ASSESSMENT OF SHEEP AND GOAT PRODUCTION IN YABELLO AND CAUSE OF ORGAN CONDEMNATION AND FOOD SAFETY IN RETAIL MEAT SHOPS AND EXPORT ABATTOIRS IN MODJO TOWN, ETHIOPIA

MSC THESIS

BY

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BISHOFTU, ETHIOPIA

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A Thesis Submitted to College of Veterinary Medicine and Agriculture for the Partial Fulfillment of Master of Science in Animal Production

BY

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Bishoftu, Ethiopia

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As members of the Examining Board of the final MSc open defense, we certify that we have read and evaluated the thesis prepared by Teshale Fekadu Tesema, entitled: **Assessment Of Sheep And Goat Meat Production In Yabello And Loss Of Organ Condemnation And Food Safety In Retail Meat Shops And Export Abattoirs In Modjo Town, Ethiopia** and recommend that it be accepted as fulfilling the thesis requirement for the degree of Masters of Science in Animal production.

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STATEMENT OF THE AUTHOR

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LIST OF ABBREVIATION

AHT	Animal Health Technician
CSA	Central Statistical Agency
DM	Dry Matter
CVMA	College of Veterinary Medicine and Agriculture
DR	Doctor
DVM	Doctor of Veterinary Medicine
ETB	Ethiopian Birr
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statics
GDP	Growth Development Program
MSC	Master of Science
N	Number
HACCP	Hazard Analysis and Critical Control Point
KM	Kilo Meter
MOA	Minister of Agriculture of Ethiopian Government
NGO	None Governmental Organization
O/P	Ovine Pasturolosis
PA	peasant Agent
PMI	Post Mortem Inspection
USD	United State Dollar
SD	Standard Deviation
SNNP	Southern Nation and Nationality People
SOP	Standard Operation Procedure
SPS	Sanitary and Phytosanitary Agreement
SPSS	Statistical Package for Social Science
SHOAT	Sheep and Goat
SG POX	Sheep and Goat Pox
WHO	World Health Organization
WTO	World Trade Organization

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ABSTRACT

A cross-sectional survey was conducted from November 2018 to May 2019, using semi-structured questionnaire from Yabello woreda in purposively selected kebeles. All participants respond that sheep and goats were used natural pasture freely available at winter and summer, watering available in winter and summer is available once in 2 days and once in 3 days respectively. The average of marketing sheep and goat were 7-12 months, Farmers reason for typically marketing animals the majority of respondents rank that 1st for purpose immediate cash, 2nd family health care, 3rd children schooling and closing. Infectious disease outbreak were the major cause of mortality for production area. Most liver, lungs, heart, kidney, tongue, and carcasses were condemned in case of infectious, noninfectious and parasites, additionally abscess, *pericarditis, nephritis*, pneumonia, calcification, *emphysema, hydatid cyst* and discoloration were the major Couse for organs and carcass condemnation. Frequently rejected organs were lung 165 (55.3%), liver 138 (46.3%), kidney 55 (18.5%), heart 42 (14.1%), and tongue 43 (14.4%) in both species. Estimated annual financial loss was computed based on the annual slaughter rate of both species, average cost of condemned organ and carcass during the study period and condemnation rate of the slaughter house. The annual financial loss in both sheep and goat was estimated to be 765,154.29 USD from domestic and international markets. Among 164 meat handlers were interviewed by using structured questionnaire to determine the food safety knowledge, attitude and practices in export abattoirs and retail meat shops of Modjo Town. Majority of the meat handlers in retail meat shops were illiterate 34.4% and primary school level 28.1%. And only two respondents (3.2%) are attained college education all participants' duty of the meat handlers has 100.0% butchers in retail meat shop. The most of the respondents export abattoir meat handlers are butchers 69.0%, and followed by 20.0% of Meat inspectors and 3.3% of each production manager and sanitary. The knowledge of hand wash before handling meat reduce risk of contamination with age of respondents was significant.

Keywords: *abattoir, condemnation, carcass, food safety, goat, meat, modjo, meat handler, organ, production, sheep, yabelo.*

1. INTRODUCTION

The livestock population of Ethiopia is estimated at 57.83 million cattle, 28.89 million sheep, 60.51 million poultry, 29.7 million goats, excluding nomadic areas (CSA, 2015/16). The annual meat production from small ruminants is relatively small compared to the number of heads. The livestock sub sector contributes about 45% of the agricultural GDP and 16% of the national Gross Domestic Production (GDP) (IGAD, 2010). However, the current levels of contributions of the livestock sector in Ethiopia is very low. Marketing and infrastructure that affect the livestock potentials (Addisu, 2015). Currently the overall livestock production constraints in Ethiopia are feed and water shortages, livestock diseases, low genetic potential of indigenous livestock, and management system. As a result the first and the most common Production system is the traditional management system. Pastoralism is the mainstay of most people living in the dry lands of Ethiopia. About 61-65percent of the total area of the country is estimated to be occupied by pastoral areas (Biruk, 2007). Sheep and goat in Ethiopia are kept under traditional extensive systems. Despite all the constraints there are quite favorable opportunities to increase sheep and goat productivity in Ethiopia.

Abattoirs provide information on the epidemiology of diseases on livestock, to know what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs and carcasses. Yet meat is also condemned from consumption because of aesthetic values caused by diseases, animal welfare and mechanical damage during slaughtering procedures. Abattoirs played an important role in surveillance of various zoonotic diseases, and it allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific disease (Alton *et al*., 2010). In the abattoir during postmortem inspection liver, lungs, heart, kidney, tongue, and carcasses were thoroughly visual inspection, palpation and systemic incisions were important for the presence of cysts, parasites and other pathological abnormalities, The results were recorded and the judgment were classified as totally or partially approved fit/unfit for human consumption. The different reason for organ and carcass rejection were infectious, noninfectious and parasites causes like abscess, *pericarditis, nephritis, pneumonia, calcification, emphysema, hydatid cyst* and discoloration.

Food safety as all measures that are undertaken during production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, and wholesome and fit for human consumption. Effective food safety systems are vital to maintain consumer confidence in the food system and to provide a sound regulatory foundation for domestic and international trade in food, which supports economic development.

In Ethiopia, many studies have been undertaken to identify the major disease conditions encountered during ante mortem and postmortem inspection and to determine the economic importance of organ and carcass condemnation (Jatenie *et al*., 2014). And Regassa *et al*. 2013 in Luna export abattoir and Aynalem Mandefro., *et al*. 2015 at Bishoftu elfora export abattoir. However recently there is no study done in Modjo export abattoirs, why this study was targeted in sheep and goat production constraints in Yabello and in related with organ condemnation in Modjo export abattoirs.

Objective

General objective

Assessing the major sheep and goat production constraints, assessing causes and financial loss of organ condemnation, food safety knowledge, attitude, practices of meat handler in export abattoirs and retail meat shops in Modjo town.

Specific objective

- To determine the causes of organ and carcass condemnation.
- To assess the economic loss of organ and carcass condemnation.
- To Asses food safety knowledge, attitude and practices of meat handler in export abattoirs and retail meat shops in Modjo town.

2. LITRETURE REVIEW

2.1. Meat Production in Ethiopia

According to FAOSTAT (2013), total meat produced in 2012 reached 659,305 tones, indicating a compounded annual growth rate of 2.3 percent between 2000 and 2012. Despite the fact that Ethiopia has the tenth largest livestock population in the world, the production of meat is still low and contributed only about 0.2 percent of the world total meat production, of which most is sheep and goat meat. This ranked Ethiopia the 55th largest meat producing country in the world.

2.1.1. Over view of sheep and goat production system

In Ethiopia, various sheep production system categories are practiced, namely highland sheep-barley system, mixed crop-livestock system, pastoral and agro-pastoral production system, ranching, and Urban and peri-urban sheep production system (Solomon *et al.,* 2008). The mixed crop-livestock production system is based on limited communal and/or private grazing areas and the use of crop residue and stubble. The pastoral production system is based on extensive communal grazing whereas agro-pastoralists are characterized by a combination of both pastoral and mixed crop-livestock production (Asfaw *et al.,* 2011). While contributing significantly to meat production in Ethiopia, present production levels of sheep from such subsistent type of production systems is far below their potential. As a result, meat production is estimated at about 3.5kg per sheep per year in the population and 10 kg per sheep slaughtered. Both values are very low when compared with those in neighboring countries that have small ruminant population's 50-75% less than Ethiopia Amha (2008). Likewise, The average carcass weight of Ethiopian sheep and goats is 10 kg which is the second lowest in sub Saharan Africa And also according to the report of Solomon (2014) goat production system in Ethiopia similar with sheep production system, is classified in mixed crop-livestock system, pastoral and agro- pastoral system urban and peri-urban production system.

2.1.2. Contribution of small ruminant in Ethiopian economy

Small ruminants, found all over the world, are particularly concentrated in dry areas such as the sub tropics and seasonally dry tropical regions and make a significant contribution to the farm economy in mixed farming systems. In rural areas, which are too dry for cropping, where steppes and ranges are found, they are the main source of income for the population (Rodriquez, 1997, Belete, 2013). According to Hirpa and Abebe (2008) Small ruminant contribute a quarter of the domestic meat consumption about half of the domestic wool requirements about 40% of fresh skins and 92% of the value of semi processed skin and hide export trade of the country. They represent only 7% of the average total capital invested in livestock in the mixed crop-livestock production system, while they account on average for 40% of the cash income earned by farm households 19% of the total value of subsistence food derived from all livestock production and 25% of total domestic meat consumption. Sheep and goats production is an important activity for smallholders, particularly for resource poor farmers in many parts of Ethiopia.

They are widely reared in a crop-livestock farming systems and are distributed across different agro-ecological zones of the country. They provide their owners with a vast range of products and services such as immediate cash income, meat, milk, skin, manure, risk spreading or management and social functions (Adane and Girma, 2008). According to CSA (2015), the main sheep and goat producing regions are Oromia (34.2%sheep and 27% goats), Amhara (33% sheep and 20% goats), SNNP (16% sheep and 17.5% goats) and Tigray (6.2% sheep and 15% goats). Small ruminants are mainly kept for income generation in many parts of Ethiopia to obtain cash income for household expenses, such as buying grains for household consumption, buying agricultural inputs such as fertilizer and seed and paying the medical and school expenses of household members They are also considered as investment and insurance to provide cash sources for purchase of farm inputs and house expenses (Urgessa *et al.*, 2012; Zemeda, 2016).

2.1.3. Meat consumption in developing country

Demand for food of animal origin in developing countries is expected to double by the year 2020 (Delgado *et al.*, 1999). Enhanced by increases in urbanization, population and income growth, such demand will create markets for animal products and encourage commercialization of livestock production (Delgado *et al.,* 1999). The extent of this commercialization depends on the consumption of the products by consumers. Meat consumption behavior is the deciding factor for the development of the livestock sector in general and small ruminants in particular (Thammi Raju and Suryanarayana, 2005). Consumption of sufficient meat is a rare extremity in most developing countries. Developed countries consumed a consistent level of 77 kg of meat per capita annually, while developing countries struggled to maintain a diet with only 25 kg of meat per capita annually Ethiopians remained slightly below the meat intake of all low-income countries consuming 9kg per capita annually (Tesfaye, 2007). Beginning from ages of comparable 6.2.and 6 months, respectively male goat and sheep are slaughtered for family consumption. According to the finding of (Tsedeke, 2007) 7.1 and 7.7 month respectively for kid and lambs are slaughtered for family consumption. And also Meat processing industry is on the rise in Ethiopia even though the sector is still much less than it should be given the resource potential. Currently there are about 15 export slaughter houses including 8 under establishment and more than 29 abattoirs serving the local market (AACCSA, 2015).

2.1.4. Small ruminant marketing in Ethiopia

Potential production and market opportunities for small ruminant meat have not been exploited because of scant knowledge of small ruminant demand patterns (Ehui *et al.,* 2000). An important aspect of production and its response to demand and supply is knowledge of markets and marketing systems. To shift production from subsistence to a more commercial outlook is especially important to describe and intervening aspects of marketing infrastructure and facilities, market channels and outlets, buyer preferences for live animals and their meats, major market players, government intervention and role of the private sector (Devendra, 2007).

There is an increase in demand of Ethiopian small ruminants both for local and export markets (Azage *et al.,* 2006). Some studies showed that smallholder farmers mainly keep small ruminant as a source of income (Getahun, 2008) which may indicate higher demand for small ruminants. The main actors of the 1st tier are local farmers and rural traders/rural assemblers who transact at farm level. Those small traders from different corners bring their animals to the local market (2nd tier). Traders/wholesalers purchase a few large animals or a fairly large number of small animals for selling to the secondary markets. In the secondary market (3rd tier), both smaller and larger traders operate and traders (wholesalers or retailers) and butchers from terminal markets come to buy animals. In the terminal markets (4th tier), big traders and butcher (wholesalers or retailers) transact larger number of mainly slaughter type animals.

2.1.5. Status of small ruminant export market

Preferred small ruminant breeds: According to abattoirs and live animal exporters, the Ethiopian sheep and goats breeds most preferred in the Middle East market are the Black Head Somali and Afar sheep. The Borena, Somali and Afar are among the most preferred goat breeds. The preferences to these breeds may have been due the breeds' lowland background, their adaptation of the buyers to the conformation of the animals and the taste of the meat. However, when there is high demand and the abattoirs are unable to fulfill orders for specific breeds; other breeds of small ruminants are also slaughtered and exported (ESGPIP, 2011).

Operational export abattoirs**:** As of early 2011, there are seven functional export abattoirs involved in exporting small ruminant chilled meat. Two abattoirs (HELIMEX and ELFORA) are located in Debre Zeit, 45km from Addis Abeba and three abattoirs (Luna, Modern and Organic) are located in Modjo, 85 km from Addis Abeba. The ELFORA abattoir in Metehara is located (170 km from Addis Abeba) and the Abergele abattoir is in Mekele, 700 km from Addis Abeba (EMDTI, 2010; ESGPIP, 2011).

2.1.6. Small ruminant export

Livestock and livestock products export are among the major earners of foreign exchange for the Ethiopian economy. Of the total number of live animals exported 19% was sheep. In sheep and goat marketing system, 95% of the exported animals were sheep (Hailemariam, 2009). Nearly all Ethiopian live sheep and goat are exported to Saudi Arabia and United Arab emirate. This indicates live animals export from the country lack diversified export destinations. Additionally, Ethiopian market share and absolute exports to the Saudi market have declined in recent years while the share of the competitors increasing. As the country has the largest number of livestock in Africa, It has much to gain from the growing global market for livestock products. The proximity of Ethiopia to the Middle East and their adaptation to the indigenous animals are some of the advantages for the Ethiopian export market (Belachew and Jemberu, 2003). However, the international market for meat has become more competitive and the meat traders have had to adopt improved practices in production, processing and packaging of meat. Market requirements also differ both in sizes of carcass and the level of fatness of the carcass. Thus the legal export of both live animal and processed meat is thus constrained due to shortage created by the illicit export. According to Daniel, (2008) the estimated annual illegal flow of livestock through boundaries reaches as high as 320,000 cattle. This being the potential for export, the actual performance has remained very low, leaving most (55 to 85%) of the projected livestock off take for the unofficial cross-border export and the domestic market.

According to the finding of Legese (2008) a large percentage of the live sheep and goat and meat exported from Ethiopia originates from Afar pastoral area Ethiopia export of meat of which most is chilled sheep and goat carcasses in 2011 was much less than 1% of the total volume of global meat exports, which was estimated at USD 105 billion (USAID, 2013). However, this is the result of the last decade in which time the country has built markets in several African and Middle Eastern countries including, United Arab Emirates, Saudi Arabia, Angola, Egypt, and Bahrain.

2.1.7. Opportunities of ruminant meat export market from Ethiopia

The following points include opportunities meat export in Ethiopia: Large and small ruminant population with diverse genotypes, proximity to the Middle East market, high Government support and interest at all levels, the coming in to being of Integrated, agro-industrial Park in Ethiopia at strategic locations to give one stop shopping service and to harmonize the products from the development wing with manufacturing, increasing number of export abattoirs in Ethiopia with big investment opportunities, the beginning of livestock registration and traceability systems at pilot level, the coming into being of Ethiopian Government is the interest to Ethiopian meat observed from Chinese government side and other countries, the presence of meat strategy and Livestock Master Plan studies as guiding documents and the consensus reached among most African countries for intra- African integration which will open the new avenue for trade relationship. The fast and sustainable economic growth which has got a spillover effect for the development of the manufacturing sector including the meat sub-sector.(Eshetie, Hussien, Teshome, & Mekonnen, 2018)

2.2. Livestock Production Systems in Ethiopia.

Farmers/pastoralists choice of agricultural enterprises in Ethiopia depends on the production environment (availability of resources, particularly land, water and climate), long-standing tradition of agricultural production in the community, socio-economic circumstances (awareness and skill, access to inputs and markets), and government support (inputs and services) which stems from agricultural policies. Livestock production systems are identified on the basis of contribution of the livestock sector to the total household revenue (income and food), type and level of crop agriculture practiced, types of livestock species kept, and mobility and duration of movement. Mode of livestock production in Ethiopia is broadly classified into pastoral, agro pastoral and mixed crop–livestock, peri-urban and urban production systems. In pastoral systems, extensive livestock production is mostly the sole source of livelihood with little or no cropping. In the sub moist/moist lowlands, agro pastoralism is the main mode of production. Crop and livestock production are both important activities. The system is either transhumant or sedentary. The pastoral production system in some areas has been evolving into agro pastoral system.

Livestock production is a secondary enterprise in the highland mixed crop–livestock systems, although livestock assumes a major importance in areas (e.g. subalpine areas) where crop production is unreliable. The less dominant and underdeveloped systems include urban/peri-urban dairying and sheep/goat fattening and large-scale commercial livestock production.

2.2.1. Small ruminant production systems in Ethiopia

Ethiopia is a country endowed with diversified fauna and flora that are found in various agro ecologies. These agro-ecologies can be further categorized into sub-agro-ecologies and macro and micro niches which are the home of differently adapted animal and plant species. In the agricultural systems, there are various integrated and interrelated systems among which crop farming and livestock keeping are important components. Livestock production system varies due to differences in livestock species, resource endowment, climatic condition, human and livestock population, and level of economic development, research support and government economic policies. Moreover, soil condition and crop farming also contribute for variation of livestock production systems. There are various factors that should be considered to categorize small ruminant production systems in Ethiopia. In mixed crop-livestock production system which mainly seen in central highland of the country, small ruminant production is characterized by low productivity due to nutritional stress and internal and external parasites. The Pastoral and agro-pastoral systems which are found in the lowlands are characterized by extensive production based largely on the rangeland (Tembely, 1998; EARO, 2000).

Based on prevalence of agricultural activity Getahun (2008) has classified traditional small ruminant production system into:

1. Small ruminant in annual crop-based system; located in northern, north western, and central highlands.
2. Small ruminant in perennial crop-based; mostly found in southern and south-western highlands.
3. Small ruminants in cattle based systems; these systems usually exist in agro-pastoral and semi-arid areas.
4. Small ruminant dominated systems; found in pastoral and arid areas of eastern and north-eastern Ethiopia, in which system sheep and goats are the dominant livestock species.

2.2.2. Challenge of small ruminant production in Ethiopia

In central rift valley, feed shortage was reported as one of the limiting factors in small ruminant productivity (Abule, 1998). In these areas where there are few rainy months with limited rainfall of erratic nature feed production for small ruminants is inadequate. According to Belete (2009) feed shortage in both seasons (dry and wet) limits productivity of small ruminants and it was further worsened due to the absence of awareness and practice of feed conservation techniques. Moreover, forage development has been given less attention in most part of Ethiopia.

According to Belete (2009) diseases and parasites hamper small ruminant production by causing high mortalities especially among suckling animals. Diseases and parasites cause reduction of productive and reproductive performance of small ruminant production. According to Belete (2009) water shortage and drought occurs due to relatively smaller rainfall and shorter rainy seasons in most of goat producing areas of the country. The major problems are the traditional management systems which are not market oriented, underdeveloped marketing systems poor infrastructure, poor financial facility and presence of cross-border trades (Berhanu *et al.*, 2007).

2.2.3. Opportunities of small ruminants and future prospects production in Ethiopia

Meat type sheep and goats consume 3% dry matter of their body weight (Alemu, 2008). Sheep and goats have higher survival rates under drought conditions compared to cattle. Moreover, because of their reproductive rates, flock numbers can be restored more rapidly. Sheep and goats are widely adapted to different climates and are found in all production systems. They also have lower feed requirements compared to cattle because of their small body size. This allows easy integration of small ruminants in to different farming systems (Adane and Girma, 2008). Small ruminants have short generation cycles and high reproductive rates, which lead to high production efficiency.

2.3. Feed Resources of Small Ruminants.

In Ethiopia the major livestock feed resources are mainly natural grazing and browse, crop residues, improved pasture and agro-industrial byproducts. The feeding systems include communal or private natural grazing and browsing, cut- and-carry feeding, hay and crop residues. At present, in the country sheep are fed almost entirely on natural pasture and crop residues. Grazing is on permanent grazing areas, fallow land and crop land after harvest (Stubble). The availability and quality of forage are not favorable year round. As a result, the gains made in the wet season are totally or partially lost in the dry season. Inadequate feed during the dry season is a major that causes decline in the productivity of small ruminants.

Natural pastures are naturally occurring grasses, legumes, herbs, trees and shrubs that are used as animal feed. They comprise the largest feed resources, but estimates of the contribution of feed resource vary greatly. Estimated that75-80% of the livestock feed in Ethiopia is obtained from natural pasture. Grazing land occurs on permanent grazing areas follow land and on farm land following harvest. Both follow land and crop stable provide. The total area grazing and browsing in the country is 62,280 million hectare. Out of this 12% is in the farming area and the rest is around pastoral area Communal grazing is normal and managed as a common property resource. The carrying capacity of the grazing area, if calculated on plant availability, should allow a plant use of 30–50%. Hay is the most commonly stored fodder on the farmer and is one oldest system used to level out the feed supply through out of the year. It is generally the most covenant process of forage. The aim of making hay is to conserve the maximum of dry matter (DM) and nutrient at the lowest cost. Hay should be made at the optimum data to maximize yield and still have the percentage of digestible dry matter necessary to meet the nutrient need.

2.4. Organ and Carcass Condemnation and Its Causes

2.4.1. Organ and Carcass Condemnation

Meat inspection assists in detecting certain diseases of livestock and prevents the distribution of infected meat that could give rise to disease in animal and human being and to ensure competitiveness of products in the local market (Hinton and Green, 1993). Abattoir data can be a source of valuable information on the incidence and epidemiology of animal diseases. This can help to know to what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs (Singla and Juyal, 2014). The main causes of organ condemnation during post mortem inspection are diseases originated by parasites, bacteria and viruses. Flukes in liver and hydatid cyst in lung, liver and kidney are mainly involved (Mezegebu, 2003).

Parasites in the tropics are responsible for far greater loss to meat industry than any other diseases (Jobre et al., 1996). Similarly, like many other tropical countries in Africa, it is well known that parasitic diseases are the major factors responsible for low productivity in livestock in Ethiopia (Jobre et al., 1996). In Ethiopia, many studies have been undertaken to identify the major disease conditions encountered during ante mortem and postmortem inspection and to determine the economic importance of organ and carcass condemnation (Jatenie et al., 2014). For instance, Fasciolosis, hydatid cyst, *C. bovis*, pneumonia, emphysema, hydro nephrosis, cirrhosis, hepatitis, calcification and abscess were the major causes of organs condemnation in cattle slaughter at Adigrat municipal abattoir (Alembrhan and Haylegebriel, 2013).

2.4.2. Pneumonia:

Pneumonia is characterized by congestion and consolidation of the lungs. Clinically, it is manifested by dyspnoea, coughing, weakness and nasal discharge. The pathological lesion in lungs are produced in a similar way irrespective of the aetiological agent and includes congestion, red hepatization, grey hepatization and resolution (Chauhan, 2007). Pneumonia is a major disease of domestic animals. Outbreaks occur in camel, cattle, buffaloes and small ruminants in various countries (Schwartz and Dioli, 1992).

Pneumonia can be caused by different agents such as bacteria, viruses, fungi, parasites and chemical agents (Jones and Hunt, 1997; Vegad and Katiyar, 2007). Classified pneumonia in animals into four morphological distinct types; bronchopneumonia, interstitial pneumonia, embolic pneumonia and granulomatous pneumonia. In many instances the gross and microscopic lesions are disconcertingly similar regardless of the causative agent.

2.4.3. Fibrosis and cirrhosis:

Fibrosis and Cirrhosis of liver are the usually findings in abattoir surveys. In the case of fibrosis, fibrous tissue is formed in response to inflammation or direct toxic insult to the liver. The initial stage of fibrosis develops around portal tracts or the central veins or within the spaces of dissent. With continuing fibrosis, liver is subdivided into nodules of regenerating hepatocytes surrounded by scar tissue, termed cirrhosis.

Cirrhosis is characterized by: bridging fibrous septa in the form of delicate bands or broad scars replacing multiple adjacent lobules, disruption of architecture of the entire liver and Parenchymal nodules created by regeneration of encircled hepatocytes (Talukder, 2001).

2.4.4. Emphysema:

Emphysema is characterized by dilatation of the alveoli. It may be acute or chronic, focal or generalized (Chauhan, 2007). There are two major forms; alveolar (vesicular) emphysema is characterized by excessive amounts of air within airspaces of the lung. Interstitial emphysema is the one in which there is air within the interlobular, sub pleural, and other major interstitial zones of the lung (Jubb and Kennedy, 1993). Macroscopically, lungs are enlarged and flabby, pale and the cut surface is smooth and dry. Microscopically, the alveoli are distended (Chauhan, 2007).

2.4.5. Hydatidosis

Hydatidos is one of the important zoonotic parasitic diseases caused by the larval stage of the genus *Echinococcus,* the tape worm of dogs. *Cystic hydatidosis,* caused by the *metacestode* of *Echinococcus granulosus* is one of the most common zoonotic diseases associated with huge economic losses and public health significance worldwide (Romig *et al*., 2011). Dogs and other carnivores that harbor the adult *cestode* in their small intestine are the definitive hosts for the parasite, while a wide range of mammalian species including domestic ungulates and man act as intermediate hosts (Kumsa, 1994).

Consumption of offal containing viable hydatid cysts results in infection of definitive host carnivores including dogs that void eggs in their feces contaminating the environment. The adult tapeworm in the definitive dog host is harmless unlike the hydatid cyst in the intermediate hosts that is responsible for immense economic and health hazard in infected hosts (Azlaf and Dakkak 2006; Ibrahim, 2010). Food animals such as sheep, goats, cattle, camels, buffaloes, and pigs acquire the infection by ingestion of infective eggs with contaminated grass and water. Man is infected incidentally on ingestion of infective eggs in contaminated water, vegetables, or other food or through direct contact with the dog. Upon ingestion, the oncospheres penetrate the intestinal wall and reach visceral organs such as the liver, lungs, heart, and kidneys of animals and humans to develop to hydatid cysts (Fakhar and Sadjjadi, 2007).

2.4.6. Post mortem examination

During postmortem inspection liver, lungs, heart, kidney, brain and carcasses were thoroughly inspected by visualization, palpation and making systemic incisions where necessary for the presence of cysts, parasites and other abnormalities. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing countries (Herenda*et al*., 1994). The results were recorded and the decisions were classified as totally approved, partially approved, conditionally approved as fit for human consumption and totally condemned as unfit for human consumption (FAO, 1993). A high number of livers (47.5%) were condemned from sheep and goat due to several reasons: from the total shoats slaughtered, parasites like

Cysticercus tenuicollis, Stilesiahepatica, and *fasciola* species were found to be the major causes that rendered liver rejection from international market. Previous studies have indicated a higher economic loss resulting from condemnation of edible organs and carcasses due to parasitic causes (Negategize*et al*., 1993; Jembere, 2002; Aseffa, 2005; Jibat, 2006). The higher rate of *fasciolosis* observed in sheep in comparison with goats could be due to their feeding behavior where sheep are usually grazers and goats tend to be more of browsers making them less exposed to the parasite (Mungube*et al*., 2006). Cumulative incidence of liver condemnation due to *S.hepatica* at 9.1% and 12.5% in sheep and goats, respectively, which is similar report was observed (Ejeta*et al*., 2008). The epidemiology of S. hepatica and C. *tenuicolis* was not well established in sheep and goats; hence, it may be difficult to explain why significantly more livers were condemned in goats than in sheep.

Lungs were condemned from the total lungs inspected in 35% ovine and 40% caprine species from being used as pet food because of reasons like pneumonia, emphysema, hydatid cysts and *cysticercus tenuicolis*. Pneumonia accounts for 60% as a principal cause of lung condemnation both in sheep and goat. Similar report was observed during retrospective study (Regassa*et al*., 2013). It was also reported pneumonia as a principal cause of lung condemnation in central Ethiopia accounting for 42.1% (Getachew, 2008). This indicates also violation of animal welfare stretching from farm to slaughter. Pneumonia might be also as a result of endemic diseases of sheep and goats such as *pasteurellosis*, which is triggered by stress, contagious caprine pleuro pneumonia (Radiostitis*et al*., 2007). Furthermore, different lesions of infectious and noninfectious causes like abscess, pericarditis, nephritis, and jaundice were found to be important causes for the condemnation of edible organs like liver, heart, and kidney. Similarly the same causes were found at central Ethiopia (Getachew, 2008; Regassa*et al.*, 2013) and in goats slaughtered at Nigeria (Ojo, 1992). Bruising was observed as major cause of carcass condemnation which is 36%. Bruising occurs due to beating of animals during transportation and the use of rough vehicles. Apart from affecting carcass value, bruising has also animal welfare implications as excessive use of sticks while driving to the abattoir, mishandling of animals during loading and unloading, improper transport vehicle and at slaughter could be responsible causes (Edward *et al*., 1997). It is stated that bruising of animals during transport is the major source of economic loss in Africa and Asia (Mitchell and slough, 1980).

2.5. Food Safety System

As a concept, a science-based approach to food safety is not completely new. It is related to processes such as good agricultural practices, good hygienic practices, good manufacturing practices and Hazard Analysis and Critical Control Point system (HACCP), which are already used in many countries. Scientific assessment of chemicals in general has also a rather long 'tradition'. What is new is the use of risk analysis as a framework to view and respond to food safety problems in a systematic, structured and scientific way in order to enhance the quality of decision-making throughout the food chain **(**FAO/WHO, 2003).

According to World Health Organization (WHO) global burden of foodborne diseases estimates 600 million people**,** almost 1 in 10 fall ill every year from eating contaminated food and 420, 000 die as a result. The issue of food safety is much more complicated in developing country due to enormous reasons. According to FAO (2004), the total annual meat production comes from cattle (63%), sheep (25%) and goats (12%). At the national level, sheep and goat account for about 90% of the live animal/meat and 92% of skin and hide (FAO 2004) export trade value.

2.5.1. Challenges to food safety

Food safety challenges differ by region, due to differences in income level, diets, local conditions, and government infrastructures (WHO, 2004). Here are some trends prevalent in both developed and developing countries that can increase food safety challenges (Rocourt *et* al., 2003).

2.5.2. Increases in international trade and travel

International trade allows for the rapid transfer of microorganisms and introduction of new and unfamiliar food borne hazard from one country to another. The increased time between processing and consumption of food due to long distance international travels leads to additional opportunities for contamination, time/temperature abuse, and increasing the risk of food borne illness (WHO, 2004).

2.5.3. Gaps on Ethiopian food safety system

The food system in Ethiopia is not always as organized and developed as in other developed countries. Moreover, problems of growing population, urbanization, lack of resources to deal with pre-and post-harvest losses in food, and environment and food hygiene issues mean that food systems in the country continue to be stressed, adversely affecting the quality and safety of food supplies (Wendafrash, 2010; Alock, 1992; FAO/WHO, 2005).

2.5.4. Benefits of a strengthened food safety system

Food safety plays a significant role in the national economic and health development by safe guarding the health of the nation, enhancing tourism, national and international trade for production, distribution and consumption of safe food, preventing avoidable losses and conserving natural resources. Countries with well-established food safety assurance systems could export and trade their products without any barriers and become competitive in the global trade (FAO and WHO, 2005). Food safety problems create an enormous burden on the country's economy such as consumer costs include medical, legal, and other expenses, as well as absenteeism at work and school. For many consumers who live at a subsistence level, the loss of income due to foodborne illness can perpetuate the cycle of poverty (WHO, 2002). Chronic diseases caused by contaminated food, like reactive arthritis or temporary paralysis, can be even more damaging than the initial disease and add dramatically to the medical costs and lost wages (WHO, 1998). Costs to national governments stem from increased medical expenses, outbreak investigations, food recalls, and loss of consumer confidence in the products.

3. MATERIALS AND METHODS

3.1. Study Area

The study was conducted from November 2018 to May 2019 in Yabello woreda and Modjo Town export abattoirs and retail meat shops; Yabello is one of the Oromia regional state of Borena zone pastoral woredas. The altitude of yabelo woreda ranges from 350 to 1800 meters above sea level. There are no rivers or streams in Yabelo. A survey of the land in this woreda shows that 10% is arable or cultivable (7.5% was under annual crops), 60% pasture, 10% forest (5.5% state forests), and the remaining 20% is considered swampy, degraded or otherwise unusable. A notable local landmark is the Yabelo Wildlife Sanctuary. The capital of the Woreda (yabelo) is 570kms far from Addis Ababa. Borana pastoralists and agro-pastoralists in southern Ethiopia have a well-established traditional system of range and water management. Based on figures published by the Central Statistical Agency in 2005, this woreda has an estimated total population of 82,443, of whom 41,132 are men and 41,311 are women; 18,478 or 22.41% of its population are urban dwellers, which is greater than the Zone average of 11.6%. With an estimated area of 5,523.31 square kilometers, Yabelo has an estimated population density of 14.9 people per square kilometer, which is less than the Zone average of 21.1. The total animal population of the yabelo woredas are; cattle 115,600, goat 100,179, sheep 43,591, camel 19,401, donkey 4,827, horse 371, mule 373, poultry 19,401. (Yabello Woreda Agriculture office; 2017) Yabelo woreda is one of the basic origins of Borena bread that can have high population of sheep and goat from borena zone. Yabello woreda have 13 PA (kebeles) from those 13 PA were purposively selecting 3 kebeles those have more production.

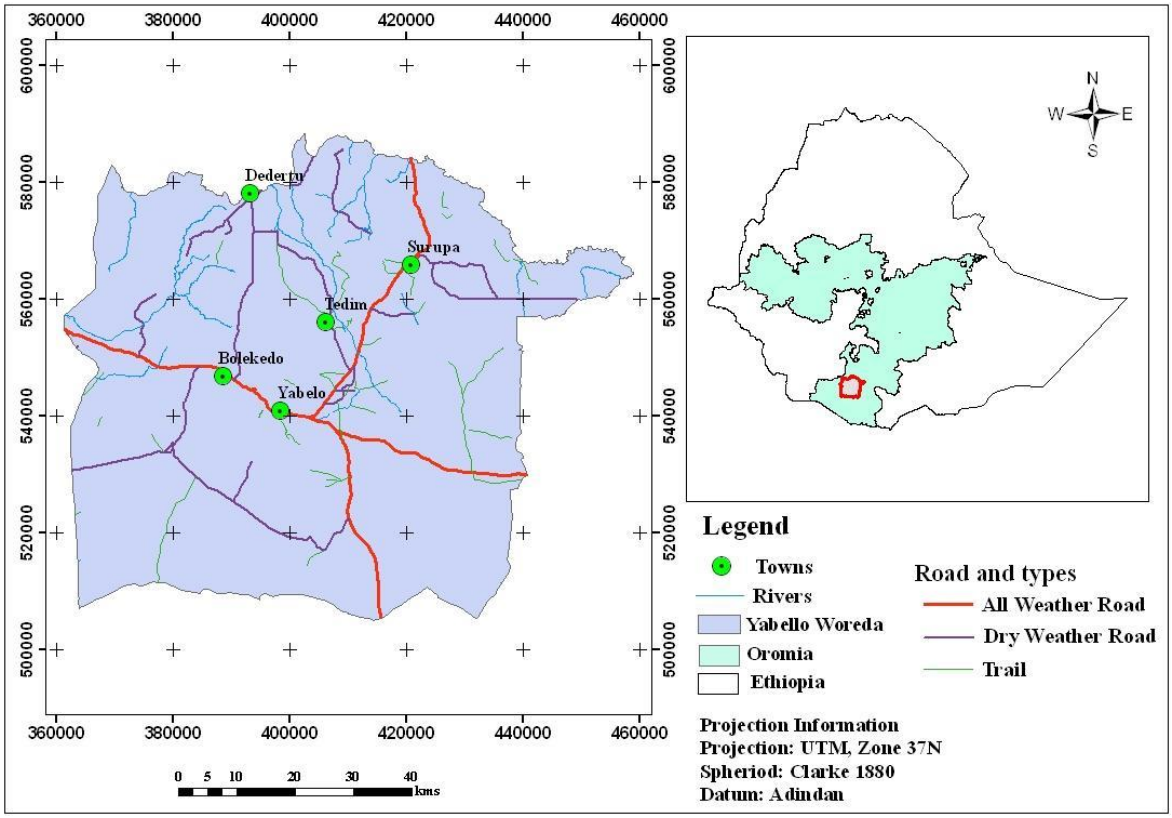

Figure1: Yabelo Woreda

Mojo (also transliterated as Modjo) is a town in central Ethiopia, named after the nearby Modjo River. Located in the Misraq Shewa Zone of the Oromia Region, The Modjo town is located at 70 km from Addis Ababa it has a latitude and longitude of 8°39′N 39°5′E with an elevation between 1788 and 1825 meters above sea level. It is the administrative center of Lome woreda.

Mojo is not only accessible by road (a road connecting the town to Adama was built before the Italian conquest) but has been the location of a train station of the Addis Ababa - Djibouti Railway since the line was extended from Dire Dawa to Akaki in 1915. With the railroad, Modjo also gained telegraph (later telephone) service and a restaurant to serve travelers.

Based on figures from the Central Statistical Agency in 2005, Modjo has an estimated total population of 39,316 of whom 19,278 were males and 20,038 were females. The 1994 national census reported this town had a total population of 21,997 of whom 10,455 were males and 11,542 were females.

Figure 2: Modjo Town

3.2. Study Population

The study animal has comprised indigenous sheep and goat brought from various localities to Modjo export abattoirs for slaughtering purposes. It is difficult to precisely trace back the exact origin of all animals which was slaughtered in Modjo export Abattoirs and relate the findings on major causes of organ condemnation and basic constraints of meat production encountered in the study area.

3.3. Study Design

A cross-sectional study design was employed to identify major constraints of sheep and goat meat production, assessing causes of organ and carcass condemnations and food safety knowledge, attitude, practice of meat handlers in Modjo export abattoirs and municipal retail meat shops.

3.4. Sample Size Determination and Sampling

The total number of sheep and goat for the study was calculated based on the formula given by thrusfield (2005), with 95%confidence interval 5% absolute precision and 50% expected prevalence.

$$N = \frac{1.96^2 (p) (1-p)}{D^2}$$

Where, n = sample size, P = expected prevalence, D = desired level of precision (5%).

Therefore: $n = \frac{1.96^2 (0.5) (1- 0.5)}{0.0025} = 384$ samples

Accordingly the minimum require sample size was 384 total of 400 sheep and goat were sampled

Systematic visit has made to abattoirs from Nov 2018 to May 2019. The organ of sheep & goat in the abattoir during the study period has investigated the cause and loss of organ & carcass condemnation examined by veterinary physician, record and spread sheet to the excel data & finally analyzed.

The animals has been selected in simple random sampling method and routinely inspected. Majority of sheep and goat have been expected are Ethiopian indigenous sheep and goat types originated from pastoral (low land) areas including Borena (Yabello), Awash Metahara, Arbaminch, Jinka, Miesso, Bable, Bati (Wollo) were used in the abattoir as slaughter animal. Most of sheep and goats are expected come from Borena (Yabello) to Modjo export abattoir for slaughter purpose, only male adult animals were slaughtered.

4. METHODOLOGY

4.1. Questionnaire Survey and Observation

Across sectional survey was conducted using semi-structured questionnaire from Yabelo wereda; Thirty house holders were involved & participated from three purposively selected kebeles source of sheep & goat production for export abattoirs. The questionnaire was adopted from previous research articles. The questionnaire was prepared in English and translated to the local language (Afan Oromo) in which all the participants can communicate. The face to face interview was made at farmers' home by trained data collectors. The questioner was structured in to 6(six) parts: including general information, and it contain purpose of keeping sheep and goat, main water source and frequency, main feeding source, feeding system, health service, and marketing system. Prior to conducting the measurements they are thoroughly oriented on basic methods of conducting the production system survey and efficiently collecting the necessary information from households.

A structured questionnaire was adopted from previous published research articles. The language of the questionnaire was translated to the local language (Amharic) in which the participants can communicate. The questionnaire structured into four distinct parts including demographic information such as respondents' sex, age, years of experience, responsibility/duty, income, employment status, having health certificate and attending food safety training. The second section of the questionnaire is about food safety knowledge, attitude practice. Questions on knowledge referred to their personal hygiene, cross contamination, causes and symptoms of food borne diseases, and time temperature control.

A cross-sectional survey was conducted among meat handlers from all Modjo export abattoirs and all municipal retail meat shops in Modjo town, Oromia Regional State of Ethiopia. One hounded sixty four meat handlers were interviewed by using structured questionnaires. with 100% response rate, All (n = 164) workers involved in meat processing in the Modjo export abattoirs and retail meat shops of the Modjo town were included in the study and the respondents were interviewed face to face. Explanation on the purpose of the study was given before and the respondents were assured about the confidentiality of their status. The respondents were given sufficient time (30 min) to answer the questionnaire

4.2. Observation and Assessment

Constraints to sheep and goat's production, marketing and opportunities for improvement were assessed based on empirical data on the characteristics of the production environments and production/marketing systems.

4.3. Postmortem Examination

The organ and carcass was systematic random selected sheep and goats are examined by visual inspection, palpation &incision organ of each slaughtered animals infected with different internal parasites and other pathological causes were identified systematically following the standard routine post mortem inspections procedure. The inspected organs were collected for close examination and identify the cause and registered.

4.4. Data Analysis

4.4.1. Statically data analysis

The statistical analyses of the data were performed by using SPSS (Statistical Package for the Social Sciences) software version 20. Descriptive statistics such as frequency (%) for categorical were used to sum up the data. Chi square ($\chi 2$) test was also used to assess the relationship between the socio demographic characteristics with knowledge, practice, organ loss and pathologic condition scores. P-value less than 0.05 were considered statistically significant.

4.4.2. Annual loss of the condemned organs and carcass

Annual economic loss of the condemned organs and carcass due to *fasciolosis, hydatidosis, cysticercosis, calcification, pneumonia, emphysema,* un known pox, bruise, discolorations, etc. were direct economic losses has been calculation based on condemned carcass, organs like liver, lungs, heart, kidney, tongue has been conducted. To calculate cost of condemned edible organs, different buyers of organ, finance mangers, and suppliers in the abattoirs ware interviewed systematically to establish the price per unit organ/carcass and the average price was determined to calculate the loss.

4.4.3. Assessment of direct financial loss

The direct financial loss due to whole carcass and organ condemnation was assessed by considering the number of slaughtered animals at the abattoir, condemnation rate and the prevailing market prices of carcass and organs as described by Ogurinade and Ogurinade, (1980).

DAL= ΣAC*AP*CR Where

DAL = Direct annual financial loss due to carcass condemnation

AC = Animal slaughter rate at the abattoir

AP = Average price of condemned carcass/organ at the market

CR = Carcass condemnation rate at the abattoir

5. RESULT

5.1. Sheep and Goat Production Constraints in Yabello Woreda

Market problem was faced because of most of kebels were far from the market, like Dikale kebele is 40km from Yabello market, Terito 25km, and Did yabello is 14km which is the nearest to yabello. Purpose of keeping sheep and goat at Yabello woreda was for in come, meat consumption and wealth status at the first rank as a response result of three kebels 50%, 46.7%, and 3.3% respectively(Table.1), All respondents are gave 4^{th} rank for the purpose of milk consumption 100.0%, and for skin purpose they gave 5^{th} rank which is 100.0%.

Table 1. Ranking purpose of keeping sheep and goat.

No	Rank	Frequency	Percentage
1	**Meat consumption**		
	1	14	46.7
	2	12	40.0
	3	4	13.0
2	**Milk consumption**		
	4	30	100.0
3	**For in come**		
	1	15	50.0
	2	12	40.0
	3	3	10.0
4	**Wealthy status**		
	1	1	3.3
	2	6	20.0
	3	23	76.7
5	**For skin**		
	5	30	100.0

Feed and water supply or availability has the basic constraints of sheep and goat production around the study area as a result of this study (Table.2), All respondents were used natural pasture feed which was freely available at winter and summer, watering available in winter and summer is available once in 2 days and/or once in 3 days 100.0% response respectively. So water availability has the basic constraints for the study area as a result, additionally the respondents say that 100.0% service of health care is only government veterinary service which has not available for all households. There was the different infection disease like CCPP, sheep and goat pox, ovine *Pasteurolosis*, and PPR etc. generally they are vaccinating annually in this year CCPP, O/P, SGpox 60%, CCPP, SGpos 33.3%, and CCPP, SGpox, O/P 6.7%.

Table 2. Availability and source of feed, water and health.

No	Rank	Frequency	Percentage
1	**Feed source**		
	Natural pasture	30	100.0
	Freely available		
	Winter and summer	30	100.0
2	**Watering available**		
	Winter and summer		
	Once in 2 day	30	100.0
	Once in 3 day	30	100.0
3	**Veterinary service**		
	Gov. veterinary	30	100.0
4	**Vaccination**		
	CCPP, SG pox,	10	33.3
	CCPP, SG pox, OP	2	6.7
	OP, SG pox, CCPP	18	60.0

5.2. Organ and Carcass Condemnation Frequency and Percentage

In this systematic study liver and lung were the most frequently affected organs with highest rejection rate followed by kidney, heart and tongue. The affected organ and carcass rejection frequency and number of liver were138 (46.3%), lung were 165 (55.3%), kidney 55 (18.5%), heart 42 (14.1%), tongue 43 (14.4%) in both species (table 3). The main causes of condemnation were calcification resulting in condemnation rate of 49.6%, followed by pneumonia with 20.9%. And 20.6%, 20.2%, 14.4%, 8.7% were abscess, *hydatid cyst, stelesia hepatica and emphysema* respectively, and also 19.6% bruising was also common reason for partial/total rejection of carcass additionally carcass discoloration 3.7% and un known pox 3.4% were major cause for total rejection of whole carcass in both species (Table 4).

Table 3. Organ and carcass condemnation n (%) both species.

		Sheep		**Goat**	
NO	Condoned Organ/carcass	Frequency	Percentage	Frequency	Percentage
1	Lung	84	27.7	81	27.6
2	Liver	72	23.8	66	22.5
3	Kidney	25	8.3	30	10.2
4	Heart	22	7.3	20	6.8
5	Tongue	21	6.9	22	7.5
6	Carcass	79	26.1	70	23.9

Table 4. Frequency and percentage of pathological reason for organ and carcass condemnation.

	Sheep.			Goat.		
No	Pathological condition	Frequency	Percentage	Pathology condition	Frequency	percentage
1.	Abscess	32	11.0	Abscess	29	9.6
2.	Abscess and contamination	12	4.1	Abscess & condemnation	9	2.9
3.	Adhesion	3	1.0	Adhesion	7	2.3
4.	Bruising	29	9.7	Bruising	30	9.9
5.	C. Ovis	6	2.0	Bruising & contamination	5	1.7
6.	C. Teniculosis	9	3.1	C. Ovis	6	2.0
1.	Calcification	34	11.6	C. Teniculosis	13	4.3
2.	Contamination	8	2.7	Calcification	38	12.5
3.	Discoloration	5	1.7	Contamination	9	3.0
4.	Emphysema	12	4.1	Discoloration	6	2.0
5.	Fasciolosis	9	3.1	Emphysema	14	4.6
6.	Fibrosis	6	2.0	Fascioliasis	9	3.0
7.	Hydatid cyst	31	10.6	Fibrosis	6	4.3
8.	Mechanical damage	13	4.4	Hydatid cyst	29	9.6
9.	Nephritis	9	3.1	Mechanical damage	9	3.0
10.	Pericarditis	10	3.4	Pericarditis	13	4.3
11.	Pneumonia	33	11.3	Pneumonia	29	9.6
12.	Stelesia hepatica	21	7.2	Stelisia hepatica	22	7.2
13.	Un known pox	4	1.4	Unknown pox	6	2.0

5.2. Financial Loss Due to Organ and Carcass Condemnation

Generally the organ was rejected due to pneumonia, hydatid cyst, adhesion, calcification, *C.teniculosis*, emphysema, in case of lung, and the liver was totally condemned due to *hydatid cyst, stelesia hepatica, abscess, calcification, fasciolla. Nephritis*, and mechanical damage the most cause of kidney rejection, in heart organ rejection mostly in case pericarditis, abscess, calcification and tongue has rejected in case of abscess, *C.ovis*, and *fibrosis* and finally the grate economic is due to total rejection of carcass this is due to bruising, discoloration and abscess etc. There is a direct financial loss due to sheep total organ rejection is 589,248 ETB and 10,137,600 ETB annually loss is due carcass total rejection, finally in sheep both organ and carcass total rejection were 10,726,848 ETB loss annually.

Table 5. Sheep organ and carcass rejection and financial loss in Modjo export abattoirs.

Organ and carcass	No. of Organ/carcass Condemned	% of organ/carcass Condemned	Price per organ ETB	Annual price in ETB($)where 1$=28ETB
Tongue	21	0.085	2	19,584
Lung	84	0.34	4	161,280
Liver	72	0.29	10	334,080
Kidney	25	0.1	2	23,040
Heart	22	0.089	5	51,264
Organs total	**224**	**-**	**-**	**589,248**
Carcass total	**25**	**0.1**	**880**	**10,137,600**
Grand Total	**249**	**-**	**-**	**10,726,848**

5.2.1. Assessment of direct financial loss.

Direct financial loss due to goat total organ rejection is 559,872 ETB and 10,137,600 ETB annually loss is due carcass total rejection, finally in sheep organ and carcass total rejection is 10,697,472 ETB losses annually (Table 5). As a summery result Organ and carcass rejection in sheep is greater than goat. Generally Estimated of annual financial loss was computed based on the annual slaughter rate of both species, average cost of condemned organ and carcass during the study period and condemnation rate of the slaughter house as indicated in the above equations. Finally based on this study, the annual financial loss in both species estimated to be 21,424,320 ETB or 765,154.29 USD from domestic and international markets (Table 5, 6). In general, 30,965,760 ETB or 1,105,920 USD was annually loss only due carcass rejection from export market.

Table 6. Goat organ and carcass condemnation and financial loss in Modjo export abattoirs.

Organ and carcass	No. of Organ/carcass Condemned	% of organ/carcass Condemned	Price per organ ETB	Annual price in ETB($)where 1$=28ETB
Tongue	22	0.09	2	20,736
Lung	81	0.33	4	152,064
Liver	66	0.27	10	311,040
Kidney	30	0.13	2	29,952
Heart	20	0.08	5	46,080
Organs total	**219**	**-**	**-**	**559,872**
Carcass total	**26**	**0.1**	**880**	**10,137,600**
Grand Total	**245**	**-**	**-**	**10,697,472**

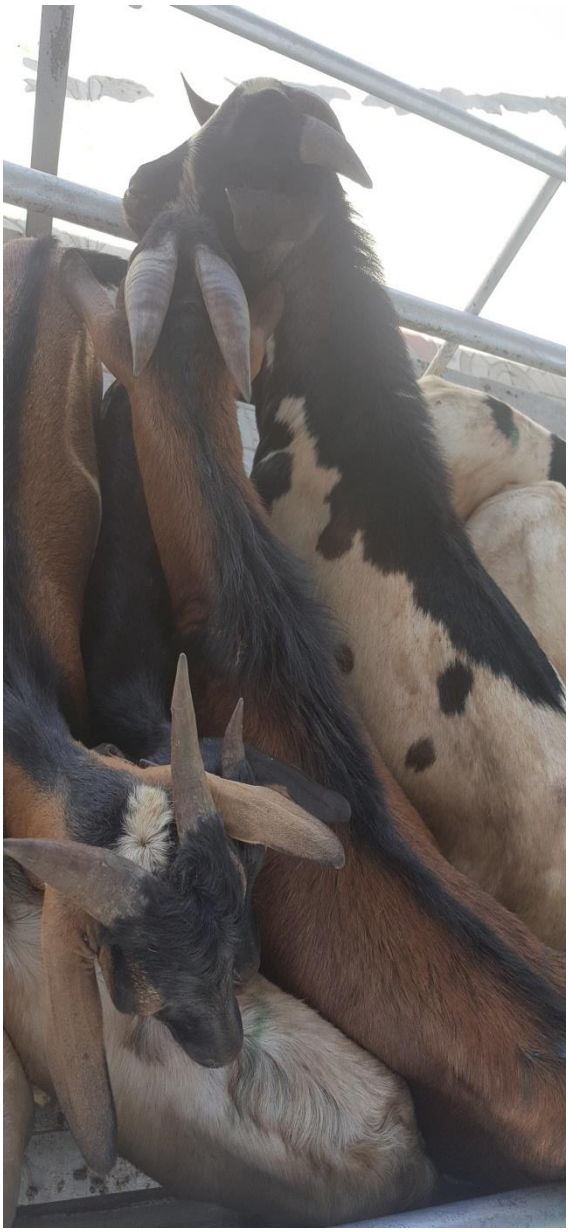

Figure 3: Activities in the abattoir

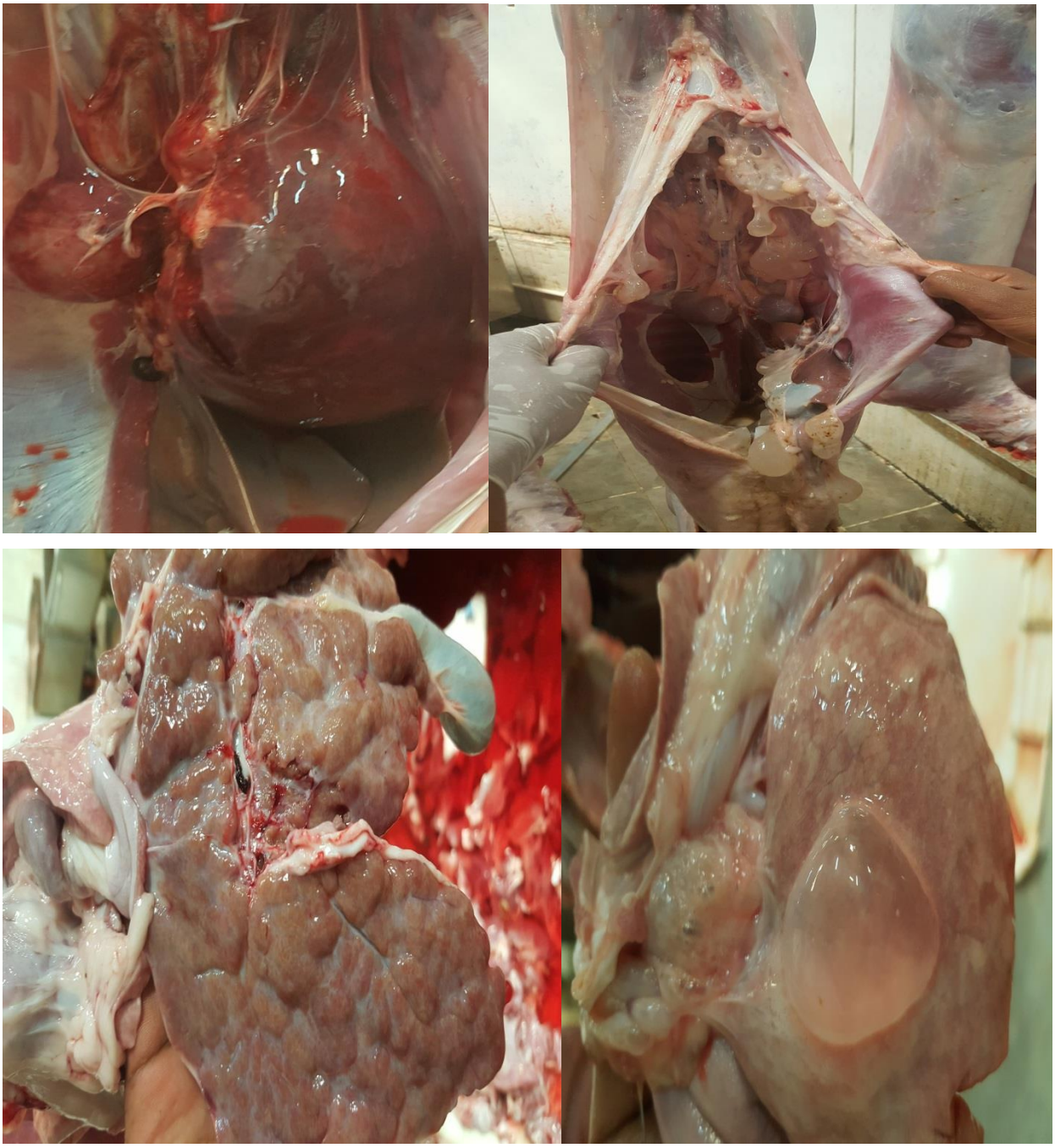

Figure 4: Organs condemned in different pathological reason

5.3. Socio Demographic Characteristics of Respondents in Modjo Retail Meat Shops.

Respondents participate in this study (Table 7) 100.0% were males. Those respondents within the age of 31-40 years comprised 51.6% followed by age of 20- 30 (48.4%). Education level of majority of the respondents (34.4%) was at the level of illiterate and primary followed by considerable number of secondary (28.1%). Only two respondents (3.2%) are attained college education/diploma (10+3). All duty of the meat handlers has 100.0% butchers and their employment status was 87.5% are permanent, the rest 12.5% are contract respectively. Monthly income of majority of the meat handlers (79.7%) is in the range between 1000 and 2000 Ethiopian Birr (ETB), which is less than 100 USD per month, and the rest respondents (20.3%) are get between 2000-3000 ETB. About 68.8% of experience year has less than five year(<5), 29.7% of respondents have been working in this sector for 5-10 years and only one person have more than 10 years' experience with an average length of 1.6% years of experience. Nobody got food safety training as a result of this assessment 100.0%, and 95.3% not have health certificate, but 4.7% have health certificate.

Table 7. Socio demographic characteristics respondents of Modjo retail meat shop

Characteristics	Frequency(n)	% Percent
Age		
20-30	31	48.4
31-40	33	51.6
Education		
Diploma	2	3.2
Illiterate	22	34.4
Primary	22	34.4
Secondary	18	28.1
Employment status		
Contract	8	12.5
permanent	56	87.5
In come		
1000-2000	51	79.7
2001-3000	13	20.3
Year of service		
<5	44	68.8
>10	1	1.6
5-10	19	29.7
Food safety training		
No	64	100.0
Health certificate		
No	61	95.3
yes	3	4.7

5.3.1 Meat handlers' food safety attitude in Modjo town retail meat shop

As a summary result of food safety attitude of meat handlers in Modjo retail meat shops Are generally they don't have a good satisfactory attitude (Table 8), as a result of participant respondents meat handlers in retail meat shop has respond that meat handlers with wound, bruise/injuries on their hand must not touch the meat 70.3% attitudes was not have a good attitude, and also many of the respondents has not have a good attitude in improper meat storage is dangerous to the health which score 81.3% are wrongly answered, in regular training for meat handlers is could improve meat safety and hygienic practice 15.3% correctly answered but, 62.5% incorrectly respond, 21.9% are didn't sure the answer respectively. All the respondents' meat handlers was not have a good attitude in both; knives and cutting boards should be properly sanitized to prevent cross contamination, and hooks, knives and cutting boards can be a source of food contamination but, all most the half of meat handlers were they don't sure the answer. 79.7% of participants have a good attitude in the same towel to clean many place and 46.7% putting on hair cover on the head is a good practice in food industry.

Table 8. Meat handlers' food safety attitude in Modjo town retail meat shop.

No	Statements	Responses %(n)		
		Yes	No	Not sure
1	Meat handlers with wounds, bruises or injuries on their hands must not touch or handle meat	57.2(11)	70.3(45)	12.5(8)
2	Using watches, earrings and rings will increase the risk of meat contamination	34.4(22)	53.1(34)	12.5(8)
3	Improper meat storage is dangerous to health	3.1(2)	81.3(52)	15.6(10)
4	Hand washing before handling meat reduces the risk of contamination	3.1(2)	68.8(44)	28.1(18)
5	Regular training could improve meat safety and hygiene practices	15.6(10)	62.5(40)	21.9(14)
6	Safe meat handling to avoid contamination and diseases is part of meat handler job responsibilities	0(0)	34.4(22)	65.6(42)
7	Keeping working surfaces and utensils clean reduces the risk of illness	4.7(3)	64.1(41)	31.3(20)
8	Using different knives and cutting boards for meat and offal is worth	0(0)	56.3(36)	43.8(28)
9	It is unsafe to leave meat out of the refrigerator for more than 2 hour.	0(0)	65.6(42)	34.4(22)
10	meat for freshness and wholesomeness is valuable	0(0)	46.9(30)	53.1(34)
11	Surfaces and equipment should be clean before re-using for meat processing	23.4(15)	48.4(31)	28.1(18)
12	After processing meat, any leftovers should be kept in a cool place within	9.4(6)	60.9(39)	29.7(19)
13	Raw meat is healthier and nutritious than cooked	54.7(35)	17.2(11)	28.1(18)
14	Knives, hooks and cutting boards can be a source of food contamination	0(0)	64.1(41)	35.7(23)
15	Knives and cutting boards should be properly sanitized to prevent cross contamination	0(0)	43.8(28)	56.3(36)
16	The same towel can be used to clean many places	79.7(51)	17.2(11)	3.1(2)
17	Sneezing or coughing without covering our noses or mouth could contaminate the meat	6.3(4)	62.5(40)	31.3(20)
18	Wearing protective clothing and shoes could help improve work safety and hygiene practices	0(0)	48.4(31)	51.6(33)
19	Putting on hair cover on the head is a good practice in food industry	46.9(30)	42.2(27)	10.9(7)
20	It is important to use potable water to wash working surfaces and cutting tools after disinfection	9.4(6)	50.0(32)	40.6(26)

5.3.2 Food safety knowledge of Modjo town retail meat shop meat handlers

The overall summary knowledge level of respondents has unsatisfactory. according to Table:9 However, many of meat handlers were aware of how to clean and sanitize food contact surface (87.5%), and Insects and pests could be a source of contamination to raw meat (37.5%), and (31.3% correct answer) in Improper handling of meat could pose health hazards to consumers. Many of the meat handlers believe that diarrhea can be transmitted by contaminated meat only (21.9%) correct answer, and cooking with elevated temperature or freezing as safe method to destroy bacteria 84.4% are in correctly answered. All respondents are they don't have knowledge or not known about *Staphylococcus aureus, hepatitis A virus*, and *E.coli* as food borne pathogens, and also they didn't now or not sure about Regular rotation of disinfectants for cleaning can reduce the risk of meat contamination from working surfaces and cutting tools, Proper cleaning and sanitization of knives and hooks reduce the risk of meat Contamination and Cross contamination is when microorganisms from a contaminated meat are transferred by the meat handler's hands or utensils to another.

Table 9. Meat handlers' food safety knowledge in Modjo town retail meat shop.

No	Statements	Responses % (n)		
		Yes	No	Not sure
1	Improper handling of meat could pose health hazards to consumers	31.3(20)	62.5(40)	6.3(4)
2	Regular washing of hands before and during meat processing reduces risk of contamination	1.6(1)	57.8(37)	40.6(26)
3	Using gloves while handling meat reduces the risk of contamination	0(0)	82.8(53)	17.2(11)
4	Proper cleaning and sanitization of knives and hooks reduce the risk of meat Contamination.	0(0)	46.9(30)	53.1(34)
5	Eating and drinking in the work place increase the risk of meat contamination	0(0)	59.4(38)	40.6(26)
6	Washing and disinfection of working surfaces and tools are important for safety of meat	1.6(1)	57.8(37)	40.6(26)
7	Regular rotation of disinfectants for cleaning can reduce the risk of meat contamination from working surfaces and cutting tools	0(0)	45.3(29)	54.7(35)
8	Insects and pests could be a source of contamination to raw meat	37.5(24)	31.3(20)	31.3(20)
9	Diarrhea can be transmitted by food	21.9(14)	46.9(30)	31.3(20)
10	E.coli is one of the food-borne pathogens	0(0)	29.7(19)	70.3(45)
11	Hepatitis A virus is one of the food-borne pathogens	0(0)	12.5(8)	87.5(56)
12	Staphylococcus is one of the food-borne pathogens	0(0)	10.9(7)	89.1(57)
13	Microbes are on the skin, nose and mouth of healthy meat handlers	1.6(1)	7.8(5)	90.6(58)
14	Clean is same as sanitized	87.5(56)	6.3(4)	6.3(4)
15	Cross contamination is when microorganisms from a contaminated meat are transferred by the meat handler's hands or utensils to another	1.6(1)	17.2(11)	81.2(52)
16	The ideal place to store raw meat is in the refrigerator	0(0)	81.3(52)	18.8(12)
17	Freezing kills all the bacteria that may cause food-borne illness	1.6(1)	79.7(51)	18.8(12)
18	High temperature or freezing is a safe method to destroy bacteria	0(0)	84.4(54)	15.1(10)
19	The correct temperature for storing perishable foods is 5C	0(0)	25.0(16)	75.0(48)
20	Contaminated meat always have some change in color, odor or taste	21.9(14)	56.3(36)	21.9(14)
21	People with open skin injury, gastroenteritis, and ear or throat diseases should not be allowed to handle meat	1.6(1)	51.6(33)	46.9(30)
22	The health status of workers should be evaluated before employment	0(0)	76.6(49)	23.4(15)

5.3.3. Meat handler's hygiene and sanitation practices of Modjo retail meat shops.

In assessing food safety practices 20 questions enquired For 64 meat handlers. Per the survey result, 51.3% of respondents eat and drink and all 100.0% are not use glove, and there are not smoke at their work place. All of the respondents 100.0% do not use aprons; wash their hand after coughing, sneezing, and wear mask while working. There is a good practice hairnet or caps 84.4% are used and the rest 15.6% are not used. All most all 93.8% wash their hands after using toilets which is good practice, but 92.2% are not wash their hands after handling waste/garbage. The most of respondents 96.9% are not use sanitizer washing service utensils (knives, hooks and cutting boards and only the rest 3.1% are used (Table 10) 100.0% of the respondents are not replace knives/sterilize them after each meat process, 76.6% are not remove their work equipment's when using toilet and the rest 23.4% are remove their equipment's while using toilet. 100.0% meat handler respond that they are handle/process when their ill and also when their cuts, bruise/injuries on their hands.

Table 10. Meat handlers' food safety practices in Modjo town retail meat shop.

N0	Food safety practices questions	Responses % (n)	
		Yes	No
1	Do you eat or drink at your work place?	51.3(52)	18.8(12)
2	Do smoke inside meat processing areas?	0(0)	100.0(64)
3	Do you use gloves while handling meat? If no, go to question no. 5?	0(0)	100.0(64)
4	Do you wash your hands properly before or after using gloves?	0(0)	100.0(64)
5	Do you wash your hands before and after handling meat?	25.0(16)	74.4(48)
6	Do wash hands after handling waste/garbage?	7.8(5)	92.2(59)
7	Do wash hands after using toilet?	93.8(60)	6.3(4)
8	Do you wash your hand after smoking, sneezing or coughing?	0(0)	100.0(64)
9	Do you wear an apron while working?	0(0)	100.0(64)
10	Do you wash your aprons after each day's work?	0(0)	100(64)
11	Do you wear a mask while working?	0(0)	100.0(64)
12	Do you wear a hairnet or a cap while working?	84.4(54)	15.6(10)
13	Do you wear nail polish when handling meat?	0(0)	100.0(64)
14	Do you properly clean the meat storage area before storing new products?	51.6(33)	48.4(31)
15	Do you use the sanitizer when washing service utensils (knives, hooks and Cutting boards)?	3.1(2)	96.9(62)
16	Do you replace knives or sterilize them after each meat processing?	0(0)	100.0(64)
17	Do you remove your work equipment when using toilets?	23.4(15)	76.6(49)
18	Do you remove your personal stuffs such as rings, necklaces, watch etc. while Processing meat?	25.0(16)	75.0(48)
19	Do you handle/process meat when you are ill?	100.0(64)	0(0)
20	Do you handle/process meat when you have cuts, wounds, bruises or injuries On your hands?	100.0(64)	0(0)

5.4. Socio Demographic Characteristics of Respondents in Modjo Export Abattoirs.

Respondents participate in this study, 78.0% were males and 22.0% are females. Those respondents within the age of 20-30 years comprised 55.0% followed by age of 31-40 (35.0%), 9.0% of respondents are >40 and only one person is less than twenty years old. Education level of majority of the respondents 25.0%, and 22.0 was at the level of primary and secondary respectively, followed by BSc (14.0%), diploma(12.0%) are participated. And also 11.0% of each respondent were as DVM and illiterate, only three respondents (3.0%) are MSc holders. The most of the respondents export abattoir meat handlers are butchers 69.0%, and followed by 20.0% of Meat inspectors and 3.3% of each production manager and sanitary. Employment status was 99.0% are permanent, and only one person is contract. Monthly income of majority of the meat handlers (60.0%) is in the range between 1000 and 2000 Ethiopian Birr (ETB), which is less than 100 USD per month, and 33.0% are got >3000 ETB monthly, the rest respondents 7.0% are get between 2000-3000 ETB (Table 11). All most half of the respondents year of work experience <5 was (51.0%), and followed by 32.0% of respondents have been working in the company for 5-10 years, and 17.0% have more than 10 years' experience. From the all participants 62.3% have got food safety training, and the rest 38.0% not trained, and 85.0% of the respondents have health certificate, only 15.0% are not have health certificate.

Table 11. Socio demographic characteristics of Modjo export abattoirs Respondents.

Characteristics	Frequency(n)	% Percent
Gender		
Female	22	22.0
Male	78	78.0
Age		
<20	1	1.0
20-30	55	55.0
31-40	35	35.0
>40	9	9.0
Education		
BSc	14	14.0
Diploma	12	12.0
DVM	11	11.0
Illiterate	11	11.0
MSc	3	3.0
Mph	1	1.0
Primary	25	25.0
Secondary	22	22.0
TVET	1	1.0
Duty		
Butcher	69	69.0
Halal supervisor	1	1.0
Manager	20	20.0
MI	1	1.0
Pro. Manager	3	3.0
Sanitary	3	3.0
Supervisor	1	1.0
System manager	2	2.0
Employment status		
Contract	1	1.0
permanent	99	99.0
Year of service		
<5	51	51.0
>10	17	17.0
5-10	32	32.0
Food safety training		
No	38	38.0
yes	62	62.0
Health certificate		
No	15	15.0
yes	85	85.0

5.4.1. Food safety attitude of meat handlers in Modjo export abattoirs

All most all of participant respondents have a good satisfactory attitude, as a result of participant respondents meat handlers in Modjo export abattoirs has respond that meat handlers with wound, bruise/injuries on their hand must not touch the meat 97.0% attitudes has very good, and also many of the respondents has not have a good attitude or un satisfactory in The same towel can be used to clean many places which is 69.0% are wrongly answered but only 21.0% are correctly answered and the rest 10.0% have no idea or note sure. Meat handlers respond in attitude question; it is important to use potable water to wash working surfaces and cutting tools after disinfection 55.0% correctly answered but, 11.0% incorrectly respond, 34% are didn't sure the answer respectively Table:12. Generally all most all of the respondents' meat handlers in all Modjo export abattoirs have a very good attitude in all most all response. 100.0% are say that putting on hair cover on the head is a good practice in food industry, 99.0% was respond correctly in improper meat storage is dangerous to health, except one person is wrongly answered. Attitude of meat handlers in Knives, hooks and cutting boards can be a source of food contamination 58.0% have good attitude but 38.0% were note sure. And in question; Knives and cutting boards should be properly sanitized to prevent cross contamination 64.0% participants are correctly answered and 33.0% are they didn't sure the answer.

Table 12. Meat handlers' food safety attitude in Modjo export abattoirs.

No	Statements	Responses %(n)		
		Yes	No	Note sure
1	Meat handlers with wounds, bruises or injuries on their hands must not touch or handle meat	97.0(97)	3.0(3)	0(0)
2	Using watches, earrings and rings will increase the risk of meat contamination	85.0(85)	3.0(3)	12.0(12)
3	Improper meat storage is dangerous to health	99.0(99)	1.0(1)	0(0)
4	Hand washing before handling meat reduces the risk of contamination	83.0(83)	17.0(17)	0(0)
5	Regular training could improve meat safety and hygiene practices	93.0(93)	4.0(4)	3.0(0)
6	Safe meat handling to avoid contamination and diseases is part of meat handler job responsibilities	57.0(57)	8.0(8)	35.0(35)
7	Keeping working surfaces and utensils clean reduces the risk of illness	68.0(68)	11.0(11)	21.0(21)
8	Using different knives and cutting boards for meat and offal is worth	47.0(47)	6.0(6)	47.0(47)
9	It is unsafe to leave meat out of the refrigerator for more than 2 hour.	86.0(86)	6.0(6)	8.0(8)
10	meat for freshness and wholesomeness is valuable	72.0(72)	6.0(6)	22.0(22)
11	Surfaces and equipment should be clean before re-using for meat processing	89.0(89)	6.0(6)	5.0(5)
12	After processing meat, any leftovers should be kept in a cool place within	93.0(93)	5.0(5)	2.0(2)
13	Raw meat is healthier and nutritious than cooked	60.0(60)	33.0(33)	7.0(7)
14	Knives, hooks and cutting boards can be a source of food contamination	58.0(58)	4.0(4)	38.0(38)
15	Knives and cutting boards should be properly sanitized to prevent cross contamination	64.0(64)	3.0(3)	33.0(33)
16	The same towel can be used to clean many places	21.0(21)	69.0(69)	10.0(10)
17	Sneezing or coughing without covering our noses or mouth could contaminate the meat	91.0(91)	4.0(4)	5.0(5)
18	Wearing protective clothing and shoes could help improve work safety and hygiene practices	94.0(94)	1.0(1)	5.0(5)
19	Putting on hair cover on the head is a good practice in food industry	100.0(100)	0(0)	0(0)
20	It is important to use potable water to wash working surfaces and cutting tools after disinfection	55.0(55)	11.0(11)	34.0(34)

5.4.2. Food safety knowledge of meat handlers in all Modjo export abattoirs

The overall summary knowledge level of respondents has satisfactory. However, many of meat handlers were well aware of 100.0% insects and pests could be a source of contamination, 99.0% have a very good knowledge in ideal place to store raw meat is refrigerator and also the knowledge of meat handlers is 91.0% in both using glove while handling meat is reduce the risk of contamination and properly cleaning and sanitizing of knife and hooks reduce risk of meat contamination. The respondents knowledge in food borne pathogens many of them are they don't have idea or note sure about pathogens but some them have a good concepts in *E.coli* is one of food borne pathogens, *hepatitis A virus* is one of food borne pathogen, microbes are on the skin, nose, and mouth of healthy meat handlers and *staphylococcus* is one of food borne pathogen are 38.0%, 32.0%, 34.0%, 38.8% participant meat handlers in all export abattoirs was correctly respond respectively (Table 13). However, all most all the rest respondents were they don't sure about food borne pathogens.

Table 13. Meat handlers' food safety knowledge in Modjo export abattoirs

No	Statements	Responses % (n)		
		Yes	No	Not sure
1	Improper handling of meat could pose health hazards to consumers	99.0(99)	1.0(1)	0(0)
2	Regular washing of hands before and during meat processing reduces risk of contamination	95.0(95)	4.0(4)	1.0(1)
3	Using gloves while handling meat reduces the risk of contamination	91.0(91)	8.0(8)	1.0(1)
4	Proper cleaning and sanitization of knives and hooks reduce the risk of meat Contamination.	91.0(91)	2.0(2)	7.0(7)
5	Eating and drinking in the work place increase the risk of meat contamination	94.0(94)	4.0(4)	2.0(2)
6	Washing and disinfection of working surfaces and tools are important for safety of meat	96.0(96)	1.0(1)	3.0(3)
7	Regular rotation of disinfectants for cleaning can reduce the risk of meat contamination from working surfaces and cutting tools	63.0(63)	2.0(2)	35.0(35)
8	Insects and pests could be a source of contamination to raw meat	100.0(100)	0(0)	0(0)
9	Diarrhea can be transmitted by food	73.0(73)	7.0(7)	20.0(20)
10	E.coli is one of the food-borne pathogens	38.0(38)	0(0)	62.0(62)
11	Hepatitis A virus is one of the food-borne pathogens	32.0(32)	0(0)	68.0(68)
12	Staphylococcus is one of the food-borne pathogens	38.0(38)	0(0)	62.0(62)
13	Microbes are on the skin, nose and mouth of healthy meat handlers	34.0(34)	4.0(4)	62.0(62)
14	Clean is same as sanitized	64.0(64)	29.0(29)	7.0(7)
15	Cross contamination is when microorganisms from a contaminated meat are transferred by the meat handler's hands or utensils to another	44.0(44)	2.0(2)	54.0(54)
16	The ideal place to store raw meat is in the refrigerator	99.0(99)	1.0(1)	0(0)
17	Freezing kills all the bacteria that may cause food-borne illness	58.0(58)	21.0(21)	21.0(21)
18	High temperature or freezing is a safe method to destroy bacteria	76.0(76)	14.0(14)	10.0(10)
19	The correct temperature for storing perishable foods is 50C	22.0(22)	18.0(18)	60.0(60)
20	Contaminated meat always have some change in color, odor or taste	97.0(97)	2.0(2)	1.0(1)
21	People with open skin injury, gastroenteritis, and ear or throat diseases should not be allowed to handle meat	81.0(81)	4.0(4)	15.0(15)
22	The health status of workers should be evaluated before employment	93.0(93)	6.0(6)	1.0(1)

5.4.3 Meat handler's hygiene and sanitation practices in Modjo export abattoirs.

In assessing food safety practices 20 questions enquired For 100 meat handlers are participate 100.0%. As an assessment result indicates that, 100.0% of respondents has not eaten and drink at work place, and all (100.0%) are not smoke at their work place. All of the respondents 100.0% was use aprons; but 94.0% are daily washing their apron and 6.0%has not wash apron daily. 92.8% wash their hand after coughing, sneezing, and 45.0% wear mask while working. There is a good practice in using hairnet or caps 100.0% used. All participant respondents are 100.0% wash their hands after using toilets which is good practice, but only 16.0% are not wash their hands after handling waste/garbage. The most of respondents 88.0% have use sanitizer washing service utensils (knives, hooks and cutting boards and only the rest 12.0% are not used. 92.0% of the respondents were replace knives/sterilize them after each meat process, 88.0% has remove their work equipment's when using toilet and the rest 12.0% are not remove their equipment's while using toilet. 43.0% meat handler respond that they are handle/process when their ill, and also 40.0% process when their cuts, bruise/injuries on their hands (Table 14).

Table 14. Meat handlers' food safety practices in Modjo export abattoirs.

N0	Food safety practices questions	Responses % (n)	
		Yes	No
1	Do you eat or drink at your work place?	0(0)	100.0(100)
2	Do smoke inside meat processing areas?	0(0)	100.0(100)
3	Do you use gloves while handling meat? If no, go to question no. 5?	55.0(55)	45.0(43)
4	Do you wash your hands properly before or after using gloves?	57.0(57)	43.0(43)
5	Do you wash your hands before and after handling meat?	84.0(84)	16.0(16)
6	Do wash hands after handling waste/garbage?	83.0(83)	17.0(17)
7	Do wash hands after using toilet?	100.0(100)	0(0)
8	Do you wash your hand after smoking, sneezing or coughing?	92.0(92)	8.0(8)
9	Do you wear an apron while working?	100.0(100)	0(0)
10	Do you wash your aprons after each day's work?	94.0(94)	6.0(6)
11	Do you wear a mask while working?	45.0(45)	55.0(55)
12	Do you wear a hairnet or a cap while working?	100.0(100)	0(0)
13	Do you wear nail polish when handling meat?	1.0(1)	99.0(99)
14	Do you properly clean the meat storage area before storing new products?	87.0(87)	13.0(13)
15	Do you use the sanitizer when washing service utensils (knives, hooks and Cutting boards)?	88.0(88)	12.0(12)
16	Do you replace knives or sterilize them after each meat processing?	92.0(92)	8.0(8)
17	Do you remove your work equipment when using toilets?	88.0(88)	12.0(12)
18	Do you remove your personal stuffs such as rings, necklaces, watch etc. while Processing meat?	93.0(93)	7.0(7)
19	Do you handle/process meat when you are ill?	43.0(43)	57.0(57)
20	Do you handle/process meat when you have cuts, wounds, bruises or injuries On your hands?	40.0(40)	60.0(60)

6. DISCUSSION

6.1. Production Constraints

Sheep and goat production in Borena pastoral area supplied their products to export abattoirs market why this paper is targeted to link shoat production related with factor affect shoat meat production, cause of organ and carcass condemnation. The basic constraints of shoat production and to improve export market income additionally further improve meat exports to Europe and other country in the future, initially work and full fill the minima of WTO to compete with the international market, this shoat export market was improved through improving preventing and especially eradicating disease those are happened as outbreak annually. All pastoral farmers was respond the average of selling/marketing sheep and goat were 7-12 months all farmers sell their products to Yabello market which access two days/weak . Farmers reason for typically marketing animals the majority of respondents rank that 1st for immediate cash, 2nd family health care and closing, 3rd children schooling, and 4th in case of feed shortage participants responds respectively additionally No farmer marketing their animal for the reason of culling and/or downsizing herds.

The major disease in Yabello woreda was CCPP, SGpox, O/P, PPR, and external and internal parasites etc. infectious disease outbreak were the major cause of mortality the basic constraints of shoat production as farmers respond. One of the limiting factors in small ruminant production and marketing in the Goma district are diseases and parasites. (Belete Shenkute, 2009).The governments done on those disease prevention through pre vaccinating annually, additionally government with FAO support propose to eradicate PPR which is Transboundary disease. Those above infectious disease and poor production managements system, in adequate feed and water, animal welfare, transportation and market etc. have reduced production, quality, and organ/carcass condemnation and specially result in death. In this study participants respond that watering available in winter and summer is available once in 2 days or once in 3 days 100.0%. As a result implication water and feed availability and prevalence of disease were the basic constraints for shoat production.

All most the same study was done by gebreegziabher zereu, 2016 at humbo district of Wolaita zone southern Ethiopia; feed shortage at 2nd rank, and prevalence of disease at 3rd rank as major constraints of goat production. During the assessment long distance were observed that animals transported on foot like the distance of Dikale kebele is 40km far from Yabello market, and suffer from long car transportation stress estimated approximately around 700km far from to Modjo export abattoirs without rest, feed and water. Those which were transported on open trucks are overcrowded and furthermore, animals are suffocated at the lairages and there was short resting time before slaughter for the animals in the abattoir to recover from physical stresses. These conditions were result in organ and carcass condemnation as observed at a higher magnitude in this study. Disturbance of animal welfare has start from farm to slaughter observed.

Transportation is a great problem in related to animal welfare like; there is no comfortable and safe transportation, over loading, un proper handling, un suitable road and car speed, drive long kilometers drive without rest, water and feed, loading problem, etc. was main problem are result in stress, bruising, broken, and most of the time death happen because of transportation during and after arrive, and at post mortem inspection the above transportation problems are finally result in organ/carcass partial/total condemnation which is now a great economic loss as this study assessment. Similarly different factors of which feed shortage, seasonal fluctuations and poor quality of the available feeds and prevalence of different diseases and parasites are among the major constraints for goat production in particular and livestock production in general in Ethiopia (Tsegaye, 2009; Solomon *et al*., 2010; Tsegaye *et al*., 2013).

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6.2. Organ and Carcass Condemnation

It was indicated that meat inspection assist in monitoring diseases in national herd and flock by providing feedback information to veterinary service to control or eradicate diseases and to produce wholesome products and to protect public from zoonotic hazards (Van Llogtestijn, 1993; Gracey *et al*., 1999). Hence, the gathered information from abattoir record can be used by farmers to improve the husbandry of their animals in such a way that farmers can improve the overall management of their animals so that pre-slaughter problems would be reduced (Edwards *et al.,* 1999). Meat inspection and meat hygiene shall make sure that meat and meat products are safe and wholesome for human consumption. According to the information obtained from the suppliers, most causes of lameness was trauma and mechanical damage caused by inappropriate vehicles and loading and off-loading negligence during transportation to market places and to the abattoir (Regessa *et al*., 2013) the same is true in this assessment. In this study 46.3% of liver were rejected due to different pathological reason in sheep and goat which is all most the same to 47.5% of liver condemned due to several reasons (Negategize*et al*., 1993; Jembere, 2002; Aseffa, 2005; Jibat, 2006). There is significant strong relationship in both species between organ and pathological condition of organ and carcass condemnation was highly significant. The respiratory signs such as presence of nasal discharge, coughing, sneezing were most probably related to stress due to lack of feed and water, immune suppression and overcrowding during transportation which was in line with (Getachew; 2008). In the present study, organ and carcass condemnation rate showed that, liver and lung were the most frequently affected organs with the highest condemnation rate followed by tongue, kidney, heart and carcass. This finding is in agreement with reports of (Cadmus and Adesokan; 2009).

In this study relatively the major constraints was disease, poor management, problem of feed and water, animal welfare, and Different lesions of infectious and noninfectious causes like abscess, *pericarditis, nephritis*, bruise and discoloration/jaundice were found to be major causes for the condemnation of edible organs like liver, heart, kidney and carcass etc. are identified and analyzed those losses only through condemnation of edible organs and carcasses in export market from international and local market during the study period.

The total percentage of carcass encountered with abnormalities resulting in meat loss with higher occurrence of carcass abnormalities observed in sheep than in goats, which has similar finding of (A. Regassa *et al*. 2013) in Luna Export Abattoir. Based on this study, (Table 5 and 6) the annual financial loss in both sheep and goat were estimated to be 21,424,320 ETB or 765,154.29 USD from domestic and international markets. In general, 1,105,920 USD were annually loss only due to total carcass rejection from export market. In our study literacy rate of total organ and carcass condemnation lower than the finding of (Aynalem Mandefro., *et al*. 2015) at bishoftu elfora export abattoir.

6.2.1. Bruising as major cause of carcass condemnation

Bruising occurs due to beating of animals during transportation and the use of rough vehicles. Apart from affecting carcass value, bruising has also animal welfare implications as excessive use of sticks while driving to the abattoir, mishandling of animals during loading and unloading, improper transport vehicle and at slaughter could be responsible causes (Edward *et al.*, 1997). It is stated that bruising of animals during transport is the major source of economic loss in Africa and Asia (Mitchell and slough, 1980) the same is true in this study; animal welfare, bruising, beating, disease, discoloration, and transportation etc. was the major cause for organ and carcass condemnation. 19.6% of total and partial condemned carcass in case of bruising during this study.

6.3. Food Safety Attitude, Knowledge and Practice

In this assessment Most of meat handler's participants are male, the same is true in many study, and in knowledge, attitude, and practice of retail meat shops was less than to respondents participants in export abattoirs were greater than to (H.A Tegenye *et al*., at jigjiga town 2017). During the study meat handlers in older age and greater than five years' of experience have good hygienic attitude, knowledge, and practice than the others. In this study the rate of food handlers especially meat handlers in retail meat shops have lower than the assessment of (Akabanda F; Jianu and Golet).

All retail meat shops meat handlers was basically need trainings, and also refreshments trainings was need for export abattoir meat handlers to improve their knowledge in to practice. According to nigusse and kumie food safety knowledge of food handlers significantly related with food handling practices. In this study, Chi square analysis testing for the association between knowledge, attitude and practices did not show any significant association, it may be due to meat handlers' below acceptable level safety practices regardless of socio demographic characteristics, knowledge and attitude.

Many of retail meat shops participant meat handlers have no idea or concept about food safety attitude, knowledge and practice (Table:8,9,10) Meat inspectors and/or educated peoples in the export abattoir have advice to give refreshment on job training for butchers to improve good food safety practice. The same is true in many studies mention that food safety trainings need continuously to improve attitude, knowledge, and practice of food handlers (Park and Kwak 2010). Hand wash before handling meat reduce risk contamination with the education level of meat handlers have a significant relationship. However, the demographic service of year with knowledge of diarrhea can be transmitted by food was not significant.

6.3.1. The codex alimentarius commission food handlers recommendation

The codex recommended that food handlers should always wash their hands at every stage of food production to safeguard the consumer from diarrheal and other food borne diseases. Particularly, before handling meat, after eating, smoking, coughing, sneezing, touching garbage and using toilet are critical time the meat handler should wash their hands. Meat handler with open skin injury, gastroenteritis, and ear or throat diseases should not deal with any meat production. (CAC/Codex Alimentarius Commission). Production service staffs in all export abattoirs and municipal retail meat shops represent a potential source of meat-borne out-breaks since they can contaminate meat with pathogens at any stage of the food chain slaughtering, dressing, and distributing process specially in retail meat shop since raw meat is favorite traditional food in Ethiopia. In this survey study the attitude, knowledge, and hygiene practice were very low expected acceptable level especially in retail meat shop meat handlers as compare to codex alimentarius commission recommendations. However, during the study observation there is good food safety practice in export abattoirs.

7. CONCLUSION AND RECOMMENDATIONS

The annual meat production from small ruminants is relatively small compared to the number of heads. The levels of foreign exchange earnings from livestock and livestock products are also much lower than would be expected, given the size of the livestock population. There are various factors that contribute for low productivity: health constraints, socio economic and technical limitations like inadequate feed quality and quantity, poor feeding, water and health management. Potential production and market opportunities for small ruminant meat have not been exploited because of scant knowledge of small ruminant demand patterns. The befit of Sheep and goats have higher survival rates under drought conditions compared to cattle. So water and feed availability and prevalence of disease were the basic constraints for shoat production especially around pastoral area. The constraints of small ruminant meat production are inadequate feed quality and quantity, diseases, poor breed potentials, poor overall management, marketing and infrastructure that affect sheep and goat performances. As to the production of meat, the majority of meat is produced by smallholder farmers and the pastoralists.

The study identified the major causes of organ condemnation accordingly; *hydatidosis, fasciolosis,* Abscesses, *calcification, pneumonia, emphysema, fibrosis, pericarditis, SGpox, pasturolosis,* discoloration, bruise, mechanical damage and *nephritis* were the major reason for organs and carcass condemnation. There was great financial loss burden because of organ and carcass condemnation at all exports abattoirs annually during the study.

In retail meat shop meat handlers had unsatisfactory knowledge mainly on food borne pathogens, time temperature control, cross contamination, and difference between cleaning and sanitation. Though most of the meat handlers have basic understanding and good attitude about personal hygiene, hand washing and proper cleaning, they did not translate into strict food hygiene practices. Therefore, continuous food safety education and hands on training for meat handlers should be given that can enhance good safety practices through better understanding and positive attitude.

Food safety system in Ethiopia is not always as organized and developed as in other developed countries. The Training for all levels of personnel, especially for overall meat handlers of municipal retail meat shops under assessment is inadequate or very low. Hand washing facilities are inadequate to ensure satisfactory control of the risk of contamination of the product through dirty hands or poor hygiene. There is a need for all abattoirs to step up their control of personnel health and personnel personal hygiene according to mandatory standards in export abattoirs.

In view of the assessment of this study the following recommendations can be made:

- Establishing marketing channel should be necessary to paramount the production and productivity of small ruminant meat.
- Awareness should be created for the animal attendants, farmers, customers, abattoir workers and Butchers regarding the public health significance of diseases of animal origin and the related losses.
- Gathering the feedback from export abattoirs has been used by the farmers/pastoralists to improve overall management of their animals; to reduce the frequency of organ and carcass condemnation.
- Prevent unintentional contamination due to lack of adequate knowledge, attitude, practice and educational/training programs need to be established in order to continually strengthen food safety principles.

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9. ANNEXS

Annexes 1. Questionnaire for production constraints survey in Yabello woreda

This questionnaire is prepared to assess the basic meat production constraints and market system in Borena Zone Yabelo Woreda. You are kindly requested to read the questions carefully and respond in the manner clearly indicated for each. The information you provide is very crucial for the success of the study. You are, therefore, kindly requested to be honest towards all the items provided. Your responses will only be used for research purpose and therefore be kept confidential.

1. General Information

Region_____zone_____Woreda_____Kebele _____

1.1. Date of interview_____

Production and Management Systems

1. Purpose of keeping sheep/goats

	Ranking
Meat for home consumption	
Milk for home consumption	
Wool	
Income	
Wealth Status	
Skin	

2. Main Feed Source

Feed Source	**Ranking**
Natural Pasture	
Hay	
Homemade Concentrate	
Other (specific)	

3. Feeding system

Frequency	**Dry Season / Winter**	**Wet Season / Summer**
Freely available		
Twice a day		
Once a day		
Once in 2 days		
Once in 3 days		

4. Watering source

Frequency	***Dry Season / Winter***	***Wet Season / Summer***
Freely available		
Twice a day		
Once a day		
Once in 2 days		
Once in 3 days		

5. Health

1. Access to veterinary services.

Government veterinarian_____ Private veterinarian_____ Shop/Market_____

Other (specify) _____

2. Vaccination (type of vaccines given in the year) flock. _____

3. What kind of disease preventative medical procedures do you perform within your herd? None_____

Other (specify w/ drug name) _____

4. What is the cause of mortality _____

5. If any other constraints of shoat production

_____

_____

_____

6. Marketing

1. How far is your herds form the nearest market? (Minutes) _____

2. What season do you usually sell animals?

Wet/Summer Season_____ Dry/Winter Season_____ Any time _____

3. Reasons for typically marketing animals.

Reason	***Ranking***
Immediate Cash	
Disposal/Culling	
Feed Shortage	
Children/Schooling/Etc.	
Family Health Care/Clothing	
Downsizing Herd	

4. Average market age. (Months) Male_____ Female_____

5. Is your overall herd number increasing in the last 5 years?

Increased_____ Decreased_____ Stable_____

Why?

_____

_____

_____

Annexes 2. Structured Questionnaires for Meat handlers

General Information

Date_____ Questionnaire Code_____ Retail meat shop

1 Gender: Male [ ] Female [ ]

2 Age: < 20 [ ] 20-30 [ ] 31-40 [ ] >40 [ ]

3 Level of education: Illiterate [ ] Primary education [ ] Secondary education [ ]

4 Field of duty: Butcher [ ] Helper [ ] Cook [ ]

Other (meat inspector) _____

5 Employment status: Daily bases [ ] Contract [ ] Permanent [ ]

6 Incomes: < 1000 ETB [ ] 1000-2000 ETB [ ] 2001-3000 ETB [ ] > 3000ETB [ ]

7 Year of service (experience): < 5 [ ] 5-10 [ ] > 10 [ ]

8 Food safety training: Yes [ ] No [ ]

9 Health certificate: Yes [ ] No [ ]

1. Meat handlers' food safety attitude in Statements

1Meat handlers with wounds, bruises or injuries on their hands must not touch or handle meat?
Yes [ ] No [ ] note sure [ ]

2 Using watches, earrings and rings will increase the risk of meat Contamination Yes [ ] No[ ]note sure [ ]

3 Improper meat storage is dangerous to health? Yes [ ] No [ ] note sure [ ]

4 Hand washing before handling meat reduces the risk of contamination? Yes [ ] No [ ] note sure [ ]

5 Regular training could improve meat safety and hygiene practices? Yes [ ] No [ ] note sure [ ]

6 Safe meat handling to avoid contamination and diseases is part of meat handler job responsibilities?
Yes [ ] No [ ] note sure [ ]

7 Keeping working surfaces and utensils clean reduce the risk of illness? Yes [ ] No [ ] note sure [ ]

8 Using different knives and cutting boards for meat and offal is worth? Yes [ ] No [ ] note sure [ ]

9 It is unsafe to leave meat out of the refrigerator for more than 2 hour? Yes [ ] No [ ] note sure [ ]

10 Inspecting meat for freshness and wholesomeness is valuable? Yes [ ] No [ ] note sure [ ]

11 Surfaces and equipment should be clean before re-using for meat processing Yes [ ] No [ ] note sure [ ]

12 After processing meat, any leftovers should be kept in a cool place within? Yes [ ] No [ ] note sure [ ]

13 Raw meat is healthier and nutritious than cooked? Yes [ ] No [ ] note sure [ ]

14 Knives, hooks and cutting boards can be a source of food contamination? Yes [ ] No [ ] note sure [ ]

15 Knives and cutting boards should be properly sanitized to prevent cross Contamination?
Yes [ ] No [ ] note sure [ ]

16 The same towel can be used to clean many places? Yes [ ] No [ ] note sure [ ]

17 Sneezing or coughing without covering our noses or mouth could contaminate the meat?
Yes [ ] No [ ] note sure [ ]

18 Wearing protective clothing and shoes could help improve work safety and hygiene practices?
Yes [ ] No [ ] note sure [ ]

19 Putting on hair cover on the head is a good practice in food industry? Yes [ ] No [ ] note sure [ ]

20 It is important to use potable water to wash working surfaces and cutting tools after disinfection?
Yes [ ] No [ ] note sure [ ]

2. Meat handlers' food safety knowledge

Statements

1 Improper handling of meat could pose health hazards to consumers? Yes [ ] No [ ] note sure [ ]

2 Regular washing of hands before and during meat processing reduces risk of contamination?
Yes [ ] No [ ] note sure [ ]

3 Using gloves while handling meat reduces the risk of contamination? Yes [ ] No [ ] note sure [ ]

4 Proper cleaning and sanitization of knives and hooks reduce the risk of meat contamination?
Yes [ ] No [ ] note sure [ ]

5 Eating and drinking in the work place increase the risk of meat contamination Yes [ ] No [ ] note sure [ ]

6 Washing and disinfection of working surfaces and tools are important for safety of meat?
Yes [ ] No [ ] note sure [ ]
7 Regular rotation of disinfectants for cleaning can reduce the risk of meat contamination from working surfaces and cutting tools? Yes [ ] No [ ] note sure [ ]
8 Insects and pests could be a source of contamination to raw meat? Yes [ ] No [ ] note sure [ ]
9 Diarrhea can be transmitted by food? Yes [ ] No [ ] note sure [ ]
10 E.coli is one of the food-borne pathogens? Yes [ ] No [ ] note sure [ ]
11 Hepatitis A virus is one of the food-borne pathogens? Yes [ ] No [ ] note sure [ ]
12 Staphylococcus is one of the food-borne pathogens? Yes [ ] No [ ] note sure [ ]
13 Microbes are on the skin, nose and mouth of healthy meat handlers? Yes [ ] No [ ] note sure [ ]
14 Clean is same as sanitized? Yes [ ] No [ ] note sure [ ]
15 Cross contamination is when microorganisms from a contaminated meat are transferred by the meat handler's hands or utensils to another? Yes [ ] No [ ] note sure [ ]
16 The ideal place to store raw meat is in the refrigerator? Yes [ ] No [ ] note sure [ ]
17 Freezing kills all the bacteria that may cause food-borne illness? Yes [ ] No [ ] note sure [ ]
18 High temperature or freezing is a safe method to destroy bacteria? Yes [ ] No [ ] note sure [ ]
19 The correct temperature for storing perishable foods is 5°C? Yes [ ] No [ ] note sure [ ]
20 Contaminated meat always have some change in color, odor or taste? Yes [ ] No [ ] note sure [ ]
21 People with open skin injury, gastroenteritis, and ear or throat diseases should not be allowed to handle meat? Yes [ ] No [ ] note sure [ ]
22 The health status of workers should be evaluated before employment? Yes [ ] No [ ] note sure [ ]

3. Meat handlers' food safety practices

Food safety practices questions

1 Do you eat or drink at your work place? Yes _____ No_____
2 Do smoke inside meat processing areas? Yes _____ No_____
3 Do you use gloves while handling meat? If no, go to question no. 5? Yes _____ No_____
4 Do you wash your hands properly before or after using gloves? Yes _____ No_____
5 Do you wash your hands before and after handling meat? Yes _____ No_____
6 Do wash hands after handling waste/garbage? Yes _____ No_____
7 Do wash hands after using toilet? Yes _____ No_____
8 Do you wash your hand after smoking, sneezing or coughing? Yes _____ No_____
9 Do you wear an apron while working? Yes _____ No_____
10 Do you wash your aprons after each day's work? Yes _____ No_____
11 Do you wear a mask while working? Yes _____ No_____
12 Do you wear a hairnet or a cap while working? Yes _____ No_____
13 Do you wear nail polish when handling meat? Yes _____ No_____
14 Do you properly clean the meat storage area before storing new products? Yes _____ No_____
15 Do you use the sanitizer when washing service utensils (knives, hooks and cutting boards)?
Yes _____ No_____
16 Do you replace knives or sterilize them after each meat processing? Yes _____ No_____
17 Do you remove your work equipment when using toilets? Yes _____ No_____
18 Do you remove your personal stuffs such as rings, necklaces, watch etc. while processing meat?
Yes _____ No_____
19 Do you handle/process meat when you are ill? Yes _____ No_____
20 Do you handle/process meat when you have cuts, wounds, bruises or injuries on your hands?
Yes _____ No_____

Annexes 3. Data collection format on the major causes of organ/carcass condemnation

Name of abattoir: _____ Month/year: _____
Species_____ Age _____

Total no of Animals slaughtered_____

Organs/carcass	Conditions/reason for condemnation	Degree of condemnation(partial or total)	Frequency	Price for the condemned organ/carcass
Head				
Tongue				
Lung				
Liver				
Heart				
Kidney				
Intestine				
Carcass				