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Cause and Economic Loss of Organ and Carcass Condemnation in Modjo Export Abattoirs Modjo Town, Ethiopia

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Abstract

Infectious disease outbreaks were the major cause of mortality for production area. Most liver, lungs, heart, kidney, tongue, and carcasses were condemned in case of infectious, non-infectious and parasites, additionally abscess, pericarditis, nephritis, pneumonia, calcification, emphysema, hydatid cyst and discoloration were the major Cause 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.

Keywords: Abattoir, Condemnation, Carcass, Goat, Meat, Modjo, Organ, Production, Sheep, Financial loss.

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) [1]. However, the current level of contributions of the livestock sector in Ethiopia is very low. Marketing and infrastructure that affect the livestock potentials.

Currently the overall livestock production constraints in Ethiopia are feed and water shortages, livestock diseases, low genetic potential of indigenous livestock, and management system [2]. 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. Sheep and goat in Ethiopia are kept under traditional extensive systems. Despite all the constraints there are quite favourable opportunities to increase sheep and goat productivity in Ethiopia.

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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 [3]. 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. In the abattoir during post-mortem 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, non-infectious and parasites causes like abscess, pericarditis, nephritis, pneumonia, calcification, emphysema, hydatid cyst and discoloration.

Materials and Methods

Study Area

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 travellers.

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.

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.

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.

Sample Size Determination and Sampling

The total number of sheep and goat for the study was calculated based on the formula given by thrufield in 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

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

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

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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 have 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.

Post-Mortem Examination

The organ and carcass were 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.

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 (χ^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.

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. where direct economic losses have 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 managers, and suppliers in the abattoirs were interviewed systematically to establish the price per unit organ/carcass and the average price was determined to calculate the loss.

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 Ogurinate and Ogurinate in 1980.

$DAL = \Sigma AC * AP * CR$ 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

Result

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 livers were 138 (46.3%), lung was 165 (55.3%), kidney 55 (18.5%), heart 42 (14.1%), tongue 43 (14.4%) in both species (Table 2). 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

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carcass discoloration 3.7% and un known pox 3.4% were major cause for total rejection of whole carcass in both species (Table 1).

No.	Condoned Organ/carcass	Sheep		Goat	
		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 1: Organ and carcass condemnation no (%) both species.

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

Table 2. Frequency and percentage of pathological reason for organ and carcass condemnation.

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Financial Loss Due to Organ and Carcass Condemnation

Generally the organ was rejected due to pneumonia, hydatid cyst, adhesion, calcification, *C.tenaculosis*, 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 losses annually.

Organ and carcass	No. of Organ/ carcass	% of organ/carcass	Price per organ	Annual price in ETB(\$) where 1\$=28ETB
	Condemned	Condemned	ETB	
Tongue	21	0.085	2	19, 584
Lung	84	0.34	4	1,61,280
Liver	72	0.29	10	3,34,080
Kidney	25	0.1	2	23,040
Heart	22	0.089	5	51,264
Organs total	224	0	0	5,89,248
Carcass total	25	0.1	880	1,01,37,600
Grand total	245	0	0	1,07,26,848

Table 3. Sheep organ and carcass rejection and financial loss in Modjo export abattoirs.

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 3). 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 3, 4). In general, 30,965,760 ETB or 1,105,920 USD was annually loss only due carcass rejection from export market.

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Organ and carcass	No. of Organ/ carcass	% of organ/carcass	Price per organ	Annual price in ETB(\$) where 1\$=28ETB
	Condemned	Condemned	ETB	
Tongue	22	0.09	2	20,736
Lung	81	0.33	4	1,52,064
Liver	66	0.27	10	3,11,040
Kidney	30	0.13	2	29,952
Heart	20	0.08	5	46,080
Organ total	219	0	0	5,59,872
Carcass total	26	0.1	880	1,01,37,600
Grand Total	245	0	0	1,06,97,472

Table 4. Goat organ and carcass condemnation and financial loss in Modjo export abattoirs.

Discussion

It was indicated that meat inspection assists 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 [4-7]. 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. 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 the same is true in this assessment [8-12]. 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. 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 was most probably

related to stress due to lack of feed and water, immune suppression and overcrowding during transportation which was in line with Getachew in 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 [13-15]. This finding is in agreement with reports of Cadmus and Adesokan.

In this study relatively the major constraints was disease, poor management, problem of feed and water, animal welfare, and Different lesions of infectious and non-infectious 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 in 2013 in Luna Export Abattoir [16-19]. Based on this study, (Table 3 and 4) the annual financial loss in both sheep and goat were estimated to be 21,424,320 ETB or

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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 at bishoftu elfora export abattoir.

Conclusion

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. 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.

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