

The Impact of Foot and Mouth Disease on the Beef Industry in Botswana: The Case of Tonota Village

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Abstract

Foot and Mouth Disease (FMD) is a communicable disease found in cloven-hoofed wild and domestic animals. It is one of the major livestock diseases which have a great economic impact on the livelihood of livestock farmers. This study looks at the impact of foot and mouth disease on Botswana's beef industry. The study used primary data collected through survey questionnaires and interviews. Impact studies were done to assess the impact of FMD on the weight of cattle, level of milk production, continued interest in farming after FMD and the control and prevention cost impact to the economy. The findings show that FMD results in loss of weight in cattle (13.2%), loss in milk production (23.1%), a decrease in draught power (27.5%), a decline in fertility (14.3%), the death of newborns and suckling calves (22%). Recommendations to curb this outbreak include public education, frequent vaccinations of cattle coupled with subsidies of medications for the vaccines and the use of restrictive grazing.

Keywords: Botswana; Diseases; Foot and Mouth Disease (FMD); Impact; Industry; Livestock.

1. Introduction

Foot and Mouth disease (FMD) is an extremely communicable disease of cloven-hoofed wild animals and domestic animals, such as cattle, pigs, sheep, goats, deer, and buffalo and it is one of the significant livestock diseases in terms of its economic impact throughout the biosphere. The FMD virus can live in processed meat, milk and dairy products, and frozen products over a large range of regions and climates [1].

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In Southern Africa, there is a trans-boundary disease of animals and a high cost of regulation of meat export standards. Conventional thinking holds that FMD free nations are rich while countries with FMD disease are not. This is due to the lack of resources to control the spread of these diseases which lead to lack of export market for beef hence resulting in these countries being poor countries. Disease control is done in four phases: surveillance, separation, vaccination and movement restriction. Across the SADC there has been an erection of FMD control fences such as the Namibian veterinary cordon fence (VCF) which cuts across the FMD control zone and the free zone and only areas in FMD free zone are able to export. Botswana has struggled to put a fence between its borders with Zimbabwe because the fence it puts up has often been damaged by wild animals such as elephants and illegal immigrants from Zimbabwe [2].

The recurrence of FMD epidemic in Botswana led some farmers to start trafficking cattle from South Africa to Botswana. The government initiated an intervention to control the transportation of cattle from one zone to the other. According to [3] in a study which was focused on analyzing the intervention of cordon fencing, zonal branding, and permit usage in zones when transporting cattle from one zone to another in Botswana, noted that the intervention helped to reduce the spread of other cattle diseases but FMD continued to spread like veld fire despite all the effort invested in preventing and controlling the spread of the disease. Botswana's beef industry has been negatively affected by FMD from as early as 1935 and resulted in a great loss in this industry due to loss of market from European Union (EU) [3].

1.1 Statement of the problem

There are challenges that affect the beef industry in Botswana. The major problem is foot and mouth disease (FMD) and its expensive control and prevention measures. The impact of FMD in Botswana is unbearable to most rural households as they depend largely on cattle. The outbreak of FMD cripples their source of income and negatively impacts on their economic welfare. Tonota and other villages in the north of Botswana suffered a great loss in 2011. Francistown BMC incurred production and market losses in 2011. The government of Botswana also incurred some loss of revenue due to the outbreak of FMD.

1.2 Objectives of the study

The main objective of the study is to identify the impact of Foot and Mouth Disease (FMD) on the beef industry in Botswana.

The specific objectives are to:

- Identify the impact of FMD on the weight of cattle.
- Identify the impact of FMD on the milk production of cattle.
- Identify the impact of FMD on the economy of the area in terms of control and prevention.
- Identify the impact of FMD on the farmers' interest in farming.
- Provide recommendations to help minimize the recurrence of FMD and associated economic losses.

1.3 Significance of the Study

This study is expected to provide knowledge about the impact of FMD in the beef industry of Botswana with particular reference to Tonota, Central District. It is also expected to help future researchers with a source of references on related researches. The significance of this research is to highlight the effect of the 2011 FMD outbreak in Tonota village to draw the attention of key stake-holders and future researchers to its impacts on household welfare.

2. Literature Review

Before the discovery of diamonds, Botswana had depended on agriculture more especially on cattle farming for its development. The discovery of diamonds shifted the dependence of the country from agriculture to the mining industry [4]. This shift led to a decline in the contribution of the agricultural sector to the countries' Gross Domestic Product (GDP) to 2.5 percent in 2016. The beef industry is the backbone of agriculture in Botswana and contributes 1.3 percent of exports from markets in European Union countries (EU), South Africa and others [5].

There are challenges that affect the beef sector in Botswana. These include lack of water, shortage of land for grazing, disease, more especially (FMD), and weak linkage with markets [5]. The control of FMD is very expensive and prevention by vaccination sometimes does not bring sufficient results [6].

The livestock industry is a source of income for most rural households and the outbreak of FMD really cripples their welfare. Cattle farming have been the backbone of Botswana's economy since 1905 when 3000 heads were exported to South Africa and the number increased to 12000 heads per annum since 1914. Due to globalization, Botswana's beef is being exported to the EU, United Kingdom (UK) and Southern Africa since the establishment of Lobatse abattoir in 1955 [7].

The impact of FMD in Botswana includes production losses in relation to income loss from sales and loss of draught power. FMD inhibits performance and growth and results in the death of some of the infested animals. Cattle may produce less milk as they tend to have less appetite when they are infested by FMD. With the reduction in draught power, the animals are unable to do their work since their hooves have been infested. To cattle owners, sickness of livestock may lead to loss of income and low productivity from livestock activities.

The government incurs losses from an FMD outbreak as it is costly to treat affected animals and there is a high cost of preventing the recurrence of FMD in a particular area. FMD leads to loss of market for livestock and because they have lost weight they end up being sold at lower prices and they are bought and slaughtered for domestic consumption. This limits farmer's negotiating power. To abattoirs such as Botswana Meat Commission (BMC) in Francistown, the impact of FMD reflects in a loss of productivity in terms of the number of cattle slaughtered per day, loss of international market and also a loss of revenue as the price of beef is reduced [8].

Reference [5] in his study outlined that the beef industry is the subset of the agricultural sector that has remained a significant contributor to Botswana's GDP. This sector has been encountering many problems for the past 42

years hence experiencing a steady decline in growth. The poor performance has led to an additional challenge in the fight against poverty and food security as the vast populations who earn a living from this sector are the poor, rural-based, subsistence farmers. The beef export to EU is important for Botswana's diversification away from diamond revenue. The alternative markets that Botswana beef has been able to access are Norway, European Union, and South Africa. Botswana's access to EU markets for premium cuts has made it possible for BMC to modernize production facilities and meet international criteria. For veterinary control purposes, Botswana has been divided into 17 veterinary zones. Exports to the EU from the FMD vaccinated areas are prohibited. Selibe Phikwe has been declared a vaccination area while Francistown, Palapye and Serowe areas which cover zone 6, 7 and 8 are currently the buffer zones. These areas are the focus of this study. In 2007 the world organization for animal health declared these areas as the FMD- free status zones [5].

The study by [9], emphasized that even though FMD is a disease that has low death rates, its impact to the global village is massive, and this is because a large number of animals are infected. He managed to separate the economic impact of FMD into two categories being the indirect losses and direct losses which are due to FMD control costs, loss of market and less access to technology that can improve production. [9], observed that FMD impacts are harsh on the poor people who are living in developing countries and are mainly dependent on agriculture for a living. FMD leads to a reduction in cattle fertility which leads to herd structure being less efficient and discourages farmers from raising FMD vulnerable breeds which are highly productive. The estimate of impacts in terms of direct losses and vaccination in affected areas amounts to between US\$ 6.5 and 21 billion. The outbreak in FMD free zones and countries leads to losses of about US\$ 1.5 billion annually. FMD is highly contagious and leads to externalities; the action of one farmer may affect another farmer. Therefore the control of FMD needs cooperation between and within countries [9].

3. Methodology

3.1 Sources of information

The study used primary data. The reason it used primary data instead of secondary data is that the objective is to capture the welfare effect of foot and mouth disease among farmers. Cross-sectional data were collected in Tonota village covering zones 7 and 8. The cross-sectional study is when data is collected over a short period of time without a follow-up period [10]. In 2011, zone 7 had an FMD outbreak and zone 8 was not infected by FMD but it was declared to be FMD vaccination area. Data from the two zones were compared to determine the impact of FMD in zone 7 and to establish the reason for the reduction in production, cattle mortality and other factors that are affecting the beef industry.

3.2 Method of data collection

The method of data collection used in the study was through a survey by questionnaires and interviews. Questionnaire survey research is a method of collecting information about behavior, characteristics, and attitudes of a sample by issuing a similar set of questions to sample individuals [11]. This was because the research aimed to cover respondents who are literate and those who are not literate. Interview allowed face to

face interaction that made it easy to describe and explain some aspects of the questionnaire. It also made allowance for translation for respondents who did not understand the English language.

Convenience sampling was used to select which zones to include in the research. It was also used to select which cattle posts to include in the study. Simple random sampling was used to select a hundred households to be interviewed in total.

Simple random sampling from a finite population is selecting elements for the sample one at a time in a way that all the other elements have an equal chance of being selected [12]. A hundred households were interviewed in zone 7. The number of households to be included was selected based on constraints such as time and money available to carry out this research.

3.3 Method of data analysis

The data was analyzed using SPSS software package which is mostly used by researchers who use cross-sectional data. The features of the software such as correlation coefficient, Pearson correlation and frequencies were used in the analysis.

3.3.1 Type of data

The type of data that was adopted for this research is both qualitative and quantitative data. The qualitative method consists of a researcher describing features of people and events while the quantitative method emphasizes on measurement and amount of the features displayed by the people and events that the researcher studies [13]. The types of questions that were asked are open-ended and closed questions.

3.3.2 Target population

The respondents that the research was focused on are the owners of the cattle posts as well as caretakers of the cattle (herd boys). This was due to the fact that these people independently have their views about FMD, and its related challenges including the loss of jobs and cattle, decrease in salary, or long delay in salary payments for herd boys.

3.4 Main research questions of the study

The main questions that were asked in the questionnaire include:

- Demographic background of respondents
- How many cattle died in 2011 due to FMD in the zone?
- How has this loss affected the production of milk and meat on the farm?
- How has FMD reduced the income revenue for the farm due to loss of market for BMC?
- What measures have farmers taken to control the spread of FMD?

4. Data Analysis and Discussion of Results

4.1 Introduction

This chapter deals with presentation and analysis of the results of the study. These results are the analysis of primary data that were collected during the school vacation period in Tonota using questionnaires. The total number of respondents is 100. The software used in the analysis of this data is SPSS. Most of the questions in the questionnaire are qualitative and less quantitative. This is because the study wanted to capture the in-depth analysis of the impact of FMD on farmers in Tonota village.

4.2 Results and Interpretation

To measure the impact of Foot and Mouth Disease (FMD) on the beef industry, Pearson's correlation analysis was used as well as the p-value. The correlation shows the relationship between two variables.

The correlation was to aid in showing how FMD is related to other variables such as milk production, the weight of cattle, cattle morbidity rate, number of cattle farmers had before and after the FMD outbreak, FMD control measures, method of grazing adopted by farmers and finally what should be done by all stakeholders involved. The p-value was used to show the significance of the variables correlated.

The analyses have been divided into two categories, being the direct cost and the indirect costs. The direct cost involves the weight production, morbidity rate and reduction in the number of cattle due to FMD. The indirect cost includes the market access loss, spread of FMD to other livestock, control measures and method of grazing that should be adopted by farmers.

4.3 Frequency Tables

Table 1: Age and Gender of Respondents'

Age	Male	Female	Total
Less than 25	10	4	14
25 -40 years	5	10	15
41- 55 years	14	18	32
More than 55	22	17	39
Total	51	49	100

A large proportion of respondents are made up of males who were above 55 years. Most men pursue farming when they retire hence a larger number of them. The majority of the respondents in the female category were between 41-55 years. The total proportion of adult respondents constituted 71 percent of the population. Women also engage in farming in later ages of their lives as they also spent their youthful years taking care of children

and their career.

The youth constituted a small proportion of the respondents. The youth are classified as those below the age of 40. This is due to the mentality that young people have against farming as they consider it to be meant for old people only as they are less productive in the job market.

Another reason may be that the agricultural situation in Botswana is such that farmers are constantly making losses due to unfavorable weather conditions and unreliable rainfall.

4.3.2 Level of Education by Farm Responsibility

Table 2: Level of Education by Farm Responsibility

Level of Education	Owner	Care Taker	Total
None Formal	13	17	30
Primary	15	12	27
Secondary	24	11	35
Tertiary	7	1	8
Total	59	41	100

The results show that a high number of owners who have a secondary education are engaged in farming. This number is followed by farm caretakers who have no formal education. Farm owners who have primary education also formed a high proportion of the sample.

Those numbers show that individuals who have a high education are likely to be farm owners when they engage in farm activities while people with lower education are likely to be farm caretakers in agriculture.

This is because the educated are better informed about agricultural programmes and initiatives such as Integrated Support Programme for Arable Agricultural Development (ISPAAD), youth grants, Livestock Management and Infrastructure Development (LIMID), and other initiatives from the government and access them to enhance their productivity.

Those individuals with no education end up settling in their comfort zone and receiving a minimum wage monthly from their bosses. After the 2011 FMD outbreak, the government rolled out a compensation package for affected farmers.

Our interview revealed that some farmers did not receive any compensation for their loss.

4.3.3 Reasons Some Farmers did not Receive Compensation

Table 3: Reason for no Compensation of Farmers

Reason	Frequency	Percentage	Cumulative Percentage
Did not meet requirement	9	39.1	39.1
Don't know the reason	10	43.5	82.6
Institutional Failure	4	17.4	100
Total	23	100	

A total of 23 farmers who were interviewed indicated that they did not receive any form of compensation from the government for the loss they incurred because of the FMD. A high proportion of them indicated that they did not receive any explanation as to why their losses were not compensated for. They went from office to office in the government department to no avail.

Some farmers indicated that they were told that they did not meet the requirements. The government failed to tell them what was the requirement that they did not meet and why their losses were deemed insignificant. These farmers are still grieving for their loss till today. A small proportion of farmers indicated that there was an institutional failure. They said that they applied for compensation and made follow up only to be told when they are supposed to receive their lump sum that there is no money for them, reasons still unknown to these farmers till today.

4.3.4 Reasons why the Compensation was not enough

Table 4: Reasons why the compensation was not enough

Reason	Frequency	Percentage	Cumulative Percentage
Did not cover the cost of losses	19	57.6	57.6
Below the market price of a head Of a Cow	9	27.3	84.8
Only a percentage of infected catthe was Compensated	5	15.2	100
Total	33	100	

A total of 33 farmers who were given cash payments as compensation indicated that the lump-sum payments were not enough to cover their losses'. This number is followed by farmers who indicated that the compensation was below the market price of a head of a cow, this means that they received the amount of money that could not enable them to replace the cows they lost as it was very little. A lesser proportion of farmers indicated that only a percentage of the infected animals were compensated for. This brought a huge loss to farmers because if they had 1000 cattle for example and they are all infected by FMD and were told that only 400 cattle would be covered by compensation it was less than what they had and it would take time to reach the 1000 cattle they had.

4.3.5 Farmers Control Measures against FMD

Table 5: Farmers Control Measures against FMD

Measures	Frequency	Percentage	Cumulative Percentage
Secure and maintain farm boundary fences	25	25	25
Disinfect equipment at the farm entrance	27	27	52
examining and testing of animals	36	36	88
limitation of visitors to the farm	12	12	100
Total	100	100	

Farmers are taking the responsibility for ensuring that the spread of FMD does not bring great negative impact upon their farms. Most farmers examine and test their animals. This helps in early detection and treatment of the virus before it spreads. Some farmers disinfect pieces of equipment at the farm entrance for visitors and their vehicles. This ensures that the virus borne by equipment from outside the farm is not allowed to enter the farm gates. Others indicated that they secure and maintain farm boundary fences; this helps control animal movement hence restricts infections. Some farmers take an extreme measure such as limiting the number of visitors to their farms by recording visitors; this can be costly as someone has to be hired to do the job of monitoring and recording visitors.

4.3.6 Type of Losses incurred by Farmers

Table 6: Type of Losses incurred by Farmers

Type of Loss	Frequency	Percentage	Cumulative Percentage
Loss of weight in cattle	12	13.2	23.2
Loss of milk production	21	23.1	36.3
Decrease in draught power	25	27.5	63.8
Decrease in fertility	13	14.3	78.1
Death of a newborn and suckling calves	20	21.9	100
Total	91	100	

Farmers indicated that their main loss was in decreased draught power. This is because farmers used their bull to pull plows in the field and FMD makes farming difficult for them. The second problem is the loss of milk production. When cattle are sick they do not produce enough milk to sustain their calves. These mean that farmers spend money to buy milk to supplement what the cows produce in order to feed suckling calves. Another problem that is of concern is the death of newborn and suckling calves which die in large numbers

because their immune system is not strong to resist the FMD infection. Loss of weight and decrease in fertility also bring problems because when the cattle weight less, their market value decreases and the decrease in production also hinders the process of reproduction in the farm.

4.3.7 Method of Grazing adopted by Farmers

Table 7: Method of Grazing adopted by Farmers

Method	Frequency	Percentage	Cumulative Percentage
Free movement grazing	74	74	74
Restrictive grazing	26	26	100
Total	100	100	

Free movement grazing is the most practiced method by most farmers. This is because most rural farmers are subsistence farmers who cannot afford feedlots and buy lab for their cattle. This method of grazing makes cattle to be exposed to infections as they interact with others hence spreading the infection. Few farmers practice restrictive grazing. Usually, these farmers are well-established farmers who rear cattle for commercial purposes and do everything they can so that they do not compromise the profit they want. This method can help with controlling the spread of FMD virus as farmers can treat their cattle easily without any interaction with other farmer's cattle.

4.3.8 Control Measures that are used to prevent the spread of FMD on the Farms

Table 8: Control Measure that is used on the Farms

Control measure	Frequency	Percentage	Cumulative Percentage
Control slaughter	24	24	24
Destruction of animals	19	19	43
Carcass disposal	18	18	61
Cleaning and disposal of animals	14	14	75
Emergency vaccination	12	12	87
Movement restriction	13	13	100
Total	100	100	

Most farmers prefer FMD to be controlled using controlled slaughter. This is the method whereby only the infected cattle will be slaughtered and the rest remain on the farm. This preference is followed by farmers who prefer the destruction of animals. This means that all the livestock on the farm are destroyed so that the spread

production before FMD. These results mean that when the weight of cattle increases, milk production also increases and when the weight of cattle decreases, milk production also decreases. The $r = 0.231$ (correlation coefficient), is a value that shows a weak correlation between the weight of cattle and milk production. Conclusion: The $p = 0.021 > 0.01$, the evidence is not enough to reject the null hypothesis. This means that there is no association between the weight of cattle and milk production before FMD.

4.5 Correlation between Weight of Cattle and Milk Production after FMD Outbreak

$H_0: \rho = 0$ (There is no association between milk production and weight of cattle).

$H_0: \rho \neq 0$ (There is an association between milk production and weight of cattle).

Decision rule: Reject null hypothesis if $p\text{-value} < 0.01$ (two-tailed test).

Table 10: Correlation between Weight of Cattle and Milk Production after FMD Outbreak.

		How has the loss affected the production on daily basis in the farm in terms of milk production after FMD?	How has the loss affected the production on daily basis in the farm in terms of average weight of cattle in the farm after FMD?
How has the loss affected the production on daily basis in the farm in terms of milk production after FMD?	Pearson Correlation Sig.(2-tailed)	1	0.278 0.007
How has the loss affected the production on daily basis in the farm in terms of average weight on the farm after the FMD?	Pearson Correlation Sig. (2-tailed)	0.278 0.007	1

The results above show that there is a positive relationship between the weight of cattle after FMD and milk production after FMD. This means that when the weight of cattle increases, milk production also increases and when the weight of cattle decreases, milk production also decreases. The $r = 0.278$ (correlation coefficient), shows a weak correlation between the weight of cattle and milk production.

Conclusion: The $p=0.007 < 0.01$, the evidence is enough to reject the null hypothesis. This means that there is an association between the weight of cattle and milk production after FMD.

4.6 Correlation between Numbers of Cattle Affected by FMD and Loss of Market by BMC

$H_0: \rho = 0$ (There is NO association between the number of cattle affected by FMD and loss of market by BMC).

$H_1: \rho \neq 0$ (There is an association between the number of cattle affected by FMD and loss of market by BMC).

Decision Rule: Reject the null hypothesis when $p\text{-value} < 0.01$ (2 tailed test).

Table 11: Correlation between Numbers of Cattle Affected by FMD and Loss of Market by BMC

		What is the total number of cattle that were affected by FMD in your farm including suspected cases?	What kind of loss was incurred by farmers?
What is the total number of cattle that were affected by FMD in your farm including suspected cases?	Pearson Correlation	1	-0.167
	Sig.(2-tailed)		0.195
What kind of loss was incurred by farmers?	Pearson Correlation	-0.167	1
	Sig. (2-tailed)	0.195	

The results above show that there is a negative relationship between the number of cattle affected by FMD and the loss of market incurred by farmers. These means that when the number of cattle affected by FMD increase, loss of market decreases. The $r = -0.167$ (correlation coefficient), this value shows a weak correlation between the number of cattle affected by FMD and the loss of market incurred by farmers. Conclusion: The $p=0.195 > 0.01$, the evidence not enough to reject the null hypothesis. This means that there is no association between the number of cattle affected by FMD and the loss of market incurred by farmers.

5. Conclusion and Recommendation

The results of the study show the outbreak of FMD did not result in a loss of market by the farmers besides the issued identified in relation to the payments of compensations. The study, however, recommends the adoption of the following measures.

- Public education by veterinary officers should be done frequently even when there are no threats of

FMD outbreaks.

- Frequent vaccination should be done in cattle post on regular bases to prevent the occurrence of the diseases. This will enable the government to save money that can be used to develop agriculture to be in a better position like the industries.
- Encourage restrictive grazing because results show that cattle that are feed on paddocks have a better chance of survival than cattle that graze on communal land as the virus does not spread rapidly to other animals when they do not interact with each other.
- Subsidies on cattle medicine should be done as these will encourage farmers to buy medicine for their animals when they get sick because as of now animal medicine is expensive and some subsistence farmers are failing to buy the medicine such as a tip for ticks and ringworms. This could help as when the virus of FMD finds the immune system of cattle already weak it is difficult to control the spread of this disease.

5.2 Limitations of the Study

This study was limited by the fact that the FMD outbreak happened in 2011 and some people had a memory lapse that is they could not remember that this was an event that happened during that time. The questionnaire had close-ended questions and this helped a lot to make respondents remember what exactly happened.

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6. Appendices

Appendix I: Questionnaire

STUDY ON THE ECONOMIC IMPACT OF FOOT AND MOUTH DISEASE ON THE BEEF

INDUSTRY IN BOTSWANA: case of Tonota village

Tick where appropriate.

1. Gender: Male Female
2. AGE: less than 25 25-40 41-55 more than 50
3. Level of education: No formal education Primary level
Secondary level Tertiary level
4. Marital status: Single Married Cohabiting
Widowed Divorced
5. Farm owner farm care-taker other (specify) _____
6. How many cattle did you have before 2011?
1-50 51-100 101-150 151-200 201-250 251-300
more than 300

7. How many cattle do you have now?

1-50 51-100 101-150 151-200 200-251
251-300 more than 300

8. Was your farm infected by foot and mouth in 2011?

Yes No

9. If yes, what is the total number of cattle that were affected by FMD in your farm including suspected cases?

1-50 51-100 101-150 151-200 201-250
251-300 more than 300

10. If yes, did you receive any compensation from the government?

Yes No

11. If no, what are the reasons why you did not receive any compensation?

I did not meet the requirements

I don't know the reason why I did not receive the compensation

There was institutional failure on compensation follow up

12. If yes, was the compensation enough to cover the cost incurred due to food and mouth disease outbreak?

Yes No

13. If no, what is the reason why the compensation, not enough?

It didn't cover the cost of losses

It was below the market price of a head of a cow

Not all cattle were compensated but a percentage of the infected cattle

14. Which method of compensation scheme do you think is appropriate when there is

FMD outbreak?

Object recovered

Percentage covered of compensation

Cost sharing between government and farm owner

15. How is your life after 2011 FMD outbreak in terms of interest in the rearing of animals?

Loss of interest in farming in general

Loss of interest in livestock farming in general

Loss of interest in cattle farming

Nothing changed

Other (specify) _____

16. How has the loss affected the production on daily basis in the farm in terms of milk production?

a. Litres of milk before FMD outbreak

1-50

50-100

100-150

150-200

More than 200

b. Litres of milk after FMD outbreak

1-50

	<input type="text"/>	
50-100	<input type="text"/>	
100-	<input type="text"/>	150
150-	<input type="text"/>	200
More than 200	<input type="text"/>	

17. How has the loss affected the production of beef in terms of average weight of cattle the farm?

a. Average weight of cattle before FMD in kg

300-500	<input type="text"/>
500-700	<input type="text"/>
700-900	<input type="text"/>
900-1100	<input type="text"/>
More than 1100	<input type="text"/>

b. Average weight of cattle after FMD in kg

300-500	
500-700	<input type="text"/>
700-900	<input type="text"/>
900-1100	<input type="text"/>
More	<input type="text"/> than 1100

18. Was there any loss in the farm due to loss of market by BMC in Francistown?

Yes No

19. If yes, what kind of loss was incurred by farmers?

Less market value of
cattle

Limited marked of _____
cattle

Other (specify)

20. What measures have you taken to make sure that your animals are not affected by FMD?

Secure and maintain farm boundaries (fences)

Disinfect equipment at the farm entrance for visitors and their vehicles

Examining and testing of animals

Other (specify) _____

21. Before FMD infected your farm did you have any knowledge about the disease?

Yes

No

22. Were you aware of the consequences caused by the disease?

Yes

No

23. What was the main effect of losses in your farm on your farm due to FMD?

Loss of weight in cattle

Loss of milk production

Decrease in draft power

Decrease in fertility

Death of new-born and suckling calves

24. What is the current control policy in your area?

Restriction of animal movement

Quarantine of infected animals

Vaccination

Other

(specify) _____

25. Which method of grazing have you adopted on your farm?

Free movement grazing restricted or extensive grazing

26. Were the signs of FMD only observed on cattle only or other livestock were affected?

Yes

No

27. How is the loss of morbidity rate in your farm due to FMD?

90-100 80-90 70-80

60-70 50-60 less than 50

28. According to you, who do you think is responsible for clinical observation and notification of suspected cases of FMD?

Farm owner

Farmworker

Private veterinary

Official veterinary

29. Which method do you think should be adopted to encourage early notification about FMD?

Compensation scheme

Strengthening communication with farmers

Education activities

30. Which measure of control do you think should be taken at the affected farms?

Controlled slaughter

Destruction of animals

Carcass disposal

Cleaning and disposal

Emergency vaccination

Movement restriction

31. Is there any history of FMD outbreak status before 2011 outbreak in the region?

Yes

No

32. If yes, what do you think was done wrong that led to the reoccurrence of FMD in 2011?

Lack of cordon fence maintenance

Lack of regular cattle vaccination

Lack of proper diagnose of FMD type in the