

Assessment of the Major Animal Health Problems and its Economic Impact on Beef Cattle Export Industry at Adama Quarantine Station, Central Ethiopia

Research Article

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Abstract

The current study was conducted with major objective of assessing the major animal health factors that cause rejection in international live animal trade at Adama export quarantine station and to estimate economic loss due to the rejection factors/disease. A cross-sectional study was conducted from October 2015 to April 2016 at two private feedlots found in Adama and Adami Tullu Eastern Ethiopia. From the total of 2697 bulls examined for the presence of physically and clinical abnormalities, 3.74% (101/2697) physical and clinical abnormalities were detected. From a total of 2596 bulls that were examined for the presence of FMD (Foot and mouth disease) and CBPP (Contagious Bovine Pleuropneumonia); 12.9% (334/2596) and 9% (233/2596) were found to be positive respectively. The results of the present study showed significant variation in the prevalence of FMD (Foot and mouth disease) and CBPP with respect to origin of bulls ($P < 0.05$). The study also revealed the overall loss of hard currency due to failure to export seropositive live animals and rejected due to physical and clinical abnormalities from the two exporter farms which were included in our study was 580,826 US\$. The economic loss that is incurred from FMD, CBPP and physical and clinical abnormalities were 290,413 US\$, 202,593.5 US\$ and 87,819.5 US\$ respectively. The results of this study indicate that FMD and CBPP are still important disease in the feedlots. Therefore prevention and control strategies are needed in the feedlots; and biosecurity of the feedlots must be improved so that to reduce the exposure of bulls to new infections.

Keywords: Economic Loss; CBPP; FMD; Physical and Clinical Abnormalities.

Introduction

Ethiopia is a largely rural country with an agrarian economy. Livestock are of economic and social importance both at the household and national levels, and have in the past provided significant export earnings [1]. The diverse agro-climatic conditions of Ethiopia make it very suitable for the production of different kinds of livestock. Most of the livestock are produced by pastoralists, agro-pastoralists, and smallholder mixed crop-livestock farmers and sold to private entrepreneurs operating in a marketing chain involving collection, fattening and transportation up to terminal markets [2].

Livestock produce about 30% of the agricultural gross domestic product (AGDP) in the developing world, and about 40% of

the global GDP. Livestock play multiple roles in the livelihoods of people in developing communities, especially the poor [3]. In the majority of the rural areas of Ethiopia livestock production plays important role in the provision of draft power, food, cash, transportation, fuel, and, especially in pastoral areas, social prestige. In the highlands, oxen provided draft power in crop production [4].

Livestock development in Ethiopia is constrained, amongst other important factors, by a widely distributed disease. Out of the 15 OIE Lists-A diseases known for their rapid spread and serious socio-economic or public health consequences, and which affect international livestock trade, 8 of them are endemic in the country (FMD, CBPP, PPR, RVF, LSD, sheep pox, African Horse Sickness and Newcastle Disease) [5]. For cattle FMD, contagious

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bovine pleuropneumonia (CBPP) and brucellosis are the three most important diseases in Ethiopia according to livestock master plan [6]. The presence of these diseases makes it difficult for the country to access international livestock markets. Among these diseases FMD and CBPP are the major hindrance to international trade [7]. Importing countries frequently ban imports of meat and livestock from the horn as a result of outbreaks of livestock diseases [5]. Therefore, the objective of the present study was to assess the major health and physical factors that causes rejection in international live animal trade at Adama export quarantine station and to estimate their economic loss.

Materials and Methods

Study Area

The study was conducted at private export quarantine farms of beef cattle found in Adama and surroundings. Adama city, the previous capital of Oromia region is located in the eastern shewa zone of Oromia, at 8.55°N 39.27°E at elevation of 1712 meters, 99 Km southeast of Addis Ababa. It has annual rainfall and temperature ranging from 400mm-800mm and 13.9°C-27.7°C; respectively. The city sits between the base of an escarpment to the west and the Great Rift Valley to the east [8].

Study Animals

The study population was apparently healthy bulls that were ready to be exported, with average age range 1.5-4 years; and according to the information obtained from the feedlots and quarantine station the origin of the bulls were of Borana area, Yabello town market and Bale area. A total of 2697 beef cattle were examined to assess the major factor that cause detention and rejection in international live animal trade in the study area.

Study Design

A cross sectional study was conducted from October 2015 to April 2016 to assess the major health and physical factors that causes rejection in international live animal trade at Adama export quarantine station and to estimate their economic loss. Vaccination status, origins, body condition score, body weight of the animal in the feedlot was recorded. The body condition score was categorized into three groups such as poor, medium and good according to Nicholson and Butterworth [9].

Physical and Clinical Examination of Animals

Veterinary clinical investigation methods were applied to assess the physical factors that lead to the rejection of animals from international live animal trade.

Blood Sample Collection and Processing

Blood collection for serological examination was carried out in each export quarantine farms (feedlots). About 7-10 ml of blood was collected from the jugular vein of the animal into sterile plane vacationer's tube and venject needle. Then each animal was tagged and the respective blood samples were labeled accordingly. This blood was let down to clot for about 2-3 hours at room temperature then serum was stored at 4°C till serum extraction, usually within 24 hours. Then serum was extracted and

dispensed into cryovials in national veterinary institution (NVI). Serum was stored at -20°C; each serum sample was subjected to laboratory test through the OIE recommendation diagnostic tool [10]. Antibodies against the 3ABC non-structural polyproteins of FMD virus in cattle sera were determined using an indirect enzyme-linked immunosorbent assay (ELISA) according to the procedure obtained by De Diego et al., [11]. A competitive ELISA to detect antibodies against small colony forming Mycoplasma mycoides mycoides (MmmSC) in cattle sera was used according to the procedure obtained by Le Goff and Thiaucourt [12].

Economical Loss Analysis Due to Rejected Animal

The price of the live animal varies based the market demands. During the study period the data obtained from Adama animal quarantine centre shows that the minimum weight expected from the animal to be export was 320 kg and the unit price/kg costs was 1.85 US\$. Thus to calculate the amount cost (money) of a single bull, the exact weight in kg was taken and multiplied with the price per Kg [13].

Data Entry and Statistical Analysis

Data were classified, filtered, coded using Ms Excel, and was transferred to Statistical Package for Social Sciences software version 20 (SPSS software V.20). Thereafter, it was analyzed according to the different variables. Pearson chi-square was used to evaluate the statistical significance of variables. In all analyses, confidence interval (CI) was 95% and significance was set at $P \leq 0.05$.

Results

Major Physical and Clinical Observed Abnormalities

From the total of 2697 bulls examined for the presence of physical and clinical abnormalities, 3.74% (101/2697) physical and clinical abnormalities were detected. The distribution of physical and clinical abnormalities based on their different origins, body condition score and weight range of animals were summarized in Table 1.

Estimation of economic losses due to physical abnormalities

Direct economic loss was calculated based on the rejection rate of bulls from international market due to physical and clinical abnormalities. The total financial loss incurred due to physically and clinically observed abnormalities was 87,819.5 US\$ as shown in Table 2.

Seroprevalence of Foot and Mouth Disease (FMD)

From a total of 2596 bulls that were examined for the presence of FMD antibodies by 3ABC ELISA techniques 12.9 % (334/2596) were found to be positive. The prevalence of foot and mouth disease (FMD) based on origins; body condition score and weight range of bulls were summarized in Table 3.

Estimation of economic losses due to FMD

In the present study the economic losses due to FMD was calculated based on the rejection rate of animals from international

export was 290,413 US\$ as summarized in Table 4.

Seroprevalence of contagious bovine pleuropneumonia (CBPP)

From a total of 2596 bulls that were examined for the presence of CBPP 9% (233/2596) were found to be positive. The prevalence of contagious bovine pleuropneumonia (CBPP) based on origins; body condition score and weight range of bulls were summarized in Table 5.

Estimation of economic losses due to Contagious Bovine Pleuropneumonia (CBPP)

The total financial loss incurred due to CBPP was 202,593.5 US\$ as summarized in Table 6.

Discussion

In this study a total of 2697 bulls intended for export which were found in two feedlots located in central Ethiopia were assessed. Based on the examination; the major physical abnormalities that

Table 1. The Prevalence of Physical and Clinical Observed Abnormalities from Adami Tulu and Adama feedlots.

Origin of bulls	Types of physical abnormalities						
	Long horn	Skin disease	Deformed leg and hoof	Blindness	Swelling and hernia	Bulky abdomen	Total rejected bulls (%)
Bale (581)	6 (1.03%)	10 (1.72%)	4 (0.68%)	1 (0.17%)	1 (0.17%)	2 (0.34%)	3.94%
Yabelo (600)	2 (0.33 %)	3 (0.5%)	5 (0.83%)	1 (0.16%)	1 (0.16%)	2 (0.33%)	2.31%
Borena (1516)	13 (0.85%)	15 (0.98%)	14 (0.92%)	3 (0.19%)	13 (0.85%)	5 (0.33%)	4.12%
Total (2697)	21 (0.778%)	28 (1.038%)	23 (0.775%)	5 (0.185%)	15 (0.556%)	9 (0.333%)	101 (3.74%)

Table 2. Economic Losses of Beef Cattle (n=101) Rejected Due to Physical and Clinical Abnormalities from Adami Tulu and Adama Feedlots.

Name of the feedlot	Total animal examined	Total animal rejected	Average live weight	Rejected bulls (%)	Unit price/kg US\$	Total loss in US\$
Adami Tulu	1881	81	470	4.30%	1.85	70,429.50
Adama	816	20	470	2.45%	1.85	17,390
Total	2697	101		3.74%		87,819.50

Table 3. Prevalence of Foot and Mouth Disease (FMD) in Relation to Origins, Body Condition Score, Body Weight Range and Site of Feedlots.

	No of animals examined	No of positive	Prevalence (%)	P-value
Origin				
Bale	557	26	4.7	
Borena	1453	228	15.7	0.00**
Yabello	586	80	13.7	
Body condition score				
Medium	1797	279	15.5	
Good	799	55	6.9	0.00**
Body weight (kg)				
320-420	882	173	19.6	
421-520	1541	145	9.4	0.00**
521-620	173	16	9.2	
Farm				
Adami Tulu	1725	233	13.5	
Adama	871	101	11.6	0.17
Total	2596	334	12.9	

** Statistical significant difference at $p < 0.05$

Table 4. Economic Losses of Beef Cattle (n = 334) Rejected due to FMD in Adama and Adami Tulu feedlots.

Name of the feedlot	Total animals examined	Average live weight	No of rejected animal	Prevalence	Unit price/kg US\$	Total loss in US\$
Adama	871	470	101	11.60%	1.85	87,819.5
Adami Tulu	1725	470	233	13.50%	1.85	202,593.5
Total						290,413.0

Table 5. Prevalence of Contagious Bovine Pluropneumonia (CBPP) in relation to Origins, Body Condition Score, Body Weight Range and Site of Feedlots.

	No of animal examined	No of positive	Prevalence (%)	P-value
Origin				
Bale	557	22	3.9	
Borena	1453	166	11.4	0.000**
Yabello	586	45	7.7	
Body condition score				
Medium	1797	205	11.4	
Good	799	28	3.5	0.000**
Body weight (kg)				
320-420	882	77	8.7	
421-520	1541	146	9.5	0.026**
521-620	173	10	9.2	
Farm				
Adami Tulu	1725	176	10.2	
Adama	871	57	6.5	0.020**
Total	2596	233	9%	

** Statistical significant difference at $p < 0.05$.

Table 6. Economic Losses of Beef Cattle (n = 233) Rejected Due to CBPP in Adama and Anami Tulu Feedlots.

Rejection factors	Total animals examined	Average live weight	No of rejected animal	Prevalence	Unit price/kg US\$	Total loss in US\$
Adama	871	470	57	10.20%	1.85	49,561.5
Adami Tulu	1725	470	176	6.50%	1.85	153,032
Total						202,593.5

cause live animal export detention and rejection were long horn, skin diseases, deformities of leg and hoof, blindness, swelling and hernia and bulky abdomen. Poor farm management and lack of screening of the bulls for these abnormalities during purchasing or collection has a great role for this result. Generally the two private farms persuaded to receive this tremendous loss with above mentioned problems, with live animal rejection thus rejected animals served for local markets with lower price. Bulls those pass the clinical and physical examinations were assessed further for the presence of disease like foot and mouth disease (FMD) and contagious bovine pleuropneumonia (CBPP). Transboundary diseases, especially CBPP, FMD, and RVF hinder smooth trade flows of live animals and livestock products to the markets at domestic, regional and international level. The increased occurrence of these diseases suggests that there are certain weaknesses that are not being addressed [14].

The overall high seroprevalence of FMD (12.9 %) reported in this study shows that FMD is still existing problem in feedlots business. Similar studies done previously in export quarantine shows almost similar finding on prevalence of FMD [15]; reported overall prevalence of FMD (14.5 %) in Adama -Modjo feedlots in bulls originated from Borena area, Southern Ethiopia and [16] also reported an overall prevalence of (12.9%) at Adama- Modjo Livestock Export Industry, Eastern Ethiopia. According to study performed by [17] in livestock export quarantine stations

in central Ethiopia; majority of the feedlots practice all in/all out management system and almost none of them practice cleaning and disinfection between herds and flocks regularly. They also indicated that hygienic practices of feedlot workers and visitors are none existed. This could be one of the major factors that FMD and other infectious disease like CBPP still exist in the feedlots. The present finding of FMD was higher than the findings of [18] who reported, (5.53 %) on exported bulls of Borana and Jimma origin of Ethiopia; also study performed by [19] indicated that an overall prevalence of 5.6% in Afar Regional State while [20] reported (5.59%) in Dessie Zuria veterinary clinic and Kombolcha area of Ethiopia which is lower result from this study finding; this could be attributed to season of the year, type of animals selected for the study or age of the animal, ecological and management factors [21]. On the other hand, the find of this study was low when compared to report from Borena and Gujji zone (24.57%) and Bale zone (21.49%) of Ethiopia [22, 23].

In this study (9%) seroprevalence of CBPP recorded shows that also it is important diseases in the feedlots. Study done by [24] in prioritized transboundary diseases in borena bulls market chain of Ethiopia indicates that the bulls are usually introduced into feedlots without quarantine and also he indicated that vaccination of bulls started after two weeks of registration by Adama veterinary controlling authority. The length of time from introduction of first batch of bulls to vaccination is sufficient to

transmit the disease to healthy bulls. This could be the reason that transboundary diseases like FMD and CBPP still existing in the feedlots which serve as quarantine since this trend is not changed [24]. The finding of this study is in agreement with reports of [17] in older animals at different export quarantine of Ethiopia [21]; at Adama-Modjo Livestock Export Industry, Eastern Ethiopia and [25] in Dessanech District of South Omo Zone, South Eastern Ethiopia. The prevalence of CBPP obtained in this study was lower as compared to [26] who reported from Southern Zone of Tigray Regions, Northern Ethiopia. The lower seroprevalence in the current study might be due to the fact that, bulls intended for finishing were purchased based on their good body condition and health, the probability of purchasing chronically ill or recovered animals with poor body condition is therefore very low. This might also account for lower prevalence of diseases in the feedlots and bulls purchased after physical examination and brought to the farms and vaccinated for endemic diseases including CBPP. However the prevalence of this study was higher than report of [27] in bulls originated from Borena Pastoral Area of Southern Ethiopia.

The prevalence discrepancy recorded above with two disease show the fact between the current and the previous studies differ each other might be due to the variation exist in the epidemiology of the disease as well as cattle management system of the different study areas. In this study all animals were apparently healthy bulls purchased after physical examination and brought to the farms and vaccinated for endemic disease including FMD and CBPP. During this study over 55.9% of the animals were from Borana origin. Also this variation in result among researcher might be attribute to season of the year, furthermore, animal in field condition may have a chance of movement, contact with wild animals; production system and composition of animal species have got their own role in the epidemiology of the disease. As a result the Borana area is not free from FMD and CBPP. Even bulls were purchased from market where continuous commingling of animals from different localities. This shows that the bulls for export are not free from the FMD and CBPP due to the origins of the animals besides other reasons [28, 29].

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Conclusion

The result of this study indicates that FMD and CBPP is an important disease problem in live animal export industry of Ethiopia and are well established infection in bulls of the feedlots. A strong veterinary service structure has to be established to strengthen prevention and control of transboundary disease, and there should be surveillance network at national level, co-ordinate data collection, reporting any signs of the disease and implement appropriate control and preventive measures throughout the country. Further prevention and control strategies are needed in the feedlots; and biosecurity of the feedlots must be improved so that to reduce the exposure of bulls to new infections.

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