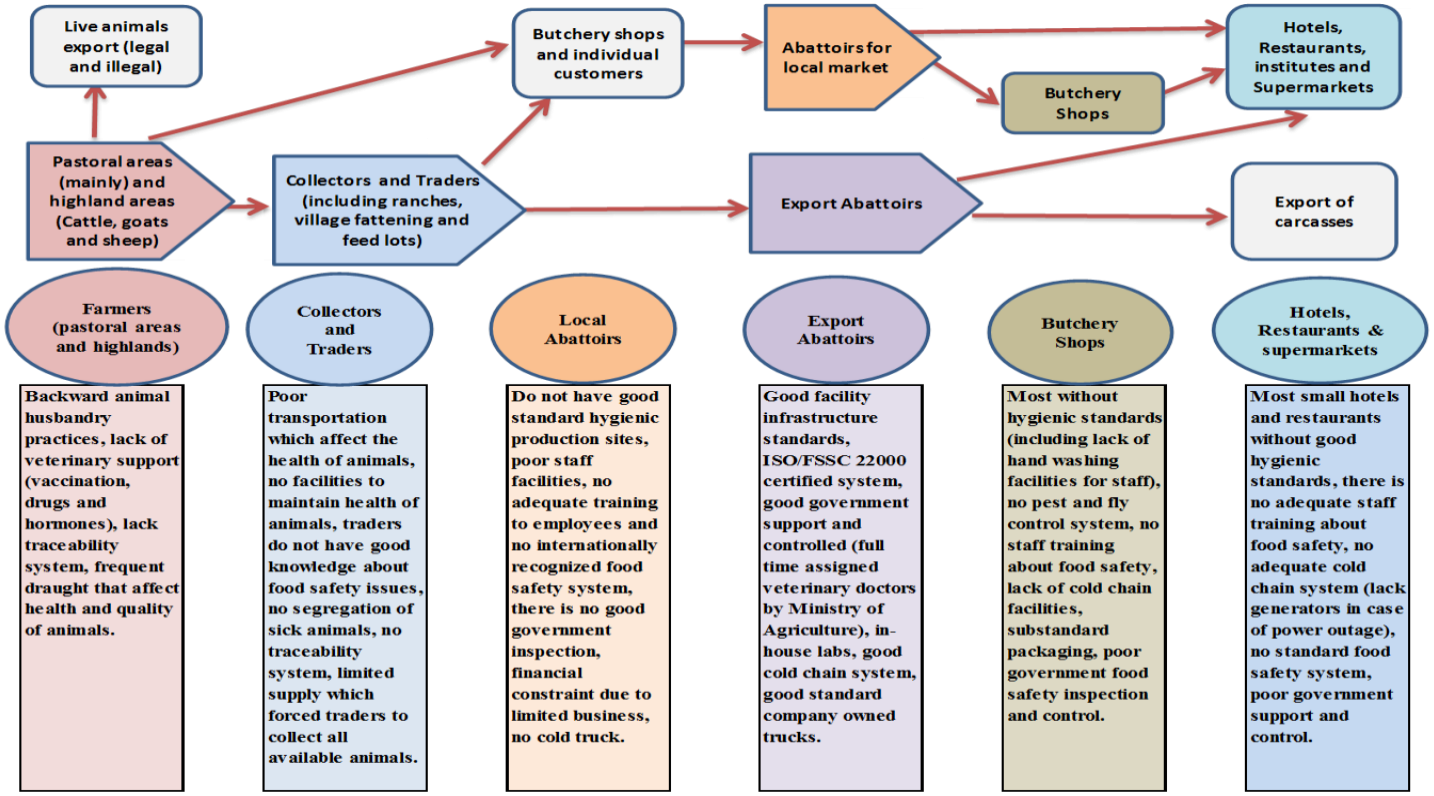


Figure 2: Marketing channels and major food safety issues
Source: Compiled based on the FSSA study findings. Data provided in Annex 2.

Core functions in meat trade

Producers: Ethiopia's meat exporters have largely relied on lowland pastoralists as their suppliers: lowland livestock provides approximately 90% of Ethiopia's meat and animal exports.[3] However, there is a growing share of highland animals entering the domestic and export supply chain. Producers are often located in rural areas where access to markets and infrastructure is insufficient. Large animal herds are considered signs of affluence and prestige. Thus, generally, smalls-scale producers in Ethiopia do not own cattle to sell as a main source of income. Rather, they would sell in emergency situations: when they face drought or need a large influx of cash on hand quickly. This stifles the meat processing industry by keeping products off the market and represents sub-optimal production management.

Collectors: These important market agents collect animals, usually from remote locations, and gather animals to the producer areas where water points are found. They are mostly independent operators who rely on their local knowledge and social relationships. They often have limited financial capital which constrains the geographic range of their operations and their ability to collect more animals. These constraints along with the poor infrastructure in the hinterlands escalate the price of animals.

Feedlots: Where cattle fattening occurs, feedlots include small-scale private operators and those that operate larger facilities aimed at animal exporting. Some operate according to generally accepted international requirements and rules of animal quarantine, while others, particularly the smaller ones do not meet the standards. Feedlots purchase livestock through their own purchasing agents acting as collectors, from traders, or occasionally from cooperatives. They generally purchase both young and older cattle, fattening young animals primarily for sale to export abattoirs and older animals (more than five years old) for the domestic market.

Traders: Markets in the study area feature animal traders spanning from large transactors, purchasing 100 animals per week on average, to small traders, purchasing 15 animals per week on average[4]. Large traders, who are relatively few, permanently operate in the value chain and are known for purchasing animals from a variety of sources to supply their key buyers (abattoirs and live animal exporters). The large traders will use their own capital and act as a source of funding for their collectors as they are the only outlet to markets that many smaller collectors have.

Brokers/Middlemen: An important feature of the livestock marketing system is the involvement of brokers/middlemen in many segments of the market chain. They match buyers and sellers and facilitate transactions. Business owners the FSSA team interviewed observed that the channel from producer to final market included one to three brokers/middlemen.

Butchers: Butchers retail meat to end consumers and are key stakeholders in the local value chain. These butchers buy fattened animals, mainly cattle, from secondary markets and slaughterhouses. The abattoirs check the health of the animals, slaughter, and distribute meat to the butcheries' retail outlets.

Live Animal Exporters: There are hundreds of legal live animal traders and exporters operating throughout Ethiopia. They are also some of the most highly paid actors along the value chain. Animals are supplied to exporters mostly by traders or small-scale fatteners, while sometimes animals are purchased directly from producers. As per the information collected during this FSSA, the increasing trend of both legal and illegal live animal export is one of the major challenges for the country's meat processing plants. The export of live animals and drought are the two major causes of animal supply shortage in the slaughterhouses.

Exporter Slaughterhouses: Export abattoirs get their animals supplied by traders or through their agents. The FSSA study team observed that the majority of abattoirs in this study have facilities for cattle, sheep, and goat slaughtering.

Local Market Abattoirs: On the other hand, local abattoirs provide slaughtering services to their customers and do not purchase animals. Upon arrival, animals undergo a physical examination and are rested for two to three days in a holding area where they receive feed and water. Before slaughtering, they are held for 12 to 24 hours with access to water but not feed. During

[3] "Poverty and Vulnerability in the Ethiopian Lowlands", The World Bank and DFID, 2019
[4] Ibid

their stay animals undergo ante mortem[5] or pre-slaughter examination. Animals that pass the examination are slaughtered. In most cases, abattoirs slaughter animals when they receive orders from their customers. The only processing that local abattoirs do is store carcasses for shipping. The order-based animal slaughtering makes the processing plants operate below their capacity and increases overhead costs. This leads the abattoirs involved in the local market to be uncompetitive and limits their financial capacity to improve their food safety standards.[6]

Processing and handling of meat products from farm to consumer

Ethiopia's export-oriented are modern and large facilities where slaughtering is carried out in fully mechanized lines. In export slaughterhouses, workers are assigned to specific workstations and the carcasses move on a conveyor system from station to station until the slaughter process is completed. In all export abattoir slaughter line operations, clean and unclean operations are physically separated and individually manned to avoid contamination of carcasses and edible by-products (e.g., organs and intestines). The unclean operations include stunning, bleeding, and skinning (cattle and small ruminants). The clean operations include evisceration, carcass splitting, and carcass dressing. In export abattoirs, the meat contamination risk is very low.

Adequate slaughter facilities are not available in most rural areas of Ethiopia. Local slaughtering is often carried out under a tree or in deteriorated and outdated slaughter units without any waste treatment facilities. This often results in health hazards through contamination of the meat during slaughter operations and of the surrounding land and water through the uncontrolled release of waste and effluents. In rural and some urban settings, slaughtering is carried out in basic small-scale facilities which supply fresh meat to the local areas, which means that the risk of contamination of meat is great. Major towns in the study area and some parts of Addis Ababa get meat from such slaughterhouses. There is a widespread habit of consuming raw meat, which can potentially cause foodborne illnesses. It is exacerbated by other factors such as overcrowding, poverty, inadequate sanitary conditions, and poor general hygiene at slaughterhouses and local restaurants. A 2014 study by the African Journal of Microbiology Research confirmed the prevalence of common foodborne pathogens including *Salmonella app*, *Escherichia coli*, *Listeria spp*, *Staphylococcus spp*, and *Campylobacter spp* in different parts of the country including the FSSA study areas.

This FSSA observed that more than 90% of the visited slaughterhouses supplying the local market do not follow guidelines of the FAO/WHO Codex Aliment Arius committee on meat hygiene and do not fulfill the "Code of Hygienic Practices for Fresh Meat" on the design, facilities, and equipment of slaughter establishments. The FSSA study also confirmed that Ethiopia's standard, ES 1115:2005 "Code of Hygienic Practices for Fresh Meat," is not implemented nor enforced in slaughterhouses supplying the local markets. Two locally engaged abattoirs maintained good hygienic standards voluntarily without proper follow up from the authorities.

Support functions in meat value chain

Good coordination of logistical efforts and multi-stakeholder support is crucial to assure food safety in the meat value chain of Ethiopia. Public and private sector support, such as financing, government health and sanitation services, etc., tend to be readily available to export-oriented enterprises. This is true because the government economic policy promotes the export of agricultural products, including meat, as means of getting the highly scarce foreign exchange. For example, during this study, BD4FS observed that on average six full-time veterinary doctors were assigned by the government to assist with food safety assurance in each export abattoir. Additionally, BD4FS identified at least one of the export slaughterhouses that received support from WB/IFC to implement ISO 22000 certified system. The government assigned full-time inspectors who assure food safety standards. In addition, the export abattoirs get benefits from export incentives.

On the other hand, this also means there is a lack of support for abattoirs engaged in local markets. For example, the two locally engaged slaughterhouses the team visited during the FSSA study (S&S Abattoir and Prime Abattoir) are working to maintain the required food safety standards, but they are not getting assistance from government offices.

The lack of support and not having consistent revenue (like export abattoirs) are the major challenges for local slaughterhouses to improve their food safety systems. Coordinated efforts of all stakeholders would likely improve meat food safety in the FSSA study area to assure provision of healthy meat products for the local society.

The most important public functions influencing meat safety are listed in Table 3 below.

[5] Ante-mortem inspection is any procedure or test conducted by a competent person on live animals for the purpose of judgment of safety and suitability and disposition.

[6] Addis Ababa Chamber of Commerce and Sectorial Association, Value Chain Study on Meat Processing Industry in Ethiopia (2015), 16-18.

Abattoir lairage and slaughter facility in Bishoftu town supplying local markets, April 2022 Photo Credit: Aschalew Wondie

Table 3: Major support functions of the food safety system in Ethiopia

Government Ministry	**Regulatory Authority/Agency/ Directorate**	**Key Responsibilities**
Ministry of Health (MoH)	Food, Medicine, and Healthcare Administration and Control Authority (FMHACA)	FMHACA is responsible to ensure: • Food safety and quality • Safety, efficacy, quality, and proper use of medicines • Competence and ethics of health professionals • The standards of food institutions • The hygiene and environmental health protection suitability for individuals and communities
Ministry of Trade and Industry (MoTI)	Import and Export Goods Quality Control Directorate	• Control quality of export and import goods • Regulatory oversight on the products as per the Ethiopian mandatory standards

Government Ministry	Regulatory Authority/Agency/ Directorate	Key Responsibilities
Ministry of Agriculture and Livestock Resources (MoALR)	Plant Health Regulatory Directorate	• Inspection of consignments of plants/other regulated articles including import and export of plants and plant products and provide import and export permits • Inspection of required phytosanitary documents and issuance of phytosanitary certificates • Disinfestations/disinfections of consignments to meet phytosanitary requirements • Supervise quarantine treatments including fumigation and weed cleaning processes • Advise and supervise disposal of plant and plant products • Crop surveillance for pests- mainly cereals, fruits and vegetables • Inspection, approval, and registration of pesticides • Food safety risk assessment in different crop products including pests and pesticide application
Ministry of Agriculture and Livestock Resources (MoALR)	Animal Health Regulatory Directorate	• Establish a system that ensures access to quality veterinary services to improve the prevention and timely control of animal diseases • Quarantine on import and export of livestock, fish, and their byproducts; prevent communicable livestock diseases and the outbreak of migratory parasites • Ensure the proper administration and quality control of veterinary drugs and feeds as well as veterinary services
Ministry of Agriculture and Livestock Resources (MoALR)	Veterinary Drug and Feed Administration and Control Authority (VDFACA)	• Responsible for registration and certification of feeds and veterinary drugs that are produced, imported, and in use in the country • Setting standards for quality control activities • Marketing surveillance, banning, revoking and suspension of registrations, packaging and labeling, trade and licensing of veterinary drugs and animal feed
Ministry of Innovation and Technology	Ethiopian Standards Agency (ESA)	• Development of national standards
Ministry of Innovation and Technology	Ethiopian Conformity Assessment Enterprise (ECAE)	• Provides certification, inspection, and laboratory testing services
Ministry of Innovation and Technology	Ethiopian National Accreditation Office (ENAO)	• Provide accreditation services, by formal third-party recognition, the competence of Conformity Assessment Bodies (CABs) to perform specific activities, such as tests, calibrations, certifications or inspections; the office uses its own staff to provide accreditation services

Government Ministry	Regulatory Authority/Agency/ Directorate	Key Responsibilities
Ministry of Innovation and Technology	National Metrology Institute (NMI)	• Responsible for the maintenance of Ethiopian National Measurement Standards and Certified Reference Materials (CRM) and also provides calibration, training, and consultancy services in the areas of metrology and scientific equipment
Ministry of Innovation and Technology	National Radiation Prevention Authority (NRPA)	• Monitor and control of radiation levels in food, water, etc.
Environment, Forest, and Climate Change Commission	Biosafety Regulatory Directorate	• Environmental contamination prevention and control

Source: United States Department of Agriculture Foreign Agriculture services 2018, 5-7.

Abattoir in Bishoftu town with modern facility supplying the local markets, April 2022. Photo Credit: Aschalew Wondie

Transport mechanisms of meat products

The Ethiopian Standard ES 1115:2005 "Code of hygienic practice for fresh meat" on *good transport standards of animals* (cattle, sheep, and goat) requires that:

- Soiling and cross-contamination with fecal material is minimized.
- New hazards are not introduced during transport.
- Animal identification as to the place of origin is maintained; and
- Consideration is given to avoid undue stress that may adversely impact the safety of meat (such as stress-induced shedding of pathogens).

The Ethiopian Standard ES 1115:2005 "Code of hygienic practice for fresh meat" about *vehicles design and maintenance* states that:

- Animals can be loaded, unloaded, and transported easily and with minimal risk of injury.
- Animals of different species, and animals of the same species likely to cause injury to one another, are physically separated during transport.
- Use of floor gratings, crates, or similar devices limits soiling and cross-contamination with fecal material.
- Where the vehicle has more than one deck, animals are protected from cross-contamination as appropriate.
- Ventilation is adequate; and cleaning and sanitizing is readily achieved; and
- Transport vehicles, and crates where used should be cleaned and if necessary sanitized as soon as practicable after animals have been unloaded at the establishment.

Abattoirs export their products to Middle East countries using Ethiopian Airlines, and chilled carcasses are transported to the airport by refrigerated trucks for final shipment. The export abattoirs have their own good standard refrigerated trucks with different load capacities. On the other hand, local abattoirs deliver meat products to nearby towns using vans without temperature controls which indicates lack of standard enforcement by the government offices. The FSSA found that local abattoir management is aware of the government meat transport requirements, but they reported that financial constraints limit their ability to comply with the compulsory standards.

Cold trucks of Modjo and Organic export abattoirs in Modjo town, April 2022 Photo Credit: Aschalew Wondie

Standards, rules, and regulations related to meat

Ethiopia follows a shared responsibility approach to monitor and enforce food safety laws and regulations. Currently, the Ethiopian Standards Agency (ESA) is the sole body engaged in establishing standards, while the Ethiopian Food, Medicine and Health Care Administration and Control Authority (FMHACA), the Ministry of Agriculture (MoA), and the Ministry of Trade and Industry (MoTI) are the other main agencies responsible for the execution of food safety laws and regulations in the country. Below are the major meat food safety related regulations of the country:

- Food, medicine and healthcare administration and control council of minister's regulation No 299/2013
- Food and Medicine Administration Proclamation No.1112/2019
- The Ethiopian Meat and Dairy Technology Institute Establishment Council of Ministers Regulation No. 143/2008.
- Veterinary Drug and Feed Administration and Control Proclamation No. 728/2011

- Ethiopian Organic Agriculture System Proclamation No. 488/2006
- Ethiopian Agricultural Research Organization Establishment (Amendment) Proclamation 382/2004
- Animal Diseases Prevention and Control Proclamation no. 267/12002
- Seed Proclamation No. 206/2000 Repeated by proclamation 782/2013
- Ethiopian Agricultural Research Organization Proclamation 79/1997
- Public Health Proclamation No. 200/2000
- The Ethiopian Health and Nutrition Research Institute Establishment Council of Ministers Regulations no. 4/1996
- Commercial Registration and Business Licensing /Amendment/ Proclamation no. 731/2012
- Trade Practice and Consumers' Protection Proclamation 685/2010
- Proclamation to amend the commercial registration and business licensing proclamation no. 376/2003
- Quality and Standards Authority of Ethiopia Establishment Proclamation No. 102/1998
- Labor Proclamation 377/2003 Ministry of Workers and Social Affairs
- Public safety and health proclamation 200/2000 Ministry of Health
- Environmental Pollution Control Proclamation 300/2002 Ministry of Environment

While the development and adoption of international food safety standards could benefit GFBs in Ethiopia, the FSSA found that food safety regulation efforts face many challenges including poor coordination among stakeholders, lack of clearly defined demarcated responsibilities, and absence of resources to enforce mandatory requirements.

3.1.2 End market systems of meat

Meat and other slaughter by-products have been contributing to the foreign export earnings and GDP growth of Ethiopia. Even though the country has a significant livestock industry, the share of meat and other slaughter by-products exported from the overall export commodities is roughly 2% and the per capita meat consumption is below Sub-Sahara African countries average.[7] Despite Ethiopia's strategic location to market and sound climatic condition, the country is not benefiting from the widespread livestock production due, in part, to the poor food safety practices by meat processors and supporting industries. The FSSA found that there is limited knowledge among both producers and consumers about food safety and a lack of compliance with international food safety standards such as ISO and HACCP. Other constraints on the growth of the livestock industry include limited promotion and marketing, limited intra-Africa trade integration, poor linkage among stakeholders, few market outlets, and other interlinked problems.

The mixed crop livestock and pastoral/agro-pastoral production systems are where the households keep the largest number of cattle in the country. Most households do not slaughter the animal themselves and instead sell live animals to traders or commercial feedlots. In general, the country's beef consumption from their own household production is low. The wealthiest consume substantially more beef than the poor, with the richest quintile consuming 412 grams per capita per week compared to the poorest quintile consuming 186 grams per capita per week (Table 4).

Table 4: Beef consumption in Ethiopia by income group

Income group	Consumption per capita per week (g)	Share of own production in consumption
Poorest quintile	186	0%
Moderately poor quintile	149	0%
Middle quintile	191	3%
Moderately rich quintile	221	3%
Richest quintile	412	0%

Source: FAO 2018

[7]Tekeba et al, Meat Production, Consumption and Marketing Tradeoffs and Potentials in Ethiopia and Its Effect on GDP Growth: A Review (Addis Ababa: 2018).

3.1.3 Food safety practices in meat handling and its major constraints

Farm and animal health

As per standard HACCP procedures, primary producers and the competent authorities need to work together to implement risk-based meat hygiene programs. It is particularly important that primary producers document the general health status of slaughter animals and implement practices that maintain or improve that status, such as zoonoses control programs. Ethiopia lacks a robust system to ensure this. Below are major issues identified in this FSSA that need improvement at the farm level:

a) There is no risk-based meat hygiene program at the primary producers' level, such as records of relevant information on the health status of animals as it relates to the production of meat that is safe and suitable for human consumption.
b) There is not an adequate system in place to prevent the introduction of new zoonotic agents.
c) Producers lack access to information about risks of sick animals and how that can compromise the production of meat that is safe and suitable for human consumption, e.g., the presence of specific disease conditions or recent administration of veterinary drugs.
d) Numerous on-farm and transport conditions cause animal stress and physical injury leading to an adverse impact on meat safety and suitability, quality, and subsequent rejection by buyers. Some of these injuries include:
    - Bruising – This is the most common and causes the most serious and significant production loss as bruised, off-color meat must be discarded.
    - Trampling – This occurs when animals fall due to slippery floors or overcrowding.
    - Suffocation – Sheep or goats may also suffocate as a result of overcrowded transport mechanisms and even die if not helped (they can also die from dehydration and being exhausted).
e) There is no animal identification system at the primary production level (no traceability to where the meat can be traced back from the abattoir or establishment to the place of production of the animals). This increases the risks of disease transmission and spread along the transport route.

Meat quality check and grading

The FSSA study found that among interviewed local and export abattoirs, there is a good system to assure that only healthy, clean, and appropriately identified animals are presented for slaughter. All animals (cattle, goats, and sheep) are screened upon arrival at the abattoirs. In case of abnormalities in behavior or appearance, an individual animal or a consignment of animals will be segregated. Further, the FSSA found that the abattoirs interviewed, including local slaughterhouses, have competent persons undertaking ante-mortem inspection (veterinary doctors). In export abattoirs, in addition to company-recruited experts, the government assigns full-time veterinary doctors to assure and control food safety standards of the facilities.

The FSSA observed that export slaughterhouses have good food safety standards. On the other hand, most locally engaged abattoirs need significant improvement in the hygiene standards at their facilities. As per the compulsory Ethiopian Standard ES 1115:2005 "Code of hygienic practice for fresh meat" and HACCP requirements, the meat processing facilities should assure food safety by implementing the following guidelines:

a) Production of meat that is safe and suitable for human consumption requires that detailed attention be paid to the design, implementation, monitoring, and review of process control.
b) The establishment operator has the primary responsibility for implementing systems for process control. Where such systems are applied, the competent authority should verify that they achieve all meat hygiene requirements.
c) Process control should limit microbiological contamination to the lowest level practicable, according to a risk-based approach.
d) HACCP should be applied wherever practicable as the system of choice for process control and should be supported by prerequisite GHP (Good Hygienic Practices) that includes sanitation standard operating procedures (SSOPs).
e) Process control should reflect an integrated strategy for control of hazards throughout the food chain, with information available from primary production and pre-slaughter being taken into account wherever possible and practicable.
f) All bodies of animals should be subjected to post-mortem inspection that is science- and risk-based and is tailored to the hazards and/or defects that are reasonably likely to be present in the bodies of animals presented for inspection.
g) The competent authority should determine the procedures and tests to be used in post-mortem inspection, how that inspection is to be implemented, and the necessary training, knowledge, skills, and ability required of personnel involved (including the role of veterinarians and personnel employed by the establishment operator).
h) Post-mortem inspection should take into account all relevant information from primary production, ante-mortem inspection, and from official or officially recognized hazard control programs.

i) Post-mortem judgments should be based on food-borne risks to human health and other human health risks, e.g., from occupational exposure or handling of meat in the home, food-borne risks to animal health as specified in relevant national legislation, and suitability characteristics.
j) Performance objectives or performance criteria for the outcome of process control and postmortem inspection activities should be established by the competent authority wherever practicable and should be subject to verification by the competent authority.
k) Where appropriate, microbiological testing for verification purposes should be included in meat preparation and manufactured meat HACCP plans. Such testing should be relevant to the type of product and the likely risks to consumers, including vulnerable subpopulations.
l) Competent bodies or competent persons may be engaged by the establishment operator to undertake prescribed process control activities, including ante- and post-mortem inspection, as approved by the competent authority.
m) Handling of ready-to-eat (RTE) products up until the point of sale to the consumer should ensure that there is no contact with non-ready-to-eat (RTE) products, and any other exposure to potential sources of microbiological contamination is minimized to the greatest extent practicable.
n) Voluntary or officially recognized quality assurance (QA) systems may be implemented by the establishment operator where they enhance meat hygiene activities, and they may be taken into account in the verification of regulatory requirements by the competent authority.[8]

Meat transportation and handling standards

The transport of slaughtered animals should be carried out in a manner that does not have an adverse impact on the safety and suitability of meat. Of critical importance is transporting meat at temperatures that are cool enough to inhibit the growth of pathogens and microorganisms and achieve safety and suitability objectives. Equipment for continuous monitoring and recording of temperatures in transport vehicles and bulk containers are technologies that can be utilized to ensure temperature control.

In Ethiopia, export slaughterhouses use good standard temperature-controlled trucks to transport chilled and frozen meat. On the other hand, the FSSA found that abattoirs supplying the local markets in the study area use trucks without temperature control to transport fresh meat products to the local markets.

In-house laboratory of Organic Export Abattoir in Modjo town, April 2022 Photo Credit: Aschalew Wondie

[8] Food and Agricultural Organization of the United Nations, *Code of Hygienic Practice for Meat CAC/RCP 58-2005*.


Elfora Export Abattoir laboratory in Bishoftu town, April 2022 Photo Credit: Aschalew Wondie

3.1.4 Food safety risks and their underlying causes

Meat and meat products present a unique set of challenges to producers and regulatory officials. The nutrient profile and composition of meat creates an environment that allows spoilage microorganisms and foodborne disease pathogens to thrive. This means that meat producers need to be vigilant about preventing contamination before it reaches the consumer. In addition to the usual risks associated with food processing, producers need to be aware of unique challenges that arise within the meat ecosystem.

Microbial contamination can arise at all stages in processing. Stages unique to meat production that add steps for Hazard Analysis Critical Control Point (HACCP) assessment include animal husbandry through to slaughter and processing. Potential sources of microbial contamination include:

Husbandry: Sources of contamination include animal disease and environmental hazards such as waterborne pathogens, feces, and in-feed hazards.

Slaughter: During slaughter, processors must be vigilant about preventing crossover contamination from gut contents, disease foci such as abscesses and wounds, and external sources such as hoof and hide.

Processing and carcass-handling issues: It is important that meat inspection quickly identifies and withdraws diseased individuals and deals with contaminated carcasses swiftly. Processors also must ensure proper chilling post-slaughter to minimize carcass changes that permit microbial colonization.

Processing-equipment contamination and worker hygiene: As with all food processing, producers should ensure worker and environmental hygiene.

The most important challenge is identifying and controlling the physical, chemical, and biological hazards at all stages of production, processing, and distribution in the supply chain. Included in the table below are the major food safety risks in the production of meat (Table 5).

Table 5: Meat food safety issues, their causes, and mitigation practices

No	Major issues	Food Safety Risks	Causes of the risks	Food safety practices to mitigate risk	Constraints to adopt practices
1	Hygiene of slaughter animals	• Health status of the animal from the farmers is not known. • No information communication about health of animals and meat between the abattoirs and primary producer (farmer) to have improvement. • No legal authority with program to control zoonotic agents, chemical hazards and contaminants of trading animals. • No animal identification and traceability system	• No system and infrastructure to check health of animas at their production site. • Lack of knowledge of farmers and traders. • Many traders and brokers between farmers and abattoirs. • Limited capacity of government offices.	• Develop systems and infrastructure to check health of animals at their production site. • Develop direct links between producers (farmers) and abattoirs. • Develop and strengthen farmers unions and support direct supply to abattoirs. • Provide capacity building support to concerned government offices. • Provide training to farmers and traders.	• Powerful and influential brokers and traders. • Building direct links between farmers and abattoirs require committed project ownership and financial resources.
2	Transport of animals	• Animals forced to walk long distances in bad weather conditions. • Soiling and cross-contamination with fecal material not minimized. • High possibility of undue stress that may adversely impact on the safety of meat (such as stress-induced shedding of pathogens). • No properly designed vehicles to minimize risk of injury during loading, unloading and transport.	• Lack of availability of appropriate transport facilities. • Lack of knowledge of farmers and traders. • Financial constraints.	• Improve transport conditions using appropriate trucks and improve road condition in livestock production areas. • Support farmers, traders, fattening facilities and abattoirs to improve their livestock transport system (use appropriate trucks). • Provide training to farmers and traders about the importance of good transport.	• Financial investment to purchase good standard trucks and improve the road conditions. • Involvement of many traders to arrange training programs.
3	Presentation of animals for slaughter	• High risk of no proper screening of animals upon arrival at the abattoir (traders are not willing to sell selected number of animals, and slaughterhouses are forced to buy the whole consignment supplied by a trader).	• Animal supply scarcity and increases in price. • Drought in major animal supply areas (pastoralist areas).	• Provide technical support to improve the livestock sector productivity. • Veterinary support to farmers to improve animals' health.	• Appropriate budget to implement the improvement measures. • Need for good stakeholder integration and project owner.

No	Major issues	Food Safety Risks	Causes of the risks	Food safety practices to mitigate risk	Constraints to adopt practices
			• No system of checking animals' health from the sources.	• Assure authorities' control at the source and during trading processes. Cost sharing support for abattoirs for rejected animals.	
4	Condition of lairage	• Due to lack of enough space, supply challenge of feed and financial constraints, there is no holding of animals presented for slaughter (holding has an important effect on many aspects of slaughter, dressing and the production of meat that is safe and suitable for human consumption). • The lairage of some facilities are not in good standard (soiling and cross-contamination of animals with food-borne pathogens are not minimized, overcrowded and animals not protected from weather). • No special facilities handle condemned animals.	• Space constraint of abattoir houses. • Abattoirs working for local markets have limited business and can't invest in lairage (including high feed and related animal keeping costs).	• Promote the importance of lairage. • Work with government offices to establish state-owned lairage in high production areas. • Support abattoirs by providing loans and the required land.	• Financial requirements to establish and run lairage. • Support from the concerned government offices.
5	Building and equipment	• Some slaughter facilities are old, no proper segregation of clean and dirty area, difficult to clean and small. • Some abattoir equipment and containers are not designed to minimize meat contamination (very old, rusty and difficult to clean). • No proper identification of equipment and implements that are used for inedible or condemned parts of animals.	• Lack of good knowledge about food safety. • Financial constraints.	• Improving the abattoirs production facilities and equipment as per the required standards. • Provide loan facilities. • Provide food safety training to improve commitment of owners and the top management.	• Poor operation and financial performance of abattoirs engaged in local markets. • With current business conditions, it is difficult for local abattoirs to invest in improved production facilities.

No	Major issues	Food Safety Risks	Causes of the risks	Food safety practices to mitigate risk	Constraints to adopt practices
6	Water supply	• Most of the slaughterhouses are using their own borehole water sources and there is need to strengthen laboratory quality monitoring. • Water storage, temperature control and disposal of wastewater needs improvement. • Some abattoirs do not have good water supply lines to keep hygienic standards.	• Lack of financial capacity to perform planned internal laboratory analysis and external water quality checks as required. • No good focus on water quality by some management. • Financial limitation.	• Improve the in-house laboratories water quality analysis capacity. • Provide training about the importance of water quality.	• Financial investment to upgrade laboratories and provide laboratory supplies.
7	Temperature control	• In some abattoirs there is no suitable temperature, humidity and other environmental controls whereas meat is particularly vulnerable to survival and growth of pathogens and spoilage micro-organisms. • No adequate facilities for Cooling, chilling and/or freezing of meat according to accepted specifications	• Financial constraints.	• Having the required cold systems to improve temperature control system of abattoirs. • Provide training about the importance of temperature control in the whole value chain. • Enforce legal requirements to assure compliance on temperature control and hygiene standards.	• Financial constraints and FOREX shortage. • Wide range of stakeholders (butcheries, restaurants, etc.) needs training. • Commitment and resources to enforce regulations.
8	Staff facilities and personal hygiene	• Some abattoirs do not have good facilities for personal hygiene (changing rooms, showers and toilets, separate areas for eating; and protective clothing that can be effectively cleaned and minimizes accumulation of contaminant). • In some abattoir houses, personal hygiene standards need improvement including health check of employees.	• Lack of good emphasis for food safety. • Lack of awareness and training.	• Provide the required staff facilities. • Train managers and employees about personal hygiene. • Enforcing legal requirements.	• Lack of owners' and managers' commitment due to poor business performance. • Availability of loans from banks.

No	Major issues	Food Safety Risks	Causes of the risks	Food safety practices to mitigate risk	Constraints to adopt practices
9	Process control system	• Some abattoirs process control need improvement since many aspects of slaughter and dressing procedures have the potential to result in significant contamination of meat, e.g., hide/feather removal, evisceration, carcass washing, post-mortem inspection, trimming, and further handling in the cold chain. • In some abattoirs supplying local markets, there is no documented process control system that describes the meat hygiene activities as per HACCP/ ISO 22000 requirements. • In some abattoirs, sanitation standard operating procedures need improvement (bad smell around the slaughterhouses, no good waste management system, birds in and around the abattoirs observed during the visit).	• No training opportunity for staff. • Lack of technical support to implement HACCP systems. • No good commitment from the top management and owners to improve the food safety system. • Financial limitations.	• Provide food safety training to employees. • Assure HACCP/ISO 22000 system implementation in abattoirs working in local markets. • Discussions with owners and top management to improve their commitment on food safety (having workshops).	• Technical support to implement HACCP/ISO 22000 systems. Financial limitations.
10	Meat transport	• In some abattoirs, meat transported without proper temperature control and without adequate protection from exogenous contamination.	• Financial constraints.	• Assuring transport of meat in temperature-controlled trucks for local markets. • Assure good control by the authorities.	• Financial limitations to purchase or rent temperature-controlled trucks.
11	Staff training	• Adequate training of competent personnel is of fundamental importance in the production of meat that is safe and suitable for human consumption. All abattoirs interviewed in the study emphasized the need for improving their training program on food safety.	• No good focus by the top management on food safety training. • Financial limitations.	• Assure good staff training for staff working in the abattoirs and other stakeholders involved in the supply chain.	• Financial constraints to arrange food safety training. • Lack of commitment from some managers to assure staff training.

Source: Compiled based on the FSSA study findings. Data provided in Annex 2.

Luna Export Abattoir in Modjo town high-tech facility with good food safety standards, April 2022 Photo Credit: Aschalew Wondie

3.2 Fruits and vegetables subsector

There is a wide range of fruits and vegetables produced throughout Ethiopia. The most common types of fruits grown in Ethiopia include bananas, avocados, tomatoes, and mangos; and the most common vegetables are cabbage, green pepper, red onion, and potato (Table 6). According to the recent publication of the Central Statistics Agency (CSA, 2021)[9] of Ethiopia, a total of 15,711,088 quintals of fruits and 66,544,404 quintals of vegetables (including root crops)[10] were produced during the fiscal year of 2020/21. This production is made up by smallholder producers as well as semi-commercial and commercial farms. The same report indicated that smallholder farmers account for 90% and 98% of the total fruits and vegetables production in the same year, respectively. The FSSA study area is one of the most important production areas of fruits and vegetables in Ethiopia. In addition to smallholders supplying the regional towns and the Addis Ababa market, most commercial fruit and vegetable farms are located in this area due to favorable climatic and soil conditions. Tomato, onion, potato, strawberry, and other similar products are mainly sourced from the FSSA study area to the Addis Ababa market.

Table 6: Volume of production in Qtl (100kg) of Fruits and vegetables by type of producer, 2020/21

Type of crops	Commercial farms		Smallholders		Total, Qtl
	Qtl[11]	Percent[12]	Qtl	Percent	
Fruit crops	1,518,679	10%	14,192,409	90%	15,711,088
Vegetables and root crops	1,259,718	2%	65,284,686	98%	66,544,404
Total	2,778,396	3%	79,477,095	97%	82,255,492

Source: Own computation based on CSA Data of May 2021

Smallholder producers in Ethiopia grow a variety of staple crops for household consumption, selling only what they do not consume. These include vegetables and root crops. Indeed, the majority (73%) of the vegetables produced by smallholders are consumed at home (Table 7). Only 23% of the total production of vegetables is sold while the balance is used for household consumption, for seed, and as a form of in-kind payment. Among vegetables and root crops, relatively large portions of tomato (38%) and red onion (43%) were taken to market. Tomatoes are easily perishable and could benefit from intervention in food safety practices for collection, storage, processing, and transporting of such products.

On the other hand, fruits in Ethiopia are generally grown as cash crops, which smallholders grow mainly for sale. About 49% of the total fruits produced by smallholders during the fiscal year of 2020/21 were sold (Table 7). Hence, smallholders in Ethiopia are important players in the production, marketing, and consumption of fruits and vegetables.

Table 7: Fruits and vegetable production and utilization by smallholders

Type of crop	Total production in qtl.	Utilization purpose		
		HH consumption	Sales	Other use
Fruits				
Banana	8,983,548	44%	51%	5%
Avocados	2,453,356	46%	49%	5%
Mangos	1,513,312	52%	42%	5%
Papayas	720,078	63%	33%	4%
Oranges	399,157	48%	47%	5%
Lemons	61,815	33%	62%	4%
Guavas	35,553	63%	24%	13%
Pineapples	25,589	49%	47%	4%
Total Fruits	**14,192,408**	**46.3%**	**48.7%**	**5%**

[9] CSA (Federal Democratic Republic Of Ethiopia, Central Statistical Agency). Agricultural Sample Survey 2020/21 [2013 E.C.], Volume VII. Crop and Livestock Utilization, 2021

[10] Note that the classification of crops into fruits, vegetables, and root crops is based on the Central Statistics Agency of Ethiopia.

[11] Qtl (quintal) is equivalent to 100 kilogram

[12] Percent against total production made by both commercial farms and smallholders

Vegetables				
Ethiopian cabbage	4,330,245	79%	18%	3%
Red peppers	2,959,805	63%	33%	4%
Green peppers	740,077	74%	23%	3%
Head cabbage	561,042	68%	29%	3%
Tomatoes	419,483	59%	38%	3%
Swiss chard	51,681	69%	21%	10%
Lettuce	5,538	67%	29%	4%
Subtotal: Veg	**9,067,871**	**73%**	**23%**	**3%**
Root Crops				
Taro/'Godere'	23,279,723	74%	14%	12%
Sweet potatoes	15,988,385	73%	19%	8%
Potatoes	11,418,717	63%	24%	13%
Onion	3,460,481	51%	43%	6%
Garlic	1,149,447	58%	28%	14%
Yam	457,301	67%	23%	10%
Beetroot	266,275	71%	27%	2%
Carrot	196,487	56%	42%	3%
Subtotal: Root crops	**56,216,815**	**68%**	**21%**	**10%**
Total veg and root crops	**65,284,686**			

Source: Computed based on CSA Data (May 2021).

Methods of production of fruits and vegetables: The method of production, whether irrigated or rain-fed, impacts the quality of vegetables. Smallholder farmers have experience growing vegetables using both methods, and according to CSA data, the majority (68%) of smallholder total production is made through a rain-fed farming system. This indicates that most vegetable production is seasonal and that investment in storage facilities and processing of such products will be important.

Production location of fruits and vegetables: Oromia, SNNP, and Sidama regions, which all are found or mainly connected to the FSSA target Southern Corridor, are the main sources of fruits and vegetables in Ethiopia. The three regions jointly account for 88% of the total production of fruits and vegetables in the country, with the Oromia region alone contributing 41% of the total vegetables produced during the fiscal year of 2021 (Table 8). Sidama and SNNP regions are popular sources of major fruits such as banana, mango, and avocado. The FSSA's primary informants also confirmed that most fruits and vegetables produced in Ethiopia come from these regions.

Table 8: Main producing regions of fruits, vegetables, and root crops, 2021

Type of crops	Oromia		SNNP		Sidama		Sum of 3 Regions		Country total
	Qtl	%[15]	Qtl	%	Qtl	%	Qtl	%	
Fruits	3,843,643	27%	8,255,374	58%	1,457,815	10%	13,556,831	96%	14,192,408
Veg.	3,738,852	41%	3,068,317	34%	286,175	3%	7,093,344	78%	9,067,871
Root crops	17,518,650	31%	30,819,111	55%	973,206	2%	49,310,966	88%	56,216,815
Total	**25,101,145**	**32%**	**42,142,802**	**53%**	**2,717,196**	**3%**	**69,961,142**	**88%**	**79,477,094**

Source: Own computation based on CSA data

The businesses the FSSA team interviewed reported that with the exception of apples, most fruits are locally sourced. Whenever there is a shortage in local production, red onions are imported from Sudan and shipped to Shashemene and other parts of the country. In the process, red onions travel thousands of kilometers to reach consumers. The study team was able to see the

imported red onion being distributed in different markets in Shashemene. As also indicated in Table 9, bananas mainly come from the Arba Minch and Mizan areas of the SNNP region.

Table 9: Common production areas of different fruits and vegetables

Type of product	Common production areas	Remark
Banana	Arba Minch and Mizan- Tepi (from SNNP region) and Jimma region (from Oromia region) are the most popular sources of banana to the national market as well as to the study area.	The banana from Arba Minch is considered quality produce with its large bulb size and better shelf life.
Avocado	Avocado is sourced from various areas including Wondo Genet, Yirgalem (Sidama), Arba Minch, Gedeo zone, Wolita (from SNNP region).	The production is very seasonal; wholesalers must look for various production areas.
Mango	Mango is mainly sourced from Wondo Genet and Yirgalem (Sidama), Arba Minch, Gedeo zone, Wolita (SNNP), Wollega (Oromia) and Assosa area (Benishanguel Gumuz region).	Like avocado, mango is a seasonal crop. Wholesalers from Hawassa and Shashemene commented that mangoes from Wolita and Arba Minch area are preferred for their better shelf life.
Tomato	Tomatoes are produced and sourced from various parts of the country. Central Rift Valley area in Oromia Region is the main source of tomato. Specifically, the outskirts of Meki and Ziway towns are the chief sources of tomato.	Wholesalers prefer to source tomatoes from nearby locations so that its quality will not deteriorate during transport. Even though there is high practice of growing tomatoes using irrigation, there are times that tomato market could be over produced leading to price fluctuation. During the field visit, the study team witnessed that tomato was the cheapest commodity in Meki open market. In Meki market, a kg of tomato was sold at ETB 9 whereas a kg of red onion at the same market was ETB 45.
Red onion	Like tomato, onion is produced and sourced from various parts of the country. As mentioned earlier, there are times that red onion could be imported from the neighboring country Sudan. But Central Rift Valley area in Oromia Region is the main source of red onion.	Compared to tomato, it is relatively easy to transport red onion from far places. There are wholesalers in Shashemene who regularly source red onion from Amhara region.

Source: FSSA interviews of wholesalers, retailers and institutional buyers from Hawassa, Shashemene, Wondo Genet, Meki and Ziway, May 2022. Data provided in Annex 2.

3.2.1 Market corridors of fruits and vegetables

The marketing structure of fruits and vegetables in the Southern Corridor consists of primarily moving products from production sites to points of final consumption. In the process, the market performs exchange functions as well as physical and facilitating functions. The exchange function involves buying, selling, and pricing. Transportation and marketing information facilitation (often referred to as brokering) services are important services of horticultural product marketing in Ethiopia. The core actors involved in the production and marketing of fruits and vegetables in Ethiopia include producers, aggregators and wholesalers, processors, retailers, institutional buyers, exporters, and end consumers.

The market structure of fruits and vegetables in Ethiopia is not well-organized, with very limited or no formal forward and backward linkages among the core actors. This has caused information and knowledge gaps about quality standards of fruits and vegetables. There are few industrial and institutional buyers which engage in formal backward linkages by entering long- or

medium-term supply contractual agreements. In such agreements, quality parameters, method of transport, and all product safety issues are most often mentioned.

However, this is common only with large industrial buyers such as ELFORA Agro Industry PLC vegetable and meat soup processor in Melge Wondo, and large hotels such as Lewi Hotel and Resorts chain in Hawassa. Such agreements are mostly between institutional buyers and wholesalers. Both institutional buyers and wholesalers have commented that it is always difficult to fulfill the requirements detailed in the contract. Commonly, the wholesalers get into such contracts to supply a variety of fruits and vegetables. Hence, they must collect such produce from various locations and suppliers, which are produced and transported with different contexts. As there is no formal backward linkage between the wholesalers and producers, it becomes difficult for wholesalers to ensure products are delivered with predefined specifications. On top of that, wholesalers might not have the chance even to directly reach out to farmers and check the quality of the produce as local brokers prevent direct contact between wholesalers and farmers.[13]

Institutional buyers and retailers who are getting produce from wholesalers check quality and variety mostly by physical inspection. Wholesalers most often need to do primary level cleaning and screening before they deliver or sell to retailers and institutional buyers. If the quality of the produce is not acceptable, retailers and institutional buyers will return the produce to wholesalers. Wholesalers in Hawassa and Shashemene, on the other hand, cannot return the product to the producer directly because they get their supply from local brokers. The FSSA team has not been able to identify mechanisms for returning unacceptable quality produce that exist between wholesalers and brokers.

Main actors in fruit and vegetable marketing

The market actors involved in fruits and vegetables marketing include producers, farmer organizations, wholesalers, brokers, retailers, and institutional buyers (Figure 3). Crate suppliers also play an important role in the fruits and vegetables marketing and storage. Wholesalers and retailers use crates while storing and transporting avocadoes and tomatoes. However, the FSSA team has not been able to identify post-harvest shed or storage service providers as viable businesses. Indeed, wholesalers and retailers tend to have their own sheds. The businesses that the FSSA team interviewed also stated that there were no temperature-controlled transporters for fruits and vegetables destined for domestic markets. The team was identified only one export company, Ethio Veg, in the Koka Oromia region, which is using cold trucks for transporting fruits and vegetables.

Even though smallholders are often members of cooperatives, selling their produce to their coop is a very rare practice. Farmers or cooperatives collect vegetable products only when cooperative unions ask them to do so. There are some notable exceptions to that rule. For example, Meki-Batu Fruits and Vegetables Cooperative Union, based in Meki town in Oromia region collects different agricultural products including cereals and vegetables from cooperatives and sells the same to public universities and Ethiopian Airlines. From vegetables, the Union is mainly active in the collection and sales of red onion, tomato, and green beans.

Local brokers: There are individuals, usually with no business license, who connect smallholder producers to traders, transporters, and other brokers. The local brokers play an important role in collecting price information from central markets and sharing the information to different actors including smallholders. These brokers will be contacted either by the producers or by buyers.

Transporter traders: There are individual traders with their own trucks who collect the vegetables from the farm or local markets and sell commonly to open markets such as Piazza and Saris markets in Addis Ababa. They usually have licenses for transport. Sometimes these traders may retail the vegetables across the road directly from the truck.

Wholesale: Ethiopian cities and towns have marketplaces where fruits and vegetables are traded. Some of the open market traders act as wholesalers in which they sell the vegetables in bulk to institutional buyers such as supermarkets, restaurants, hotels, and vegetable shops. For instance, Piazza in Addis Ababa is the central hub of vegetable distribution and redistribution in the country, and Shahemene town in Oromia region hosts vegetable wholesalers as well.

Retailer: There are two types of retailers including highway or roadside retailers in rural areas and the petty traders in urban areas. The roadside retailers commonly sell under temporary sheds or under trees to those who pass by, and scaling (weighing

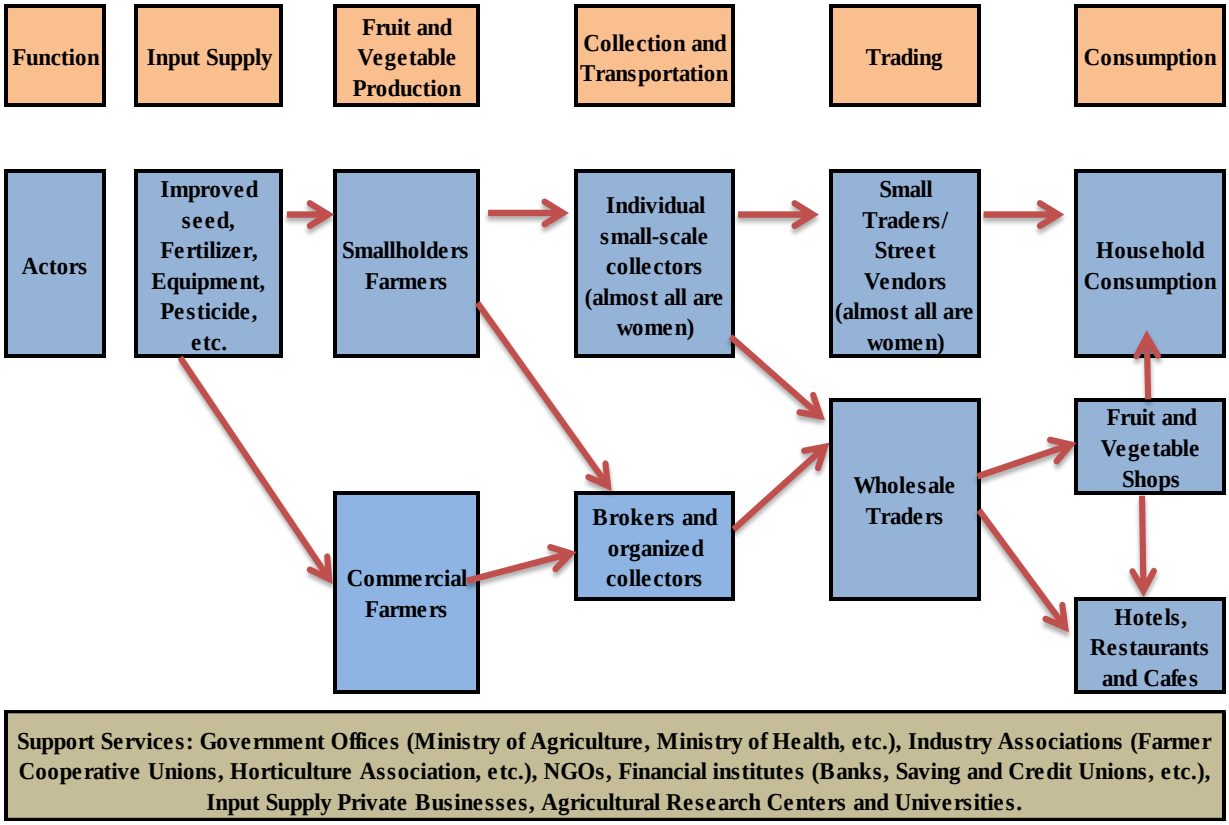
[13] Local brokers, most often informal (with no license) claim that they have the 'right to represent' their village or town while wholesalers most often come from other (far) areas need to go through such brokers.

the product) is typically not applied. They primarily receive products directly from farmers but in some circumstances farmers themselves engage in highway roadside retailing. The urban retailers are mostly based in residential and relatively crowded areas and offer a variety of produce. Some have shops which specialize in trading raw and processed fruits and vegetables. They commonly buy from open markets and commercial farmers and sell to household buyers.

Supermarkets: These are important actors in addressing the high-end market. Most of the supermarkets use agent traders who bring varieties of fruits and vegetables from open markets; where others, like Safeway supermarket in Hawassa, directly buy vegetables from open markets.

Hotels, resorts, and restaurants: Wholesalers and retailers of fruits and vegetable commented that big hotels and restaurants in Addis Ababa, Hawassa, Langano, and Debre Zeit prefer to source vegetables from commercial farms such as Jittu, Genesis farms, ABCO, and Luna for their product safety and consistent supply. As they also engage in export business, such commercial farms are believed to have better quality standards and they are at good at engaging in long-lasting supply relationships. However, commercial farms fall short of meeting the demand due to limited land and limited production capacity.

As indicated in Figure 3 below, there are different food safety related issues in the FSSA study area where primary production is mainly conducted in small holdings using traditional farming techniques.



Small-holder Farmers
Lack of knowledge about good agricultural practices to produce safe fresh fruits and vegetables. Lack of good hygienic conditions and inputs during primary production activities. Potential contamination from the adjourning land (agricultural chemicals, fecal materials, water contaminated by sewage, etc.), no date coding and traceability system, no appropriate packaging and transport of products.

Collectors and Traders
No proper sorting and grading of fruits and vegetables to maintain safety of products, lack of proper cleaning of containers and bins, no appropriate storage facility and equipment, lack of good transport mechanism to assure fresh fruits and vegetables safety, Lack of safe and quality water, lack of on time and appropriate cleaning and waste disposal practices, no packaging and date coding system, no adequate pest and rodent control system, no training and health check of employees.

Hotels, Restaurants and Cafes
In the FSSA study area almost all small restaurants, cafes and juice shops are over crowded and lack appropriate design to assure food safety, partly due to lack of consistent and good quality supply there is no appropriate incoming inspection, most do not have appropriate clean water supply, almost all do not have good drainage and waste disposal system, no adequate temperature control and cold storage system, no appropriate hygienic condition during fruit and vegetable processing, there is high risk of cross contamination from personnel and equipment, no food safety related training to employees, lack appropriate storage and transport mechanism for fruits and vegetables, no appropriate hygiene and sanitary facilities for employees, no appropriate systems to assure good personal hygiene and staff health as per the country legal requirements.

Figure 3: Fruit and vegetable channels and major food safety issues
Source: Compiled based on the FSSA study findings. Data provided in Annex 2.

Processing and handling of fruits and vegetables

Fruit and vegetable processing companies in Ethiopia include Africa Juice, ELFOR Agro-Industrial PLC, Meaza Mango, Yemi Juice, and Pregat Juice. These and others process tomato paste, orange marmalade, vegetable soup, frozen vegetables, etc. (Hengsdijk, *et, al.*, 2021). While most fruits are consumed fresh or juice, some fruit crops are used for industrial processing including, pineapples, passion fruits, avocados, citrus fruits, mangoes, and grapes.

Recently, three companies have started processing avocado oil. Two of them, Sunvado and YBM Trading PLC, are in Yirgalem Integrated Agro-Industrial Parks, just 50km from Hawassa. The third avocado processing plant Akshay Jain PLC is recently inaugurated in Jimma Oromia region (in the southwestern part of the country). Meaza Mango, Yemi Juice, and Pregat are located in Dukem (35 km from Addis Ababa), at least two of them are owned by foreigners. They make mango juices from imported concentrates.

Africa Juice (foreign owned), located in Wonji (near to city of Adama) Oromia region, is known for its passion fruit and mango juices. It mainly produces the juice for the export market.

ELFORA Agro-Industrial PLC is one of the largest and most active players in processing vegetable soup, tomato paste, and meat stew. It is a subsidiary of MIDROC Ethiopia Investment Group. ELFORA also engages in crop production, livestock operation, and meat processing. The study team was able to visit one of the factories located in Melge Wondo, 23 km from Hawassa.

- It has production lines dedicated to the production of tomato paste, vegetable soup, and meat-based stews.
- For vegetables, the factory processes red onion, potato, carrot, cabbage, and tomato. The factory has its own farm in a nearby location which produces a variety of vegetables. As the farm production is not enough, most of the vegetables used by the factory are sourced through a private trader.
- The factory is interested to engage with projects that work on food safety practices. Particularly, the production manager mentioned that it could be relevant for them if they can strengthen their backward linkages with trader-suppliers and producers. The lab technician commented that her team should be first trained on the features and safety of agricultural commodities production, sourcing, and processing.

Support functions

Transporters: Wholesalers of fruits and vegetables commonly use medium-sized trucks and identify them by capacity and brand. The most common types of trucks are ISUZU NPR and ISUZU FSR, with a design carrying capacity of 35 and 90 quintals, respectively. For transporting red onions from Sudan to different parts of the country, trucks with trailers with a carrying capacity of 400 quintals are used. However, that quantity exceeds the design capacity and will have a negative impact on the quality and safety of the produce transported.

Retailers use all forms of transport including motorbike, donkey cart, rickshaw (Bajaj), and pull cart. Institutional buyers such as hotels, restaurants, supermarkets, and processors prefer to give the transport responsibility to the suppliers (who are either wholesalers, retailers, or commercial farms).

The FSSA team could not find a single company that uses refrigerated trucks for transporting fruits and vegetables for the domestic market in and around the Southern Corridor study area.

Overloading trucks and exposing fruits and vegetables to sun and moisture are common. This occurs with the intention of reducing unit cost of transport, as requested by wholesalers who are aware of overloading issues, according to FSSA findings.

Relationships between wholesalers and transporters are usually informal. Local brokers typically arrange trucks for transport. In some areas, like Arba Minch, wholesalers who FSSA interviewed reported that they could not use their own trucks for transport as brokers opposed it.

Packaging material supply

The common packing materials used by wholesalers and retailers of fruits and vegetable is Polypropylene (PP) bags. PP bags are used for packaging red onion, potato, carrot, and sometimes for tomato. When wholesalers have the financial capacity, they use

wooden crates for tomatoes as this extends their shelf life. Interviewed wholesalers and retailers commented that as the price of wooden crates is increasing, it is difficult to use these materials. Raw bananas are transported with no packaging materials apart from the banana leaves and the truck is then covered with plastic canvas; and cabbage can be transported using hemp. This, of course, makes local small-scale transportation as a hub for food spoilage, damage and contamination.

On the other hand, industrial processors, such as a vertically integrated ELFORA Agro-Industrial PLC, uses tin cans and cartons as packaging material for tomato paste and vegetable soups. Tin cans and cartons are supplied by an affiliated company, and they can get the quantity of packaging material they need in a timely manner. According to the production manager, the tin can they are using meets international standards.

Support from government and other organizations

The Government of Ethiopia considers fruits and vegetables an important subsector for local agro-processing and export, as well as for the local market. Different government agencies give support to the development of the subsector. At the national level, the Ministry of Agriculture and the Agricultural Transformation Agency (ATA) has a leading role in the fruits and vegetables subsector in Ethiopia. Horticulture is currently led by a separate state minister within the Ministry of Agriculture. The horticulture sector is one of the priority areas for ATA. At regional levels, the Bureaus of Agriculture provide extension services to producers. The agricultural research institutes, both at federal and regional levels, are supporting the horticulture sector in breeding and release of new varieties.

The review on Consumer and Vendor Perspectives and Practices Related to Food Safety in Ethiopia by USAID EatSafe Project (GAIN, 2022) indicated that there are about 19 government bodies that have a role in influencing food safety practices in Ethiopia. The report further indicated that among these government bodies, the three ministries including the Ministry of Health (MoH), Ministry of Agriculture (MoA), and the Ministry of Trade and Industry (MoTI) have direct roles in leading and guiding food safety issues of the country.

From development organizations to NGOs and multilateral organizations, there are supportive actors in the fruits and vegetables supply chains. They provide services related to technical training and advice regarding physical inputs and marketing strategies (Huib, et al., 2021). Notably, the Dutch-funded Horticultural Livelihoods, Innovation and Food Safety in Ethiopia (Horti-LIFE) Project - a project implemented by SNV Ethiopia - is working on improving food safety of various horticultural crops. The project supports efforts related to formalizing and regulating the use and application of agrochemicals.

Rules and Regulations

Experts believe that the focus of the Ethiopian government has been more on ensuring the availability of food to different sections of the society than on setting standards for regulating quality and safety of production and processing of foods in the country (Woolfrey et al., 2021). The Ethiopian government promotes food security by improving agricultural productivity and ensuring the affordability of staple foods. However, Ethiopia is in the process of updating the country's food safety system (Woolfrey et al., 2021). An important driver for this process is the country's export policy and the need to meet international safety standards to take advantage of market opportunities. Reportedly, in export-oriented value chains, food safety systems are mainly guided by private standards, while domestic market enforcement of regulations is weak.

The attention given by the government in promoting and regulating nutrition-sensitive production and consumption is indirectly contributing to food safety. The National Food and Nutrition Policy guides the multi-sectoral and multi-stakeholder approach needed to address malnutrition and provides a policy framework for collaborative governance of food and nutrition activities in the country. The policy promotes the consumption of a variety of fruits and vegetables as part of a healthy diet.

Various laws, rules, and regulations by different government agencies in Ethiopia regulate the registration of food businesses and guide the food safety practices in fruits and vegetables production, processing, and marketing (Table 11). The public health proclamation (no 200/2000) covers details related to food standard requirements, water quality control, occupational health control and use of machinery, waste handling and disposal, and availability of toilets.

Table 2: Summary of national food safety standards relevant to fruits and vegetables

Number (Code)	Title	Enforcing Authority
ES 6780:2021	Fresh black currant – Specification	Ethiopian Standards Agency (ESA)

ES 6686:2021	Dried fruits – Specification (draft)	Ethiopian Standards Agency (ESA)
686/2010 and 731/2012	Commercial registration and business licensing proclamation and its amendment	Ministry of Trade and Industry
813/2013	Trade Competition and Consumers' Protection Proclamation	Ministry of Trade and Industry
300/2002	Environmental Pollution Control Proclamation	Ministry of Environment
299/2002	The Environmental Impact Assessment Proclamation	Ministry of Environment
501/2006	Trademark Registration and Protection Proclamation	Ministry of Trade and Industry
377/2003	Labor Proclamation	Ministry of Workers and Social Affairs
200/2000	Public health proclamation	Ministry of Health

3.2.2 End market systems

Fruits and vegetables in Ethiopia are produced for both export and domestic markets. The domestic market for fruits and vegetables can be segmented into household and institutional markets. The institutional buyers are organizations that buy vegetables for processing and for reselling and can include supermarkets, hotels, public universities, hospitals, and restaurants. Household buyers can further be classified into three segments based on income: high-end market, middle-class market, and the mass market (characterized in Table 12).

Table 3: Characteristics of household consumer market segments

High-end market	Middle class market	Mass Market
They are relatively quality- and food safety-sensitive. This category includes expats working at industrial parks such as in Hawassa and the diplomat communities in Addis Ababa. They prefer to buy fruits and vegetables from supermarkets and shops for better food safety and variety. They mostly buy and use more varieties of fruits and vegetables. They buy relatively larger quantities at a time since they have refrigerators.	They consider both price and quality of fruits and vegetables. They buy from open markets and fruits and vegetables shops; they have the awareness and capacity to choose different market retailers. They buy relatively large quantities at a time.	They are more interested in price and availability than quality. This group buys from open markets and roadside markets. They are interested in vegetables such as onions and potatoes. Fresh is considered as quality and safe; they buy smaller quantities, enough for a few days.

Source: FSSA interviews of retailers from Hawassa, Ziway and Meki, May 2022

3.2.3 Food safety practices in fruits and vegetables and major constraints

Food safety practices

Quality standards and grades for different fruits and vegetables in Ethiopia are done informally by market actors. The FSSA team observed that market actors in the study areas commonly measure food safety of fruits and vegetables based on shelf-life, level of acceptance by the market (buyers), and amount of loss they can tolerate. Except for ELFORA Agro-Industrial PLC (a large processor of tomato paste and vegetable soup), FSSA observed that wholesalers, retailers, hotels and restaurants, and juice houses we visited do not conduct any laboratory testing. Most of the companies interviewed in this study use visual inspection while receiving and using the products.

Institutional buyers such as ELFORA and Lewi Hotel and Resort pay more attention to the integrity of their sourcing. They engage in formal contracts where the products specification and safety of the fruits and vegetables are covered by the contract.

Once produce arrives at the premises of institutional and industrial buyers, they screen and store it in cold facilities. However, wholesalers might not have the chance to directly reach out to farmers and check the quality of the produce, as noted earlier. Wholesalers most often need to do primary level cleaning and screening themselves before they deliver or sell to retailers and institutional buyers.

The fruits and vegetables market actors we interviewed noted the following major food safety practices and made the following observations:

- **Proper product identification and segregation**: The origin of the product is used as a means of ensuring quality and safety. There is a general association between origin and the quality of product. Based on their experience or recommendation of other actors in the business, wholesalers have priority sources of areas. For instance, the interviewees said that consumers consider bananas from Arba Minch, avocados from Wondo Genet, and mangos from Arba Minch and Wolita to be good quality.
- **Physical size of fruits and vegetables**: Size of the produce is used as means of keeping the product safe for some time. Large red onions and tomatoes are believed to decay in less time than smaller ones.
- **Color**: Retailers, in particular, give much attention to the color and luster of fruits and vegetables. For tomatoes, shiny is often considered to be of high quality[14]; and retailers prefer yellow in color, which is not well ripened, because it has a longer shelf life. At the same time, household consumers who buy quantities larger than their daily needs prefer a mix of red (well-ripened) and yellow tomatoes.
- **Fresh is safe**: Retailers, hotels, restaurants, and juice houses believe that serving fresh fruits and vegetables is the best way to ensure food safety. Hence, they prefer to have smaller quantities of fruits and vegetables at a time, enough for a few days' use. One juice and fruit shop owner in Shashemene town mentioned that they do not need to use refrigerators for fruits, vegetables, and juices, as they are serving all fresh.
- **Competent staff for food safety**: Lewi Hotel and Resort said they provide regular training on food safety and personal hygiene for their staff. Wholesalers and retailers do not have formal training; but they believe that the practical experience they have gained over time on proper sourcing, screening, and product handling is critical for the safety of the products they are trading.
- **Waste disposal**: The majority of wholesalers give away discarded vegetables for animal feed with no payment; while retailers, hotels, and juice houses must pay for private or municipal waste collectors to dispose of their waste. Except for ELFORA Agro Industry PLC, there is no practice of using waste to make compost.
- **Short distance sourcing**: Wholesalers and retailers in Zeway and Meki towns reported that sourcing red onion and tomato from nearby farms or locations will be important to maintain the safety of vegetables.

Major constraints

The major constraints to improve the safety of fruits and vegetables are summarized as follows:

- **No access to safe marketplaces**: The FSSA team observed that most of the wholesalers and retailers in the study work in open places or under partly covered sheds. These marketplaces are unpaved and lack proper drainage. Hence, they are prone to water pooling and mud during the rainy seasons and dust during the dry seasons.
- **Lack of adequate financing**: Wholesalers and retailers lack access to financing which limits their ability to invest in better storage or buy wooden crates. These are critical to extending the shelf life of fruits and vegetables. Wholesalers and retailers would also like to have vans for local transport within the same town.
- **Lack of information, awareness, and knowledge about food safety**: Wholesalers and retailers interviewed in this study believe that produce food safety is affected by factors beyond their control and that they can do nothing to improve the safety and quality of products. Wholesalers believe that the quality and safety of products are heavily affected during farming and harvesting due to weather and other factors. Further, they believe it is the role of the

[14] However, an expert working in the subsector has commented that shininess of tomatoes would come from over application of pesticides. He said retailers would prefer these types of colors as they look clean and might have longer shelf-life.

government to control and regulate the production and harvesting processes, and that all environmental hazards should be dealt with by the government.

- **Limited control on sourcing**: As explained earlier, wholesalers have limited control over the backward linkages with producers.

3.2.4 Food safety risks and their underlying causes

The food safety risks of fruits and vegetables trading, processing, and transporting functions are related to a lack of technical understanding about the roles that each actor can play in maintaining the safety of the produce at different nodes (Table 13). The vegetable and fruit businesses that operate in the study area have financial challenges mainly due to lack of consistent demand (the demand is higher during orthodox Christians fasting seasons), post-harvest losses due to spoilage in all stages of the supply chain, higher price of fruit and vegetable products than other food commodities (grains and cereals) which has also a major impact on the demand, and due to lack of modern irrigation technologies to improve productivity. Additional factors are the inconsistent supply of the product, price fluctuations, conflict, unregulated market relations, and unpredictable climatic conditions. The major risks and associated causes identified by the interviewed businesses are summarized in the following table.

Table 4: Major food safety risks and their possible causes in the fruits and vegetables subsector

Actors/VC function	Food Safety Risk	Possible Causes
Trading: Wholesalers and retailers	Rotting of fruits and vegetables	Limited storage space Limited storage materials such as wooden crates for tomato, red onion, and avocado None or limited cooling facilities
	Mechanical damage; breakage of fruits and vegetables; skin damage	Over heaping and overloading to cut down cost of transport per unit Poor handling at storage; crates not used
	Poor sanitation of the environment with risk of contamination with waste-water, mud, and dust	Lack of access to safe marketplaces Poor drainage systems (at municipal level) No secured places for temporary storage of waste
	Poor screening of foreign materials on produce	Lack of knowledge to properly screen the produce
Processors	Poor sanitary tools and equipment	Limited knowledge from owners on food safety Not enough knowledge about the feasibility of investing in such tools and its impact on food safety
	Poor hygiene of workers	Lack of access to safe water Lack of safe and clean working clothes Limited training of workers on product handling
	Rotting of fruits and vegetables	Limited access to cooling facilities Inconsistent electric power supply Limited storage capacity
	Poor quality of produce	Lack of access to preferred (recommended) variety of fruits and vegetables Over application of agro-chemicals by farmers
Institutional buyers: Hotels, restaurants, juice houses	Poor hygiene of workers	Lack of access to safe water Lack of safe and clean clothes
	Poor sanitary tools and equipment	Limited knowledge of the owners on food safety Limited knowledge about the feasibility of investing in such tools and its impact on food safety
Transportation	Overloading of vehicles leading to damaged goods	Cutting the cost of transport per unit
	Improper loading practices	Lack of knowledge of laborers
	Improper holding while awaiting offloading; the produce could be exposed to moisture (rain), or sun and heat	Drivers don't have enough knowledge of food safety

Actors/VC function	Food Safety Risk	Possible Causes
	Poor sanitation of loading and unloading	Limited understanding about the effect of personal and environmental hygiene on food safety

In response to these risks, the FSSA experts suggested the following food safety practices and current associated constraints in Ethiopia to implementing those.

Table 5: Summary of food safety risks and constraints in fruits and vegetables

Food safety risks	Food safety practices to mitigate risk	Constraints to adopt practices
1. Rotting fruits and vegetables	Investment (by wholesalers and retailers) in tools and facilities such as wooden crates and proper storage facilities. Train workers on proper screening, storing, and heaping. Proper planning on sourcing and supply supported by forward and backward linkages.	Limited access to finance Limited knowledge of the feasibility of investment in food safety tools and practices Lack of coordination among actors and stakeholders
2. Poor sanitation of the environment with risk of wastewater, mud, and dust contamination	Communal investment on the marketplace. Proper design of marketplaces consisting of temporary waste dumping locations, and effective routing of trucks, donkeys, workers, and market actors. Investment in waste disposal trucks (transport)	Lack of coordination among stakeholders Limited level of engagement of government stakeholders Lack of knowledge on the product safety and measures to be taken by respective stakeholders

3.3 Poultry subsector

In Ethiopia, poultry production is an important activity for income generation, job creation, and food security. In addition, chicken meat is a major protein source, particularly for low-income communities where most of the population cannot afford to buy other sources of meat. As poultry has fast proliferation and growth rate, it is a potential agri-food source to respond to the growing population of the country. On the other hand, Ethiopian commercial poultry production is not well-developed because of constraints such as poultry diseases, supply shortage, high cost of production inputs, and poor hygienic standards. [15]

Several infectious and parasitic diseases hamper poultry production in Ethiopia. To date, evidence on the nationwide burden of specific diseases has not been collated to inform the targeting of poultry health interventions. A meta-analysis revealed that 14 infectious and parasitic diseases of poultry were reported in 110 published studies from 2000 to 2017, and 82% (90/110) of the studies covered 6 diseases: Newcastle disease, infectious bursal disease, avian coccidiosis, helminth infestation, ecto-parasite infestation, and Salmonella infection.[16]

Traditionally, small-scale poultry farms in Ethiopia are owned by women. Larger poultry slaughtering facilities are primarily located in or around Bishoftu (formerly Debere Zeit).

Secondary research[17] showed that there are at least eight poultry slaughtering facilities which are located in and around Bishoftu, including Alema Farms, ELFORA Agro Industry, Abebaw Gesese Poultry Farm, Hage farms, ELERE Farms, Kelebet Agro Industry, Fasil Poultry Farm, and Bernehigo Poultry Farm. The study found that the top three slaughtering facilities were Alema,

[15] Alemayehu Tdese, Food quality and safety along the commercial broiler chicken value chain in Bishofetu and Addis Ababa (Bishoftu, 2019).
[16] Yohannes Asfaw, Gobena Ameni, Girmay Medhin, Gezahegn Alemayehu, Barbara Wieland, Infectious and parasitic diseases of poultry in Ethiopia: a systematic review and meta-analysis
[17] For instance, ENTAG BENEFIT, Business opportunity report: Invest in the Ethiopian poultry subsector (Addis Ababa, 2020).

ELFORA, and Abebaw Gessese with a respective performance of slaughtering 755,000 birds, 525,000 birds, and 23,340 birds. The same study found that none of these facilities have certificates related to food safety.

Although poultry was not a major FSSA focus, the team interviewed two small-scale broiler production businesses to corroborate food safety challenges in the industry and verify the above secondary research. During this assessment information was collected from two large-scale poultry slaughtering facilities, including Alema and Elfora.

The lack of slaughtering, marketing, and cold storage services are major causes of market loss for small- and medium-scale poultry farms. Most of the slaughtering of small-scale broiler production is conducted in the backyard without legal licenses and in poor hygiene conditions. During the study, poultry meat products without labels were observed in some supermarkets and business owners were not willing to give information about their poultry suppliers' names. As indicated in Figure 4, the major food safety issues in the value chain include lack of veterinary support to maintain the flock health, poor hygienic conditions in slaughterhouses, and lack of staff training about food safety.

Below are the major focus areas to improve food safety for poultry processing in the study area:

1. Assure health and hygiene of live chickens for slaughter (including traceability)
2. Improve hygiene standard of slaughter facilities
3. Enforce legal license requirements and compliance of all chicken slaughtering activities
4. Improve technology and equipment of commercial slaughterhouses
5. Implement pest control in and around slaughter facilities
6. Assure personal hygiene and health of employees
7. Provide staff training on food safety
8. Improve transport and storage standards of poultry meat
9. Assure good waste management practices
10. Assist in HACCP and ISO 22000 food safety system implementation
11. Improve awareness of the government authorities about the importance of inspecting and controlling chicken slaughtering activities

Elfora Chicken Slaughterhouse in Bishoftu town, April 2022 Photo Credit: Aschalew Wondie

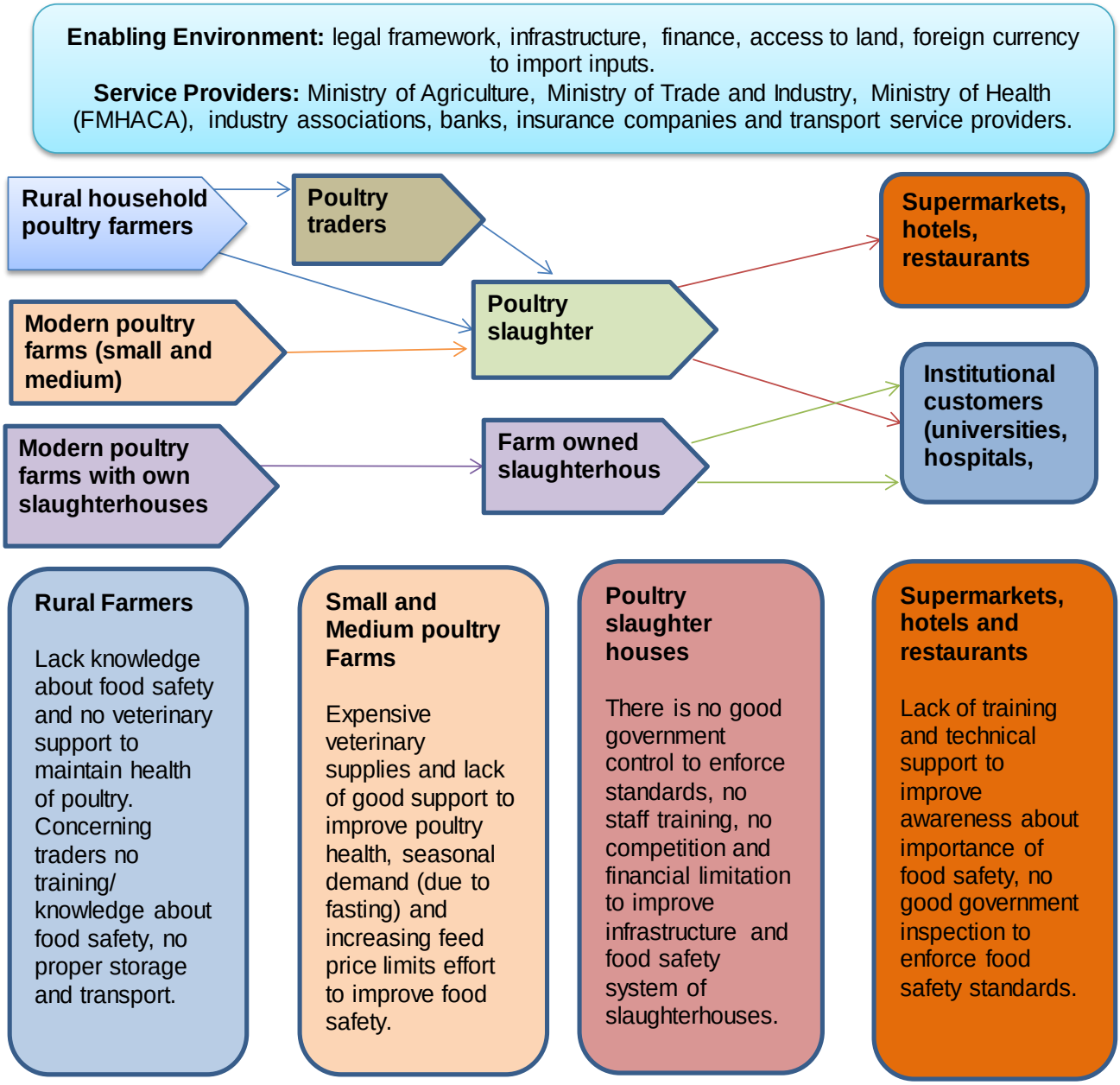


Figure 4: Poultry Market channels and major food safety issues; Source: Compiled based on the FSSA study findings. Data provided in Annex 2.

4. Conclusions

4.1 Key opportunities for food safety in beef

Figure 5 below summarizes the many opportunities to improve food safety in the beef subsector of Ethiopia.

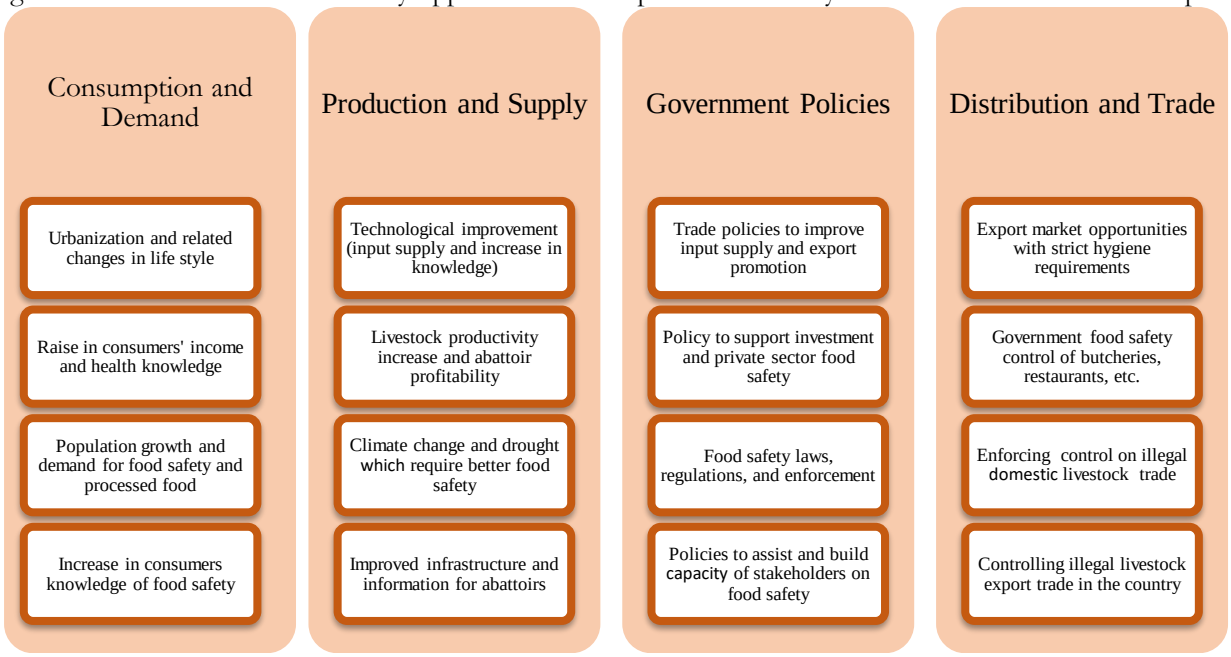


Figure 5: Key opportunities of meat food safety in Ethiopia. Source: Compiled based on the FSSA study findings. Data provided in Annex 2.

Key actions that can improve food safety in the beef value chain include:

a) Implement performance-based access to markets and finance
b) Build customer trust and reduce food safety related costs to increase profitability of businesses
c) Implement globally recognized systems to help abattoirs get involved in export markets, and provide a competitive advantage
d) Help businesses in their efforts to comply with food safety legal requirements
e) Initiate regular communication and dialogue between public and private sector leaders

4.2 Recommendations for the beef subsector

Below is a summary of recommendations to improve beef food safety in Ethiopia based on FSSA findings:

Table 15: Summary of recommendations for the beef subsector

Operation	Recommendations
Water Supply	Support improvement of in-house laboratories' water quality analysis capacity. Provide training about the importance of water quality.
Temperature control	• Provide training on the importance of temperature control for major players in the meat supply chain. • Technical support to legal authorities to help enforce legal requirements.
Staff Facilities and Personal Hygiene	• Provide training on the importance of personal hygiene to employees and managers. • Training government inspectors to assist enforcing of legal requirements.
Process Control System	• Provide food safety (HACCP/ISO 22000) training to managers and owners of abattoirs. • Provide assistance in implementing HACCP/ISO 22000 systems.

Meat Transport	• Loan facilitation to assist local abattoir houses to purchase or rent temperature-controlled trucks for meat transport.
Staff Training	• Organize staff training programs about food safety for abattoirs and other stakeholders involved in the meat supply chain.
Slaughter Animal Hygiene	• Stakeholders workshop to promote the importance of direct linkages between producers (farmers) and abattoirs. • Provide training to farmers, traders., government offices.
Animal Transport	• Stakeholders workshop on the importance of improving animal transport • Provide training to farmers, traders and abattoirs on the importance of good transport.
Slaughter Animal Presentation	• Stakeholders workshop to promote the importance of veterinary support to farmers to improve animal health. • Capacity building support to authorities to assure animal control at the source and during trading.
Lairage Condition	• Stakeholders workshop to promote the importance of veterinary support to farmers to improve animal health. • Capacity building support to authorities to assure animal control at the source and during trading.
Building and Equipment	• Technical assistance and advisory support to improve abattoir production facilities and equipment. • Support in arranging loan facilities from the banks. • Provide food safety training to improve commitment of owners and the top management.

4.3 Key opportunities for food safety in fruits and vegetables

This study found that the main opportunities for food safety in the fruits and vegetables subsector are the market requirements and government regulations.

Market Requirements: Wholesalers and retailers of fruits and vegetables in the study area reported that their motivation for food safety is to meet local market requirements and to expand their market access. Specifically, wholesalers in Hawassa and Shashemene commented that looking for new markets with better variety and quality is a motivating factor to implement food safety practices. For example, a retailer in Hawassa who is targeting the expatriate communities working at Hawassa Industrial Parks has commented that their variety of fruits and vegetables sold well as food safety practices are entirely driven by buyer interest. The owner said the store strictly checks the quality while receiving (from retailers and commercial farms), thereby doing its own cleaning and sorting. Compared to her current business capacity, she made a significant investment in cooling facilities and modern shelves. The owner runs a small supermarket within the compound of Hawassa Industrial Park, but the investment made in cooling facilities and shelves is more than the large supermarkets that are targeting domestic buyers.

Government Regulations: Wholesalers and retailers interviewed in this study commented that there is opportunity for more involvement from government regulators to check product quality regularly as opposed to only collecting taxes and duties.

Hotels, restaurants, and juice cafes take into consideration both government regulations and market demand as motivational factors for investing in food safety practices. Even though government food safety audits are not consistent, large hotels might be visited by government food safety auditors every quarter. Also, hotel employees who will have direct contact with the food undergo regular medical check-ups, which is another government requirement.

4.4 Recommendations for the fruits and vegetables subsector

Most of the stakeholders interviewed for the FSSA have a limited understanding of the part they can play in improving food safety as they externalize most of the problems and solutions. Processors are not satisfied with the ability of wholesalers and retailers to ensure a consistent supply of a variety of fruits and vegetables. On the other hand, wholesalers collecting various fruits and vegetables from different and far places are in a tricky position to take the lead in addressing food safety issues as they might not have direct contact with producers. Hence, the FSSA study team recommends the following actions:

1. **Invest in equipment and facilities**: Conducting a brief cost-benefit analysis of investing in food safety equipment and facilities could be relevant to showcase the trade-offs of investing in items such as wooden crates and proper storage facilities.
2. **Initiate dialogue to cocreate solutions:** It could be beneficial to utilize coordination platforms so that relevant subsector actors can convene to discuss and solve common problems. This platform could help facilitate linkages between wholesalers, processors, and government structures; and could be used to train owners and employees.
3. **Support the preparation of guidelines or manuals**: Improve knowledge and awareness of best food safety practices by preparing written guidelines for storage construction, proper shelving, and storing of fruits and vegetables.
4. **Train wholesalers and retailers on safe food handling:** Engage lead actors such as ELFORA Agro-Industry PLC and the mini-supermarkets, which target expatriates, to train wholesalers and retailers on the safe handling of fruits and vegetables.

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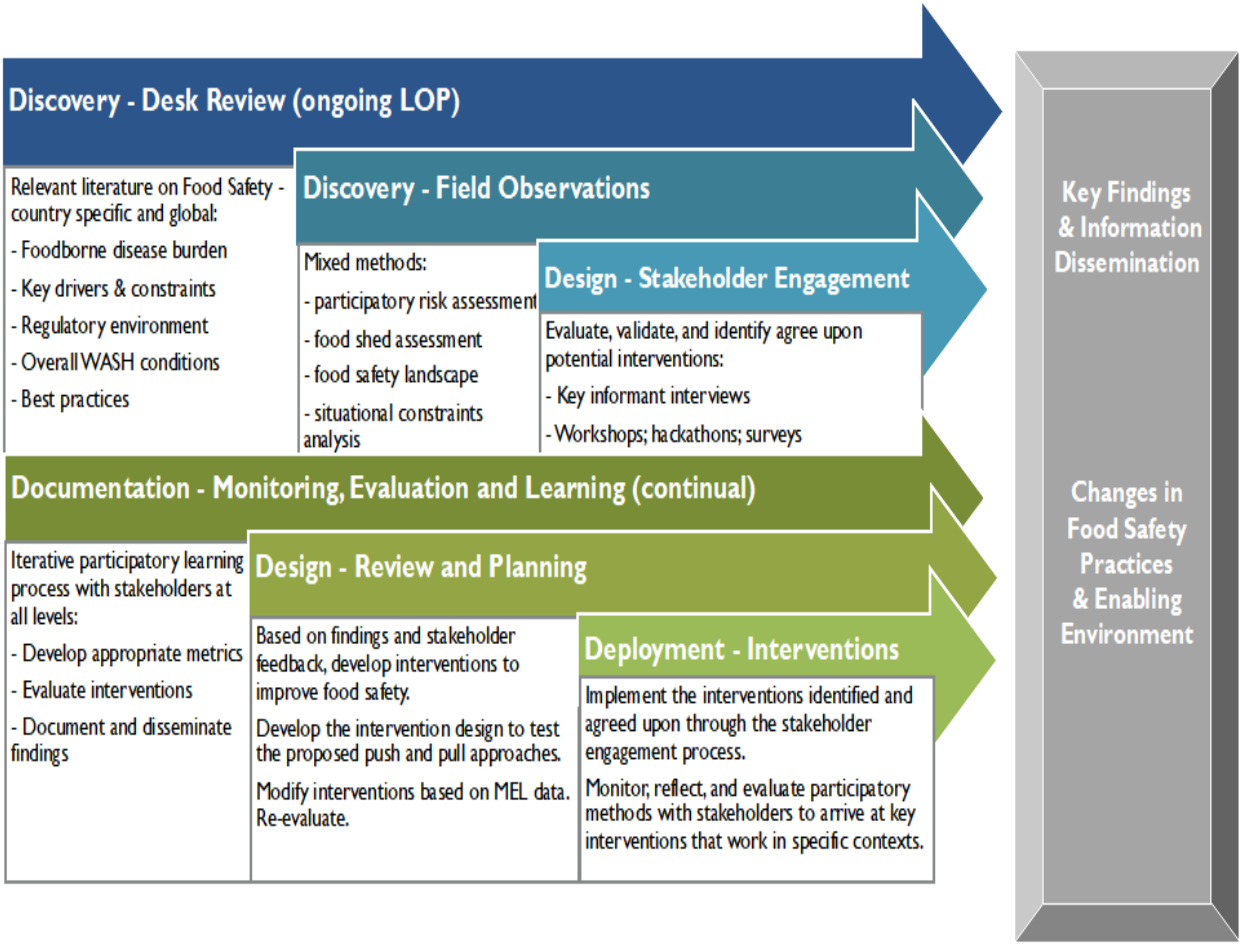
Annex 1: The D-5 Approach Applied to Food Safety



Annex 2: Field Data Analysis

Source of food

Major Suppliers/source of your food/products: (multiple choice)								
Row Labels	**Farm Gate**	**Farm Gate and other wholesalers**	**Farm gate and Traders**	**Other Wholesalers**	**Others**	**Retailers and Traders**	**Traders**	**Grand Total**
Fruits and vegetables						1	9	10
Fruits only	3			1			2	6
Vegetable only	4		2	1			5	12
Fruits, Vegetables, and Meat		2		2		1		5
Meat	1				1		11	13
Poultry							3	3
Grand Total	**8**	**2**	**2**	**4**	**1**	**2**	**30**	**49**

Transportation

Is the product protected adequately during transport?			
Row Labels	**No**	**Yes**	**Grand Total**
Fruits and vegetables	10		10
Fruits only	3	3	6
Vegetable only	7	5	12
Fruits, vegetables, and Meat	3	2	5
Meat		13	13
Poultry		3	3
Grand Total	**23**	**26**	**49**

Product quality check

Do you check the quality of the product (e.g., produce, meat) as it arrives at your facility?		
Row Labels	**Yes**	**Grand Total**
Fruits and vegetables	10	10
Fruits only	6	6
Vegetable only	12	12
Fruits, vegetables, and Meat	5	5
Meat	13	13
Poultry	3	3
Grand Total	**49**	**49**

Lab test for safety

Do you perform any sample lab test for safety, quality, pesticides, adulteration etc.?				
Row Labels	**N/A**	**No**	**Yes**	**Grand Total**
Fruits and vegetables	1	9		10
Fruits only		5	1	6
Vegetable only		11	1	12
Fruits, vegetables, and Meat		4	1	5
Meat		4	9	13
Poultry		2	1	3

Grand Total	1	35	13	49

Are food quality/safety testing facilities easily accessible in your market?			
Product	**No**	**Yes**	**Grand Total**
Fruits and vegetables	10		10
Fruits only	4	2	6
Vegetable only	12		12
Fruits, vegetables, and Meat	5		5
Meat	3	10	13
Poultry	1	2	3
Grand Total	**35**	**14**	**49**

Discarded Materials

Are discarded fresh meat and Fruits &Vegetables removed from the premises on a regular basis?		
Product	**Yes**	**Grand Total**
Fruits and vegetables	10	10
Fruits only	6	6
Vegetable only	12	12
Fruits, vegetables, and Meat	5	5
Meat	13	13
Poultry	3	3
Grand Total	**49**	**49**

Cooling

Do you use any cooling in your facility?			
Products	**No**	**Yes**	**Grand Total**
Fruits and vegetables	3	7	10
Fruits only	5	1	6
Vegetable only	10	2	12
Fruits, vegetables, and Meat		5	2
Meat		13	13
Poultry	1	2	3
Grand Total	**19**	**30**	**49**

Certification

Any FS certification: Please mention it (Such as GAP, GVP, GMP, GHP, HACCP, organic, FSMS and local standard etc)			
Row Labels	**No**	**Yes**	**Grand Total**
Fruits and vegetables	10		10
Fruits only	6		6
Vegetable only	11	1	12
Fruits, vegetables, and Meat	4	1	5
Meat	7	6	13
Poultry	3		3
Grand Total	**41**	**8**	**49**

Customer preference

Do you believe consumer preferences are increasing towards safer food?			
Row Labels	**No**	**Yes**	**Grand Total**
Fruits and vegetables	1	9	10
Fruits only	2	4	6
Vegetable only	3	9	12
Fruits, vegetables, Meat		5	5
Meat		13	13
Poultry	1	2	3
Grand Total	**7**	**42**	**49**

Motivation for the business

What are the motivations for your business in adapting food safety measures/certification?							
Products	**Gain access to new markets/ product differentiation**	**Higher prices**	**Meet buyer's requirement, gain access to new markets, high price, reduce food loss**	**Meet buyers' requirements**	**Meet Government and industry standards/ requirements**	**Reduce food loss**	**Grand Total**
Fruits and vegetables			1	9			10
Fruits only	1		1	4			6
Vegetable only		3	1	7		1	12
Fruits, vegetables, and Meat	1		3	1			5
Meat	1			11	1		13
Poultry				2		1	3
Grand Total	**3**	**3**	**7**	**34**	**1**	**1**	**49**

Staff hygiene and sanitation

Staff hygiene and sanitation					
Products	**Bad**	**Good**	**Need improvement**	**Very good**	**Grand Total**
Fruits and vegetables			9	1	10
Fruits only	3		3		6
Vegetable only		3	9		12
Fruits, vegetables, and Meat		4	1		5
Meat		3	3	7	13
Poultry		1	1	1	3
Grand Total	**3**	**11**	**26**	**9**	**49**