



## Financial loss due to foot and mouth disease outbreak in cattle in some affected areas of Bangladesh

M. Giasuddin<sup>1,2,\*</sup>, M.Z. Ali<sup>1</sup>, M.A. Sayeed<sup>2</sup> and E. Islam<sup>2</sup>

<sup>1</sup>Animal Health Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka 1341, Bangladesh.

<sup>2</sup>Research on FMD and PPR in Bangladesh, Bangladesh Livestock Research Institute, Savar, Dhaka 1341, Bangladesh.

### Abstract

Foot and mouth disease (FMD) is a severe and highly contagious disease that causes immense financial losses due to mortality, reduced milk production, treatment cost of affected cattle, weight loss of fattening cattle and manpower loss for taking care of affected cattle, which occurs in Bangladesh almost every year. Outbreak of this disease causes financial loss to the farmers as well as the national economy of Bangladesh. Therefore, an attempt was made to assess the morbidity and mortality by FMD and to estimate financial loss incurred therein. For this study, data were collected from 850 affected households of Dhaka, Rajshahi, Rangpur, Khulna and Chattogram divisions of Bangladesh during July 2017 to June 2018 using a pre-tested interview schedule responding to the study objectives. In total, there were 4857 crossbred and 2138 native cattle in the affected household. The study revealed that the overall morbidity and mortality rates were 55.43% and 5.15%, respectively in crossbred cattle and 77.83% and 12.39%, respectively in native cattle and it differed significantly ( $p < 0.01$ ) with areas and category of cattle. Infection period for an FMD affected crossbred cattle were an average of  $18.46 \pm 0.27$  days and for native cattle were an average of  $19.56 \pm 0.40$  days. The total financial loss due to the FMD outbreak was calculated as Taka 53172067 (Tk. 53.17 million or US\$ 0.63 million) for 850 affected households. The percentage of loss incurred was the highest for the death of affected cattle (63.47%) followed by veterinary cost (10.71%), weight loss of fattening cattle (10.68%), reduction in milk yield (9.17%) and manpower loss for taking care of affected cattle (5.98%). Based on this calculation the projected financial loss due to the FMD outbreak would be Taka 18856.96 crore (Tk. 188.57 billion or US\$ 2.22 billion) per year in Bangladesh.

**Keywords:** Foot and Mouth Disease, Morbidity, Mortality, Financial loss

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### Introduction

Livestock is a sub-sector of agriculture and it also contributes to the country's Gross Domestic Product (GDP) to a great extent. Agriculture sector contributes BDT 10468.8

\*Corresponding author: [mgias04@yahoo.com](mailto:mgias04@yahoo.com)

million to the national GDP, which is 13.07% to the total GDP (BBS, 2016). Out of this contribution, livestock sub-sector contributes BDT 1360.94 million, which is 13% to the total agriculture GDP and 2.5% of the country's GDP (BIDS, 2016). According to the Bangladesh Economic Review (2011), livestock sub-sector contributes 2.57% to the GDP of Bangladesh and 9% to the agricultural GDP. Though livestock contributes significantly to the economy of Bangladesh, animal diseases are still a major constraint on economic growth, reduction of poverty, and food security. Among the significant diseases, FMD is one of the most important contagious transboundary animal diseases that cause severe economic losses due to high morbidity and export trade restrictions imposed on affected countries (FAO, 2002; FAO, 2007; Khokon *et al.*, 2017; Bhuiyan *et al.*, 2019). FMD is one of the most prevalent diseases. Once the outbreak starts, it continues around the year, affecting a large number of cattle herd (Mahmud *et al.*, 2018; Ali *et al.*, 2019; Ali and Giasuddin, 2020). An average of 130 outbreak of FMD every year has been reported from Bangladesh (Domingo *et al.* 2002; Bary *et al.*, 2018; Ali

and Sultana, 2013). Rahman *et al.* (2014) reported the prevalence of FMD were 13.04, 12.48, 9.42 and 55.85% for cattle, buffalo, goat and sheep, respectively during 2004-2006. Giasuddin *et al.* (2017) collected 68 suspected samples from different areas of Sirajgonj district, Bangladesh from 2014-2016 and found out that of these samples 48 were FMDV positive with susceptibility 70.6%. Howlader *et al.* (2004) conducted a study in Baghabari milk shed area in 1999 estimated economic losses at US\$ 163329 incurred from 3072 FMD affected cattle due to calf mortality, reduced milk and draught power losses. Baluka *et al.* (2014) reported the annual economic cost per head of cattle due to FMD was US\$ 123, US\$ 41 and US\$ 17 for small medium and large herd sizes, respectively. The studies available in Bangladesh are very old, sporadic, location specific and mostly on the prevalence of this disease and a little study is available for financial losses due to FMD in Bangladesh. Considering the losses caused by FMD in the national economy, the present study was conducted to estimate the direct financial losses, morbidity and mortality rates according to location, age, sex and breeds of cattle caused by FMD in Bangladesh.

## Materials and Methods

For this study, data were collected from 850 affected households of Dhaka, Rajshahi, Rangpur, Khulna and Chattogram divisions from July 2017 to June 2018. In total, there were 4850 crossbred cattle and 2138 native cattle in the affected households. Data on the incidence of FMD in cattle and financial losses incurred from reduced milk yield, mortality, cost of treatment, weight loss due to infection in fattening cattle, labour cost for taking care of infected cattle were

recorded by interviewing the farmers using a pretested interview schedule. Microsoft Excel (Microsoft Corporation, USA) and IBM SPSS Statistics for Windows (IBM Corp., USA) (SPSS 16) were used to analyze data. Loss due to milk yield reduction, mortality and loss of weight were estimated following the procedure of Kumar (<http://www.fao.org/docs/eims/upload/299846/an367e00.pdf>). Chi-square test was carried out for better precision of data to determine the prevalence of FMD and mortality.

## Results

### Morbidity and mortality rate of crossbred and native cattle by area

Morbidity and mortality of crossbred and native cattle by area are shown in Table 1. The overall morbidity and mortality in crossbred cattle were 55.43% and 5.15%, respectively. Morbidity in crossbred cattle was observed the highest in Khulna (83.87%), followed by Rajshahi (72.67%), Rangpur (66.67%), Dhaka (63.57%) and Chattogram (28.40%). Mortality was found the highest in Dhaka (9.88%) followed by Rangpur (8.33%), Khulna (6.45%), Rajshahi (4.69%) and Chattogram (3.87%). Chi-

square values showed that morbidity and mortality in crossbred cattle differed significantly ( $p < 0.01$ ) and with areas. The average morbidity and mortality in native cattle were observed 77.83% and 12.39%, respectively. Significantly ( $p < 0.01$ ) higher morbidity in native cattle was found in Khulna (84.92%), followed by Rangpur (77.14%), Dhaka (73.29%) and Rajshahi (70.48%). Mortality was found the highest in Dhaka (16.02%) followed by Khulna (13.97%), Rajshahi (11.43%) and Rangpur (9.47%). Chi-square values showed that morbidity and mortality in native cattle differed significantly ( $p < 0.01$ ) with areas.

Table 1. Morbidity and mortality of crossbred and native cattle by area.

Area	No. of farms	Crossbred cattle			Native cattle		
		Total no. of cattle	Morbidity	Mortality	Total no. of cattle	Morbidity	Mortality
Dhaka	210	678 (13.96)	431 (63.57)	67 (9.88)	337 (16.39)	247 (73.29)	54 (16.02)
Rajshahi	298	2367 (48.73)	1720 (72.67)	111 (4.69)	420 (13.12)	296 (70.48)	48 (11.43)
Rangpur	202	24 (0.49)	16 (66.67)	2 (8.33)	665 (33.95)	513 (77.14)	63 (9.47)
Khulna	110	31 (0.64)	26 (83.87)	2 (6.45)	716 (36.55)	608 (84.92)	100 (13.97)
Chattogram	30	1757 (36.17)	499 (28.40)	68 (3.87)	0 (0.00)	0 (0.00)	0 (0.00)
Total	850	4857 (100)	2692 (55.43)	250 (5.15)	2138 (100)	1664 (77.83)	265 (12.39)
$\chi^2$ values* Significance			836.24 $P < 0.01$	38.62 $P < 0.01$		1997.42 $P < 0.01$	1797.18 $P < 0.01$

Figures in parentheses are percentages the respective total area;  $\chi^2$  was estimated from absolute numbers and not from percentages

### Morbidity and mortality rate of crossbred and native cattle by category

Morbidity and mortality of crossbred and native cattle by category are presented in Table 2. The overall morbidity and mortality were 55.43% and 5.15%, respectively in crossbred cattle. Morbidity was observed the highest for the bull (75.44%), followed by the growing bull (73.33%), male calf (70.93%), female calf (65.82%), heifer (62.67%) and was the lowest for cow

(45.17%). It was found that morbidity in crossbred cattle differed significantly ( $p < 0.01$ ) with categories of cattle. Mortality was observed the highest for the bull (11.03%) followed by female calf (10.35%), male calf (8.33%), growing bull (5.71%), heifer (3.83%) and cow (2.79%) and differed significantly ( $p < 0.01$ ) with categories of cattle. Herd specific mortality of crossbred cattle showed that it was the highest for cow (29.6%) followed by female calf (29.20%), male calf (17.20%), bull

(12.40%), heifer (9.20%) and growing bull (2.40%). Again, the overall morbidity and mortality in native cattle were 77.83% and 12.39%, respectively. Morbidity in native cattle varied significantly ( $p < 0.01$ ) by different categories with higher in growing bull (85.86%) followed by cow (80.87%), bull/bullock (77.23%), heifer (76.92%) and female calf (69.85%). Mortality was found the highest for female calf (26.27%), followed by male calf (15.30%),

bull/bullock (9.52%), growing bull (9.09%), cows (8.88%) and heifer (6.73%). Chi-square values showed that mortality in native cattle differed significantly ( $p < 0.01$ ) with categories of cattle. Herd category-specific mortality rate in native cattle was the highest for female calf (33.21%) followed by a cow (24.53%), bull/bullock (17.36%), male calf (16.23%), heifer (5.28%) and growing bull (3.40%).

### Estimation of financial loss due to FMD infection

For estimating financial loss due to FMD infection only direct loss such as cost incurred for the reduction in milk

production, death of cattle, treatment cost, weight loss of fattening cattle and labour cost for taking care of infected cattle were considered.

Table 2. Morbidity and mortality of crossbred and native cattle by category.

Category of cattle	Crossbred cattle				Native cattle			
	Total No. of cattle	Morbidity	Mortality	Herd age specific mortality	Total No. of cattle	Morbidity	Mortality	Herd age specific mortality
Cow	2650 (54.56)	1197 (45.17)	74 (2.79)	29.60	732	592 (80.87)	65 (8.88)	24.53
Bull	281 (5.79)	212 (75.44)	31 (11.03)	12.40	483	373 (77.23)	46 (9.52)	17.36
Heifer	600 (12.35)	376 (62.67)	23 (3.83)	9.20	208	160 (76.92)	14 (6.73)	5.28
Growing bull	105 (2.16)	77 (73.33)	6 (5.71)	2.40	99	85 (85.86)	9 (9.09)	3.40
Male calf	516 (10.62)	366 (70.93)	43 (8.33)	17.20	281	220 (78.29)	43 (15.30)	16.23
Female calf	705 (14.52)	464 (65.82)	73 (10.35)	29.20	335	234 (69.85)	88 (26.27)	33.21
All category	4857 (100)	2692 (55.43)	250 (5.15)	100	2138	1664 (77.83)	265 (12.39)	100
$\chi^2$ values*		396.12	107.84			857.36	16220.97	
Significance		$P < 0.01$	$P < 0.01$			$< 0.01$	$P < 0.01$	

Figures in parentheses are percentages;  $\chi^2$  was estimated from absolute numbers and not from percentages; Herd category age proportional mortality rate, i.e., death specific age group in a year per total deaths in the same year, expressed per 100.

### Financial loss due to reduction in milk production

A total of 1011 milking crossbred and 440 milking native cows were infected by FMD in the studied farms/households presented in Table 3. The average reduction in milk yield/cow/day was  $5.43 \pm 0.91$  L and  $0.91 \pm 0.02$  L which lasted for  $18.46 \pm 0.27$  days and  $19.56 \pm 0.40$

days for crossbred and native cows, respectively. The average price of milk was Tk. 43.96 for crossbred and Tk. 53.43/L for native cow milk. Total milk production loss for the infected period was Tk. 44,54,924.68 and Tk. 4,18,454.36 for crossbred and native cows, respectively and it stands at Tk. 48,73,379.04 (USD 57462) (1USD=84.81 BDT).

Table 3. The number of crossbred and native milking cattle infected, infected days, reduction in milk production/day, price of milk/L and total price of milk yield loss by area.

Breed	No. of in-milk cow infected	No. of infected days	Reduction in milk yield/cow/day	Price of milk/lit	Loss of milk/cow for the infected period (lit)	The total cost of milk yield loss (Taka)
Crossbred	1011	$18.46 \pm 0.27$	$5.43 \pm 0.91$	$43.96 \pm 0.59$	$100.24 \pm 3.20$	44,54,924.68
Native	440	$19.56 \pm 0.40$	$0.91 \pm 0.02$	$53.43 \pm 0.30$	$17.80 \pm 0.55$	4,18,454.36
Total	1451	$19.01 \pm 0.27$	$3.15 \pm 0.11$	$48.75 \pm 0.22$	$59.88 \pm 2.40$	4873379.04

### Financial loss due to death of crossbred and native cattle

The financial loss incurred due to the death of crossbred and native cattle affected by FMD in the surveyed farm is presented in Table 4. A total of 250 crossbred and 265 native cattle died with a mortality rate of 5.15% and 12.39% for crossbred and native

cattle, respectively. The average unit price of cattle died was estimated as Tk. 85,400 and Tk. 46,788 for crossbred and native cattle, respectively. Total loss incurred for death due to FMD infection was Tk. 3,37,48,820. The average loss for per affected farms was Tk. 97,258.85 (USD 1145).

Table 4. Financial loss due death of crossbred and native cattle.

Breed of cattle	Total number of cattle	No. of farms affected from death of cattle	No. of cattle died	Price per unit of dead cattle (Tk.)*	Total loss ** (Tk.)	Loss per affected farm***
Crossbred	4857	150	250 (5.15%)	85,400.00	2,13,50,000	1,42,333.33
Native	2138	197	265 (12.39%)	46,788.00	1,23,98,820	62,938.17
Total	6995	347	515 (7.36%)	65531.69	3,37,48,820	97258.85

\* It was calculated by estimating the total value of cattle died dividing by the number of cattle died. \*\* It was calculated by the unit price of cattle died multiplying by the number of cattle died. \*\*\* It was calculated by dividing total loss incurred by the number of affected farms in each area.

### Cost of treatment of affected cattle

Treatment costs were incurred for antibiotics and veterinary doctors' fee, use of multivitamins and antiseptics for infected wounds. The treatment cost for affected cattle is shown in Table 5. During the survey period, a total of 2692 crossbred and 1664 native cattle were affected by FMD. Average treatment cost per affected cattle

was Tk. 1560.86 and Tk. 895.83, for crossbred and native cattle, respectively with an average of Tk. 1306.82. Total treatment cost for crossbred and native cattle was Tk. 4201835 and Tk. 1490661, respectively.

Hence the total cost of treatment for infected cattle was Tk. 5692496 (USD 67120.58).

Table 5. Veterinary cost for treatment of affected crossbred and native cattle.

Breed of cattle	No. of cattle infected	Treatment cost per cattle (Tk.)	Total cost incurred
Crossbred	2692	1560.86	4201835
Native	1664	895.83	1490661
Total	4356	1306.82	5692496

### Loss due to FMD infection in Crossbred and Native fattening cattle

Financial loss due to weight loss of fattening cattle was estimated by considering the expected price of cattle before and after infection and the difference between the two prices were considered as body weight loss

of the cattle. A total of 239 crossbred and 308 native cattle were fattened (Table 6). Average financial loss per fattening cattle due to FMD infection was Tk. 13356 and Tk. 8078 for crossbred and native cattle, respectively. Total financial loss due to FMD infection in 547 fattening cattle was Tk. 5680108 (USD 66974).

Table 6. Loss due to FMD infection in Crossbred and Native fattening cattle.

Breed of fattening cattle	No. of fattening cattle infected	The average loss per cattle (Tk.)	Total loss (Tk.)
Crossbred	239	13356	3192084
Native	308	8078	2488024
Total	547	10384.11	5680108

### Cost of labour for taking care of affected crossbred cattle and extra feed supplied to affected cattle

During the FMD outbreak the farmers of the affected farms have to spend extra time for nursing the affected animals, disinfecting

sheds and surroundings. Considering 30 minutes/cattle per day for the affected animal during the infection period the labour cost was calculated. The cost of labour was calculated at the prevailing market price of Tk. 400.00 for 8 hours of working hour a day. The infected cattle become weak due to

reduced feed intake from foot and mouth lesions. The farmers supplied extra concentrate feed and vitamins to the affected animals for recovery of body weight,. Cost of labour for taking care of affected cattle and extra feed supplied to affected cattle is shown in Table 7. The labour cost for taking

care per affected cattle was Tk. 450 and Tk. 394; and feed cost was Tk. 394 and 150, for crossbred and native cattle, respectively. Total cost for taking care and feed was estimated to Tk. 3177266 (USD 37419) for 4356 infected cattle.

Table 7. Cost of labour for taking care and extra feed supplied to FMD infected crossbred and native cattle.

Breed of cattle	No. of crossbred cattle infected	Labour cost/cattle (Tk.)	Cost of extra feed and vitamins supplied/cattle (Tk.)	Total labour cost (Tk.)	Total feed cost (Tk.)	Total cost of labour and feed (Tk.)
Crossbred	2692	450	394	1211400	1060648	2272048
Native	1664	394	150	655616	249600	905216
Total	4356	428.61	300.79	1867025	1310241	3177266

### Total financial loss due to FMD infection in the cross and native cattle

The financial loss incurred due to the occurrence of FMD for different reasons is summarized in Table 8. There were 4857 crossbred and 2138 native cattle in the affected farms/households with a total of 6,995 cattle. Among the crossbred cattle 2692 (55.43%) and native cattle 1664

(77.83%) were affected due to the FMD outbreak, which caused financial loss of Tk. 531,72,067.00 (USD 626955.2). The table 8 shows that highest 63.47% loss incurred due to death of infected cattle followed by veterinary cost (10.71%), loss due to bodyweight loss of affected fattening cattle (10.68%), reduction in milk yield (9.17%) and manpower loss due to taking care of affected cattle (5.98%).

Table 8. Total financial loss due to FMD according to breed

Breed of cattle	Milk reduction cost (Tk.)	Death loss	Veterinary cost	Weight loss of fattening cattle	Labour and feed cost	Total financial loss
Crossbred	4,454,924.68	21,350,000	4201835	3192084	2272048	35,470,892
Native	418,454.36	12,398,820	1490661	2488024	905216	17,701,175
Total	4,873,379.04	33,748,820	5692496	5680108	3177264	53,172,067
% loss	9.17	63.47	10.71	10.68	5.98	100

## Discussion

The survey study on FMD outbreak during July 2017 to June 2018 in five divisions of Bangladesh shows higher incidence in native cattle (77.83%) than in crossbred cattle (55.43%) which mostly in accordance with Howlader *et al.* (2004), Sorwar *et al.* (2016) and Adhikari (2018) but higher than that reported by Giasuddin *et al.* (2017) who found 56.5% and 77.8% positive case in indigenous cattle and crossbred cattle, respectively. This might be due to the fact that the study was confined in one specific area. Much higher mortality (50.9%) in calves was reported by Chowdhury *et al.* (1993) and lower mortality (9.71%) was reported by Howlader *et al.* (2004). Dey and Nooruddin (1993) estimated an economic loss of Tk. 4168.4 thousand for 475 FMD affected cattle due to calf mortality, reduced milk yield and plough loss. The much higher percentage of loss due to reduction in milk was reported by Howlader *et al.* (2004) and Mathew and Menon (2008), 41.18% and 80.68%, respectively. This might be due that they considered only milk reduction of crossbred cows but in this study both crossbred and native cattle were considered. However, it was observed that the outbreak of FMD causes immense economic losses to the farmers. This loss will be more or less with the variation of the causes concerned.

Howlader *et al.* (2004) estimated an economic loss of USD 163329 for 3708 affected cattle, buffalo, sheep and goat due to mortality, reduction of milk and draft power loss. About 1.5 million US\$ economic losses is incurred per year only due to the outbreak of FMD in Bangladesh. In a study carried out in mid-nineties by Bangladesh Livestock Research Institute revealed a loss of around

500 crore taka per year only from FMD. The total economic loss due to FMD is 60 million US dollar per year in Bangladesh and in India it is 4.45 billion per year (Morzaria *et al.* 2010). Knight-Jones and Rushton (2013) estimate that the annual impact of FMD in endemic countries of the world will be US\$6.5 and 21 billion considering production loss and vaccination loss per year. They also estimated losses of >US\$1.5 billion a year in FMD free countries. The impact of FMD on the economy is not the same throughout the world. It has a multidimensional impact like production losses, losses in breeding, hampered food security, losses in international trades, increase cost in regaining FMD free status (Knight-Jones and Rushton, 2013).

A hypothetical projection of annual economic loss due to FMD outbreaks in Bangladesh presented in Table 9. The calculation is based on the following assumptions.

(a). Average milk production loss = Average milk production at the pre-FMD period (lit/day) – Average milk production at post FMD period (lit/day) (Kumar, <http://www.fao.org/docs/eims/upload/299846/an367e00.pdf>). Milk loss/cow was calculated by milk reduced/cow/day × number of infected days × price/lit milk. For crossbred cows milk reduction/cow/day was considered 5.43 lit and that of native cows was 0.91 lit. Disease period was considered 18.46 days for crossbred cattle and 19.56 days for native cattle (based on this study) and the price of per liter milk was considered Tk. 43.96 for crossbred cows' milk and that for native Tk. 53.43.

Table 9. Projection of estimated direct loss due to FMD in Bangladesh.

Description	Loss/cattle for the infected period/death (Tk)	Susceptible Population	Incidence/mortality rate (%)	Total loss (Tk. in crores)
Loss due to milk yield				
Crossbred milking cows	4510.70	191860	36.20	84.54
Native milking cows	800.98	1086000	36.20	103.28
Loss due to mortality of affected cattle				
Crossbred cattle	84900	189262	5.15	1606.83
Native cattle	46788	2580218	12.39	12072.32
Loss due to weight loss of fattening cattle				
Crossbred cattle	13355	600000	36.20	801.30
Native cattle	8078	3400000	36.20	2746.52
Treatment cost				
Crossbred cattle	1560	1328540	36.20	207.25
Native cattle	895	7540460	36.20	674.87
Cost of labour for taking care of affected cattle and extra feed supplied				
Crossbred cattle	844	1328540	36.20	112.13
Native cattle	594	7540460	36.20	447.90
<b>Total projected total cost</b>				<b>18856.96</b>

(b). There are about 24.50 million cattle population in Bangladesh. Out of this cattle population 3.67 (15%) million are improved breed and 20.83 (85%) million are indigenous (Hamid *et al.*, 2017). Among the total cattle, 3.53 million are milking cows and 2.61 million dry cows (Begum *et al.*, 2017).

(c). The incidence rate in cattle is considered 36.20% (averaging incidence rate reported by Chowdhury *et al.* (1993), Howlader *et al.* (2004), Mannan *et al.* (2009), Sarker *et al.* (2011), Sorwar *et al.* (2016) 35.5%, 63.41%, 24.51%, 25.07%, and 32.53%, respectively).

(d). Susceptible crossbred milking cows was estimated assuming 15% of the total milking cows are crossbred ( $3.53 \text{ million} \times 15\% \times 36.20\% \times 1000000$ ) = 191679. And susceptible native milking cows was estimated assuming 85% of the total milking ( $3.53 \times 85\% \times 36.20\% \times 1000000$ ) = 1086181.

(e). Death of crossbred cattle was estimated assuming the total number of crossbred cattle population 3.67 million and mortality was considered 5.15% ( $3.67 \text{ million} \times 5.15\% \times 1000000$ ) = 189262 and death loss per crossbred cattle was considered Tk. 84900. To estimate death loss for native cattle mortality rate was considered 12.39% ( $20.83 \text{ million} \times 12.39\% \times 1000000$ ) = 2580218) and death loss per native cattle were considered Tk. 46788.

(f). It was reported that 80-90 lakh cattle are slaughtered in a year for meat purposes (Giasuddin *et al.*, 2017). For estimating financial loss due to reduction of weight loss of fattening cattle, considering 50% of the slaughtered cattle are fattened, the total number of crossbred cattle fattened are infected ( $4000000 \times 15\% \times 36.20\%$ ) = 600000 and native cattle slaughtered are infected ( $4000000 \times 85\% \times 36.20\%$ ) = 3400000. Assuming financial loss/cattle due to infection was Tk. 13355 and Tk. 8078 for crossbred and native cattle.

(g). Treatment cost is estimated by considering the incidence rate of 36.20% for both crossbred and native cattle. Total crossbred cattle infected ( $3.67 \text{ million} \times 36.20\% \times 1000000$ ) = 1328540 and native cattle infected ( $20.83 \times 36.20\% \times 1000000$ ) = 7540460. Treatment cost/cattle were considered Tk. 1560 and Tk. 895 for crossbred and native cattle respectively.

(h). Cost of labour is estimated by considering 30 minutes per day for each affected cattle for the infected period. It was calculated at the prevailing market

price Tk. 400 for 8 working hour a day. Labour cost for taking care of infected cattle and extra feed supplied to infected cattle was estimated to Tk. 844 and Tk. 594 for crossbred and native cattle.

In this report, the only direct financial loss was considered. Here possible indirect loss such as abortion, impact on market price, trade, public health and nutrition, food security were not considered in this report. However, from this analysis, it appears that FMD outbreaks could cost about Tk. 18856.96 crore per year in Bangladesh.

## Conclusion

Foot and mouth disease (FMD) is a severe and highly contagious disease that causes huge losses to the farmers as well as to the economy of Bangladesh. The projected financial loss due to FMD would be Taka 18856.96 crore (Tk. 188.57 billion or US\$ 2.22 billion) per year in Bangladesh. Breed type and ages are the major risk factors for the occurrence of FMD. Both crossbred and native cattle are susceptible to this disease. Therefore, the findings of the study provide information on the epidemiology of FMD and its detrimental impacts on household income and the economy of Bangladesh. It also signifies the need for effective disease management and control strategies.

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## Conflict of interests

The authors declare that they have no competing interests.

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