

## Evaluation of Economic Losses due to FMD in Livestock in Chitwan District (Nepal)

Sulav Adhikari\*

Institute of Agriculture and Animal Science (IAAS), Nepal

\*Corresponding Author: Sulav Adhikari, Institute of Agriculture and Animal Science (IAAS), Nepal.

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### Abstract

Nepal is a predominant agriculture landlocked country. It is situated between India on its Southern, Eastern and Western borders and the people republic of China on northern borders. It is rectangular in shape and has an area of 147,181 sq.km and is geographically divided into three distinct belts: the mountain (35%) in the north, the hills (42%) in the middle and lowland terai (23%) in the south. Livestock sector contribute around 32% in Agriculture gross domestic Product (AGDP) of the country. Agriculture Perspective Plan (APP) predicts the share of livestock in AGDP to reach at 45% from current level at the end of 12<sup>th</sup> plan period 2014\15 (APP, 1995). It has been estimated that there are 7 million cattle 4.2 million buffaloes, 7.5 million goats and 0.8 million sheep in Nepal [1] cattle and buffaloes are important species of ruminants kept mainly for milk and draught power.

**Keywords:** Economic Losses; FMD; Livestock

Nepal has wide diversity of climate and vegetation from sub-tropical to Alpine types. Almost all the climatic conditions of the Earth are found in the country which is evident by the hot sub-tropical climate of the Terai and temperate type of climate of high mountains and the high Himalayas. There are four distinct seasons in the Nepal. They are winter season (December - February), Spring season (March - May), summer season (June- August) and Autumn Season (September- November). More than 80% of the total annual rainfalls occur during summer monsoon period between June and September. This predisposes the animal to major diseases and parasites of Sub tropical to temperate climates, under the prevailing animal management system in the country.

Foot and Mouth Disease is an acute febrile highly contagious disease of all cloven footed animals characterized by fever (104 - 106°F) and vesicular eruption in mouth feet and teats. There is focal degeneration of cardiac and skeletal muscles which leads to death in young calves. There is considerable economic stress on the cattle rearers due to reduction of milk, meat and working capabilities of dairy and draught animals respectively. It causes the most serious losses in cattle and buffalo. It is also with FMD virus that different serotypes (O, A, C, SAT1, SAT2, SAT3, and ASIA1) between strains of an animal virus were recognized. Although symptoms

and lesions produced by each virus are basically similar, infection with one virus doesn't immunize against the others. O, A, C, ASIA1 are prevalent in India as well as Nepal. It has low mortality but high morbidity [2].

### Aetiology

FMD is caused by a *Picornavirus* of the genus *Aphthoviridae*. The characteristics of the FMD virus which are important in the epidemiology of the disease include the rapid growth cycle of the virus, moderate stability under a variety of environmental conditions and the occurrence of various serotypes and strains (Table 1).

The history of FMD goes back to 1546 when the disease was first described. The virus was discovered in 1897 by Loeffler and Frosch [3,4]. In Europe, before the era of systematic vaccination, FMD epizootics used to haunt the continent at an interval of 6 years or more (Boldrini, 1978). The important serotypes in Europe are O, A, and C [5,6]. In South American countries, the serotypes responsible for FMD continue to be O, A, and C. In Southern and Eastern Africa, O, A, C, SAT1, and SAT3 are reported to be prevalent and in Western and Central Africa, O, A, C, SAT1 and SAT2 are predominant types (Pereira, 1981).

Origin	Designation	First isolated	Identified by
European	A (Alle mange)	1922	Valle and Carre
	O (Oise)	1922	Valle and Carre
	C	1926	Waltman and Trautman
South African Territories	SAT1	1948	AVRI, Pirbright, UK
	SAT2	1948	AVRI, Pirbright, UK
	SAT3	1948	AVRI, Pirbright, UK
Asian	Asia1	1957	AVRI, Pirbright, UK

**Table 1:** FMD virus serotypes.  
(Source: Donaldson, 1994).

In the Middle East, Asia1, O and A22 are encountered although the predominant virus has been type O. Types O, A, C, and Asia1 are reported from the Indian subcontinent in Asia, from the Near East and Central and South East Asia. In the Indian subcontinent including Bhutan the four types of FMDV mentioned above have become established on an endemic basis. However, type O is the most frequently encountered virus type. Distribution of different serotypes of FMD virus in South Asia is shown in table [7].

**Objectives**

Evaluation of economic losses due to FMD in term of milk production, draft power due to FMD in Livestock in Chitwan district.

**Methodology**

**Site selection**

Chitwan is one of the most potential areas of livestock and poultry production. Chitwan is already the largest poultry and dairy pocket of the country. Currently livestock pattern is changing from household sustainable level to commercialization both in poultry and dairy sectors. The principle species of livestock in Chitwan are cattle, buffalo, goat, pig and sheep. In all species there is gradual trend of shifting of indigenous breed to cross and exotic breeds due to the artificial insemination, increasing consciousness of the farmers and commercialization of livestock entrepreneurs.

**Survey in Chitwan**

The questionnaire survey was conducted in 50 households of Gitanagar VDCs of Chitwan district. The FMD outbreak had occurred in Chitwan during April 2010. The survey was conducted in FMD affected households to find out the economic loss due to FMD.

**Results and Discussion**

**Results from the Chitwan Survey**

The survey was done in 100 household and the survey data shows that in 50% household contain 6 to 10 animals in their home. Similarly 30% households rear 1 - 5 animals. However 20% household rear more than 11 animals. The above data in the table shows that the Chitwan district is commercialized in dairy sector.

No of household	Total no of animal per household		
	1 to 5	6 to 10	11 and above
	30	50	20

**Table 2:** Total number of animal per household.

The survey showed in the Chitwan that most of the farmers are raising the cattle rather than buffalo in my research site. Average cattle population was found to be 3.8 per household. Similarly in case of buffalo average population was found to be 1.52.

**Species affected by FMD**

The most susceptible animal was found to be cattle in my research work. This is followed by goat and buffalo. The bull also was also found to be suffering from the FMD. In my research site there was no practice of pig farming. The exotic cattle and buffalo were found to be more susceptible than local cattle and buffalo.

**Milk production loss due to FMD**

In FMD milk production greatly reduces than in normal condition. The below graphs show the milk production in 1st month in which the cow has suffered from FMD. The milk production generally decreases in 2<sup>nd</sup> and 3<sup>rd</sup> week period. The milk production generally increases after 4<sup>th</sup> week of period. In my research study the milk loss was found to be average of 34% with maximum loss of 39% and minimum loss of 24%. However the animal could not give the normal milk production. The decrease in milk production is due to stress condition in the body of animal.

$$\begin{aligned}
 \text{Average milk production loss} &= \text{Average milk production before FMD} - \text{Average milk production after FMD} \\
 &= 71.72 - 47.56 \\
 &= 24.16 \\
 &= 33.68\%
 \end{aligned}$$

On an average milk production before FMD was 71.72 liter per week and after FMD milk production was found to be 47.56. There was loss of more than 24 liter of milk per week. The actual loss of

milk is calculated below:

Cost of milk per liter = Rs 25 per liter

Loss in term of cost for 30 liter milk =  $25 \times 24 = \text{Rs } 600$

There was loss of Rs 750 in a week and in a month there was loss of Rs 2400 from individual cattle. While calculating the milk loss in term of percentage milk loss was found to be 34% on an average.

There are altogether 22428 lactating cattle in Chitwan District. The data shown from my research shows that 60% cattle was found to be infected with FMD. If we assume 60% affected with FMD in total lactating animal. Then milk loss due to FMD will be calculated as follow:

In 22428 animal the population of FMD infected cattle would be 13456

Normal milk production in 13456 cattle before FMD = 965064 litre of milk per week

Milk production after FMD = 639967 litre of milk per week

Milk loss during the FMD = 325096

Calculating the milk loss in term of cost =  $325096 \times \text{Rs}25 = \text{Rs } 8127400$

### Mortality of the animal by the FMD

The mortality was found highest in calves which are followed by the cattle and buffalo in my survey. Young animals die without showing any peculiar symptoms. Suckling cow generally dies as a result of myocarditis and myocardial degeneration [2]. There was no post mortem done to find any lesion that resemble to the FMD. The mortality in cattle was found high in pregnancy stage. There is less mortality in buffalo since buffalo is more resistant than cows and calves. Among 75 cattle, 5 cattle were dead and mortality percentage was found to be 6.66% by the FMD, while in case of buffalo the mortality was found to be 4%. The total buffalo affected was 50 and 2 buffalo were dead by the FMD. In calves there was mortality percent recorded of 8.88%. The total calves affected was 90 and 8 calves were dead by the FMD.

### Losses of Draught power by the FMD

The bullocks are mainly use for draught purpose. In case of FMD the lesion on the foots causes difficulty to work. Minimum time requirement to heal FMD take place was more than 25 days. The bullocks generally earn Rs 300 per day. If the bullock goes on rest for a month there would be loss of Rs 7500 per month.

Animal	Affected animal	Dead animal	Mortality percent
Cattle	75	5	6.66%
Buffalo	50	2	4%
Calves	90	8	8.88%

**Table 3:** Mortality of the animal during FMD outbreak.

In my survey the 6 bullock was found infected from my survey. The animals were kept in rest for at least 25 days.

Loss in draught power due to FMD =  $300 \times 25 = \text{Rs } 7500$  loss in one month from single bullocks

If the 6 bullock were considered then the loss was found to be Rs 45000 in a month.

### Calculation of Abortion loss due to FMD

In my survey of 50 household the case of abortion was found very minimal. The abortion was mostly noted in cow and goat. In 50 household surveys there was abortion noted in 6 cows and 4 goats. The abortion was noted in late stage of pregnancy, but in case of goat abortion was found in early stage of pregnancy. There was no abortion found in case of buffalo and pig.

### Loss in treatment of FMD

Treatment cost of the FMD depend upon the severity and extend of the disease the FMD result on the mastitis, metritis, abortion and death of the animal. The treatment in FMD is approximately Rs 500 per animal. If the animal suffers from secondary infection the treatment cost will be high due to requirement of high antibiotic, mineral, vitamin, supplements and doctor charges which increase the treatment cost. In my survey, treatment cost was varies. The treatment cost varies from Rs 500 to 5000.

### Discussion

The survey study on FMD during its outbreak in 2010 in Gitanagar VDC of Chitwan Districts show higher incidence in cattle as 60% and in buffalo as 20% and 10% in goat. This finding is lower than the finding of Howlader, *et al.* (2004), that the incidence of FMD in cattle was 63.41% followed by buffalo 48.02% in Bangladesh during outbreak. The average reduction in milk yield in the affected animals was estimated was 34%. This value is greater than the finding Gangol and Karki [7]. This increase might be due to outbreak parameter, improper care and management of affected animals. The average reduce in milk yield in affected animal was

estimated to be 34%. This finding did not revealed Gangol and Karki [7], that the average reduction in milk in FMD affected animal in Nepal was 20%, similarly the finding of this research didn't rereleased Howlader, *et al.* (2004), that the average reduce in milk yield in FMD affected animal was estimated to be 41% because of it might be due to stage of lactation outbreak of parameter in proper care and management of disease affected animal and so on. Again, Mathew, *et al.* (2007) estimated the average reduced milk yield 25%. This finding did not revealed the result of the research to few extents.

The result shows that the abortion percentage in case of cattle was found about 12% in cattle and 8% in goat. However buffalo was not found to be caused abortion by the FMD. The reason for negative case of abortion in buffalo might be the survey taken from small places [8-17].

## Conclusion and Recommendation

### Conclusion

In Nepal various types of FMDV serotypes have been isolated from field reports. Out of them, the O serotype was the most prevalent one. As FMD is the only disease which cause the most economic loss by causing animal to unproductive, secondary infection by the bacterial diseases and various complications like mastitis and abortion. Hence appropriate quarantine measures, disposal of the affected animal except cow and bullocks to be performed for the eradication of the disease. In case of the cow and bullocks they should be isolated and litters as well as contaminated materials and excreta should be properly disinfected or disposed.

On the basis of serotyping of FMD virus, we can conclude that the serotype O was the most prevalent serotype in Nepal followed by serotype Asia-1 and serotype A. Serotype C was absence in the recent outbreaks.

The disease outbreak was more in hill region that was followed by the Terai and High Mountain as considering to the agro-ecological zones. The livestock movement in the hill region is more and extensive as compared to the mountain regions may be due to high number of the livestock localization and farming.

In the seasonal basis the outbreak of FMD was more in the season of May and June followed by July and August which was quite similar in the previous findings as based on the National FMD and TADs Laboratory, Kathmandu.

From the study, the total economical loss due to FMD outbreak was really unsustainable for farmers. Among the total loss, the loss due to reduction in milk yield contribute 34%, loss due to death of animal contribute 10.9%, loss due to death of calf contribute 1.31%, treatment loss contribute 26.37%, abortion loss 6.72%, loss of manpower contribute 5.86% and draught power loss contribute 17.5%. Hence, the data indicates the much economic loss by FMD in the livestock species had been occurred in the context of Nepal. Thus the diseases FMD could be the top economic looser disease in Nepal representing significant production loss. Thus, eradication and disease control measures should be adopted for the effective production and in the context of WTO membership.

### Recommendation

- The following criteria of FMD control earlier suggested by Gongal (2002) would be strictly implemented to control the disease in Nepal:
- Creation of mass vaccination zones based upon animal population size, disease prevalence and animal movement activities.
- Stratification of each region into high, medium and low endemic zones to minimize the cost of operation.
- Eradication of the FMD made by the zone by zone in a phased manner by the application of mass immunization of all the susceptible livestock (Gongal and Karki, 2000).
- The best method of the disease control is test and slaughtering of the affected animals although it cannot be applicable in case of cattle due to religious cause.
- Due to the open porous border the infected or carrier animal may have got entered inside the country resulting frequent outbreak of the disease. Thus quarantine should be strong enough and strict measures or legislation should be adopted.
- Building of conciseness among concerned authorities of neighboring country, India to practice more vigilant, dynamic and committed animal quarantine system and border control activities.
- Access and share knowledge on movement patterns, route and volume of trade of livestock product.
- Harmonize and standardize the animal health and quarantine aspects of trade on livestock product

### Recommendation to the farmers

- The farmers should maintain their barn and equipment clean and disinfection regularly.
- The farmers should notice to near DLSO if they suspect FMD.
- The vaccination should be done timely to prevent the outbreak of the disease.
- The farmers should isolate the infected animals and healthy animals.
- Different species of animals should not be reared in close contact with each other. Pig act as amplifier of the FMD virus.

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