

# **Financial Losses due to Organ Condemnation Induced by Bovine Tuberculosis in Fako Abattoirs, South-West Region of Cameroon**

**\*Dorothy E. Fon<sup>1</sup>, Rosine Meningue<sup>1</sup> and Marc K. Kouam<sup>2</sup>**

<sup>1</sup>Department of Agricultural Economics, Faculty of Agronomy and Agricultural Sciences, University of Dschang, P.O. Box 222, Dschang, Cameroon

<sup>2</sup>Department of Agricultural Economics, Faculty of Agronomy and Agricultural Sciences, University of Dschang, P.O. Box 188, Dschang, Cameroon and Center for Research on Filariases and other Tropical Diseases (CRFiMT), P.O. Box 5797, Yaoundé, Cameroon

*\*Corresponding Author Email: [dengwali@yahoo.fr](mailto:dengwali@yahoo.fr)*



**Corresponding Author**

**Dorothy E. Fon**

**Department of Agricultural Economics, Faculty of Agronomy and Agricultural Sciences, University of Dschang, P.O. Box 222, Dschang, Cameroon**

**Corresponding Author's E-mail:**  
[dengwali@yahoo.fr](mailto:dengwali@yahoo.fr)

## **Abstract**

This article is aimed at estimating the financial losses due to organ condemnation induced by bovine tuberculosis in Fako Division of the South West Region, Cameroon.. Abattoir study was carried out between, May and October 2016 to estimate the amount of meat lost due to bovine tuberculosis and to assess the economic implication of condemned organs at meat inspection. Organs (liver, lungs, heart, kidney, intestine etc.) were examined at meat inspection following standard procedures and the financial loss was estimated by considering the total weight of condemned organs and the price per kilogram of marketable organs, obtained from the local market. The organs of 1,472 cattle were examined, of which 253 (17.18%) were condemned due to tuberculosis. The organs that were condemned due to bovine tuberculosis were the lungs (7.74%), trachea (3.60%), and the liver (1.90%). Three heads were totally condemned. Lungs and trachea represent 45.05% and 20.94% of the condemned organs, while the intestine constituted only 2.3%. The total weight of condemned organs was 475.37Kg with lungs recording the highest weight (236.21 kg). The amount of financial loss due to condemnation of organs with tuberculosis lesions was calculated as (1,189,680 FCFA).The condemned organs that contributed the most to financial losses were the lungs (590 525 F CFA), the trachea (160 350 FCFA), the heart (125 160 FCFA) and the liver (115 540 FCFA). Bovine tuberculosis is a cause of food insecurity in the region in particular and thus calls for an effective design and implement of bovine tuberculosis control strategies.

**Key words:** *Financial loss, organ condemnation, bovine tuberculosis, abattoir, Fako Division*

## Introduction

Bovine tuberculosis (bTB) is one of the causes of food insecurity due to slaughterhouse condemnation of organs/carcass that lead to reduced meat supply and financial losses. Bovine tuberculosis due to *Mycobacterium bovis* is also a zoonotic disease and in developing countries, about 10 to 15% of human tuberculosis cases are caused by *M. bovis* (Ashford *et al.*, 2001). Approximately 50 million cattle in the world are thought to be infected with bTB (Chantal, 2001) while in African countries, bTB is known to be endemic (Habarugira *et al.*, 2014; Jarikre *et al.*, 2014; Fonteh *et al.*, 2016) and to cause huge economic losses in animal production. Indeed, infected animals have been reported to lose 10 to 25% of their productive efficiency (Uduak, 2015) with direct losses due to bTB infection expressed by a decrease in 10 to 18% of milk and 15% reduction in meat production (Radostits and Blood, 1994).

Monetary and meat losses due to condemnation of organs with tuberculosis lesions are huge in many countries. For instance bovine tuberculosis has been reported to cause condemnation of 1683.5 kg of meat, resulting in an estimated loss of \$4810 in an abattoir in Rwanda over a period of 11 months (Habarugira *et al.*, 2014). The impending impact of bTB is underestimated due to the fact that post mortem examination in slaughter houses usually excludes complementary laboratory testing. Depending on the entry route of *M. bovis* into human or cattle host, tuberculosis may either be pulmonary if the respiratory route through aerosol was used, or extra pulmonary for a non-pulmonary pathway (consumption of unpasteurized milk and/or of raw or undercooked meat). Whatever the entry route, infected hosts with time developed granulomas in tissue especially the lungs, lymph nodes, liver, intestines and the kidneys which are used at meat inspection for evidence of tuberculosis infection. Though for the diagnosis of

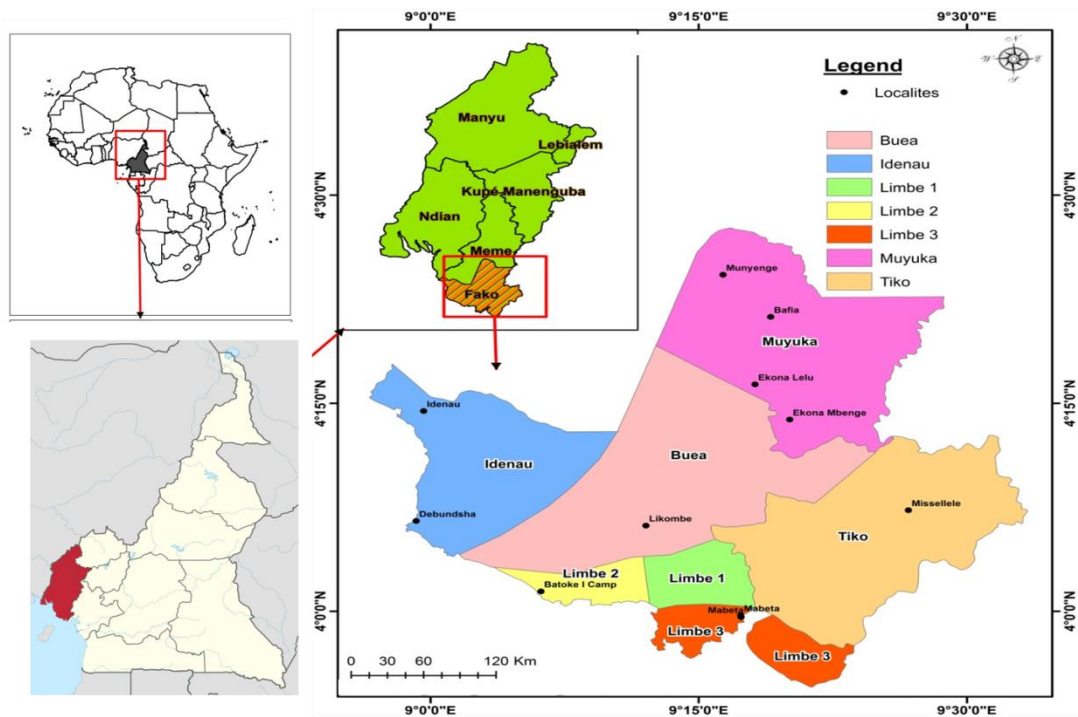
*Mycobacterium* sp culture and molecular techniques are more sensitive and recommended as gold standard (Ayele *et al.*, 2004), they remain unpractical at meat inspection because they are extremely time consuming and require highly trained personnel as well as heavy and expensive equipment.

In Cameroon, some studies have been conducted reporting the occurrence of bTB during meat inspection based on the detection of lesion or using tuberculin test on live cattle in some areas (Awah-Ndukum *et al.*, 2012; Fonteh *et al.*, 2016). However, none has ever evaluated the amount and economic implications of the condemned organs or carcasses in a given area of the country. Thus, the objectives of this study was to estimate the amount of meat lost due to bTB in cattle slaughtered in the South-West Region, and to assess the economic implications of condemned organs during abattoir inspection.

## Methodology

### Study area

The study was carried out from 1<sup>st</sup> May to 2<sup>nd</sup> October 2016 in Fako Division in the South-West region of Cameroon (Figure 1). Fako, located between longitude 9° and 9°30' East and latitude 3°90' and 4°30' North is the most urbanized subdivision of the South-West region with seven sub divisions (Yankam *et al.*, 2013). The temperature range is between 20°C and 28°C but may be as low as 4°C at the peaks. The annual rainfall reaches 10000mm in high altitude and is about 4000mm at 1000 m altitude. The air relative humidity is 75-85% due to occult rainfall (fog and mist) induced by the aerographic effect and the sea (Tasse, 2006). Animal husbandry consists of rabbit, cavy, poultry and pig rearing. Few cattle herds are found in local farms of Fako but the essential of cattle population in Fako abattoirs is brought from markets of the Littoral and North-West regions of the country.



**Figure 1:** Map of Fako Division, South-West region of Cameroon  
*Abattoirs presentation and study animals*

There are six (6) abattoirs and three (3) slaughter slabs in the study area. Abattoirs are distributed as follows in different subdivisions: 01 in Limbe, 02 in Tiko, 02 in Buea and 01 in Muyuka. The slaughter slabs are distributed as follows: 01 in Ekona, 01 in Bafia, and 01 in Mutengene. Beef cattle of various breed were the only animal materials in this study.

#### ***Routine abattoir inspection for the detection of tuberculosis***

Meat inspection was carried out by assigned meat inspectors on oath in each abattoir assisted by other assigned qualified experts and one of the investigators of this study. The procedure involved visual examination, palpation and incision of intact organs. For each animal examined, the liver, lung, kidney, and intestine were carefully watched and palpated; organs with lesions characteristic of tuberculosis (nodules) were considered infected. The following lymph nodes were further incised and examined (presence of tuberculous granuloma) to check for generalized tuberculosis: inguinal, ischiatic, internal and external iliac; the lymph nodes of the head and viscera were also examined.

#### ***Data collection***

In order to obtain a representative sample in the Division, data were collected rotationally in the abattoirs and slaughter slabs. All animals slaughtered for a week in one

abattoir were sampled then the following week, another abattoir was visited, and so on. Each abattoir or slab was visited at least twice. After slaughter and inspection, the data collected were: types of tuberculosis infected organs; types of condemned organs; causes of condemnation; and weight of totally or partially condemned organs. The financial value of the condemned organs was estimated as described by Danbirni *et al.* (2015). Briefly, the financial value was estimated as the product of organ weight and the average cost of the organ per kilogram. The overall financial loss in the study period was estimated as described above, by considering the total weight of the condemned organs during the study period.

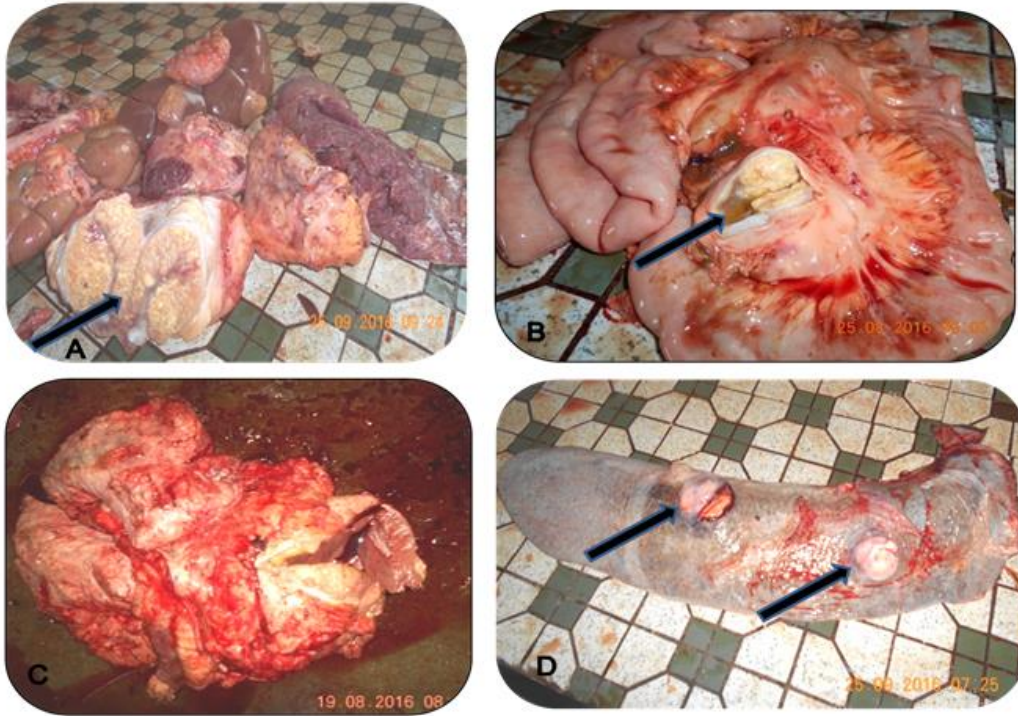
#### ***Statistical analysis***

The data obtained were subjected to descriptive statistics using the statistical package for the social sciences (SPSS version 13.0 Inc., USA).

#### ***Results***

In total, 9,039 cattle were slaughtered during the study period in Fako abattoirs, and of this number, the organs of 1,472 (16.29%) cattle were examined.

Tuberculosis lesions were observed in several organs or body part including the liver, lungs, heart, tongue, kidney, spleen, intestine, thoracic muscle, trachea, and even the head.



**Figure 2:** Condemned organs with bovine tuberculosis lesions. A= Kidney with tuberculosis granulomas; B= Intestines with tuberculosis granulomas in a lymph node; C= Lungs with tuberculosis lesions all over; D= spleen with tuberculosis granulomas.

Of the 1,472 animals examined, 253 (17.18%) organs/body parts were condemned due to tuberculosis. The lungs (7.74%) and trachea (3.60%) were the most condemned organs followed by the liver (1.90). Three heads were also totally condemned (Table 1). Lungs and trachea represent 45.05 % and 20.94% of the condemned organs, while the intestine constitutes only 2.37% (Table 1).

The total weight of condemned was 475.37 kg with lungs recording the highest weight (236.21 kg). The

amount of financial loss induced by condemnation of organs with bTB lesions was calculated as 1 189 680 FCFA (Table 1). The condemned organs that contributed the most to financial losses were the lungs (590 525 F CFA), the trachea (160 350 FCFA), the heart (125160FCFA) and the liver (115 540 FCFA) in the following percentage contribution to the total financial loss lungs (49.64%), trachea (13.48%), heart (10.52%), and liver (9.71%),

**Table 1:** Condemnation rate (%), quantity (kg) and financial value of condemned organs due to tuberculosis lesions from 1<sup>st</sup> May to 2<sup>nd</sup> October 2017 in Fako abattoirs

Organs/body parts	Number /condemned rate	Relative rate (%)	Quantity condemned(kg)	Kg price (FCFA)	Financial value	Percentage contribution to total financial loss
Liver	28 (1.90)	11.06	57.77	2000	115540	9.71
Lungs	114 (7.74)	45.05	236.21	2500	590525	49.64
Heart	20 (1.35)	7.90	41.72	3000	125160	10.52
Tongue	3 (0.20)	1.18	3.78	2500	9450	0.79
Kidney	10 (0.67)	3.95	7.22	2000	14440	1.21
Spleen	10 (0.67)	3.95	13.95	1500	20925	1.76
Intestine	6 (0.40)	2.37	9.52	2000	19040	1.60
Thoracic muscle	6 (0.40)	2.37	9.75	3000	29250	2.46
Trachea	53 (3.60)	20.94	53.45	3000	160350	13.48
Head	3 (0.20)	1.18	42	2500	105000	8.83
Total	253 (17.18)	100	475.37	-	1189680	100.00

N= number of examined organs = 1472; Figures in ( ) means condemned rate

## Discussion

Tuberculosis lesions were found in almost all the internal organs of the infected cattle. This agrees with previous findings that *M. bovis* infection is characterized by progressive development of granulomas in tissues and organs (Amanfu, 2006; OIE, 2010) but mostly in the thoracic cavity (Shitaye *et al.*, 2007). The lungs and trachea were the most affected organs while the head and intestine represented the least infected organs. This indicated that cattle slaughtered in Fako abattoirs mostly have do with pulmonary bTB rather than extra-pulmonary bTB. The higher cases of pulmonary tuberculosis compared with extra pulmonary tuberculosis simply indicates that the respiratory route is the main transmission route of *M. bovis* among infected cattle. Nevertheless, record of extra pulmonary cases especially the intestinal tuberculosis means that oral route is also present. Claves suckling infected cows is probably one of the pathways; other pathways must be investigated closely from the rearing areas of cattle. Unfortunately such a task seems tedious due to the fact that cattle slaughtered were purchased from market of the bordering regions with no possibility to trace back their origin. Our results contradict the findings from a similar study in Rwanda where the head and the liver rather than the lungs were the most condemned organs at abattoir inspection (Habarugira *et al.*, 2014). In Nigeria however, some authors found out during meat inspection only cases of pulmonary bTB (Alhaji *et al.*, 2017). These differences suggest regional differences in epidemiological profile of bTB.

The meat quantity that was lost because of tuberculosis lesions is huge especially at a time when the meat demand is very high. The lungs (49.69%), trachea (11.24%), liver (12.15%), and heart (8.77%), of total weight lost were the marketable organs which caused the most significant financial loss because of bTB. This observation is consistent with the weight of meat lost as a result of the related organs condemnation. The total financial loss incurred by tuberculosis in Fako during the study amounts to the sum required to purchase 4 adult cattle, indicating that bTB is one of the leading causes of meat shortage and consequently of food insecurity in the study area. It is important to mention that the mean price of a kilogram of meat in that area is above the mean price in most parts of the country. Habarugira *et al.*(2014) and Yibar *et al.* (2015) similarly found that bTB is among the main causes of financial loss due to abattoir condemnation of infected organs. It is important for the appropriate authorities to take steps towards the effective control of bTB nationwide, no matter the cost. Economic crisis is ravaging in the country in part due to foreign currency shortage. It is time to rely on animal products to increase the country's exportations but to be competitive only wholesome and safe animal products need to be sold.

## Conclusion

This study showed that bovine tuberculosis is an important cause of food insecurity in the country, directly responsible for the condemnation of a huge amount of meat during meat inspection. The financial value of condemned organs

in the study period in the area equalled the loss of four live adult animals. In order to make beef of Cameroon origin exportable, and to halt financial losses due to bTB in the country, it is important for the authorities to effectively design and implement bovine tuberculosis control strategies which should adopt one health concept because of threats to human health as well..

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