



Estimation of the Factors Influencing the Economic Losses Due to Foot and Mouth Disease (FMD) in Tamil Nadu

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Authors' contributions

This work was done in collaboration among all the other authors. Author JT designed the study, performed the statistical analysis, wrote the protocol, performed the literature search and wrote the first draft of the manuscript. Authors NKS, MP and SG managed the statistical analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

A study was conducted to estimate the factors influencing economic loss due to FMD at the farm level. The data were collected from the sample of 120 cattle farms randomly selected from six blocks from Nagapattinam and Thiruvavur districts of Tamil Nadu respectively. A regression model was fitted using the possible predisposing factors to explain the variations in the FMD losses. The coefficient of multiple determination (R^2) in the model fitted was high (0.50), implying that the model was a good fit. The estimated regression coefficients of the variables, viz., vaccination status was

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found to be significant and the cumulative awareness and attitude scores of the farmers towards FMD was found to be significant at ten per cent significant level. The severe economic losses estimated to be arising out of FMD was mainly due to lack of awareness and attitude towards the FMD disease and vaccination against FMD. Realizing the enormous losses caused by the disease, the cattle owners should be made to focus more attention towards this disease through creation of adequate awareness among them through suitable extension programmes for prevention and control of FMD.

Keywords: Economic loss; FMD; vaccination; regression.

1. INTRODUCTION

Animal husbandry sector has a strong role in alleviating poverty and in providing food security in rural areas. Animal husbandry, after crop production, was the main source of livelihood for marginal and landless poor farmers [1].

With more than twelve million dairy farmers being members of village dairy co-operatives, producing 21.5 million litres of milk every day [2], the dairy sector in India relies on smallholders. The dairy animals provide daily income through sale of milk and these animals are rightly considered as moving banks as the poor store their wealth in these animals to be disposed off during financial crisis. Unlike land, the distribution of animals is less skewed [3]. Animal diseases have been identified as one of the major barriers to increasing livestock productivity and its consequent positive impact on the lives of those in developing countries [4].

While it is true that FMD is not a 'killer disease', its contribution to force farmers into poverty trap and reducing food security in developing countries is to be viewed seriously [5]. Direct loss due to loss in milk production, draught power, cost of treatment, bio-security and calf mortality is estimated to be more than ` 23,000 crores per year [6]. Eighty per cent of the total direct loss caused by FMD is due to drop in milk production [7].

Swallow (2012) in his review on risk of FMD for Pacific-North-West economic region reported that animal diseases caused economic losses when they deter farmers from investing in better breeds and compelled them to adopt less profitable risk management strategies such as less productive indigenous breeds to minimise disease impact [8].

Shankar et al. 2012 in their study on "Animal diseases and livelihoods" reported a reduction in

annual household income of 4.4-11.7 per cent and loss of 54-92 per cent of animal value due to FMD infection in Cambodia [9].

Ganeshkumar, 2012 in his study on "Socio-economic impacts of FMD" reported that loss was between 450 billion pounds sterling and two billion pounds sterling per year in India [10].

FMD caused loss in production by reducing the fertility of breeding females, lowering milk production and caused death, particularly in younger animals. In addition, efforts to combat the disease were costly and involved organizing vaccination campaigns, developing and maintaining surveillance systems and responding to outbreaks [11].

One of the major obstacles in achieving the targeted growth rates in the dairy sector was the prevalence and outbreak of diseases, particularly List 'A' OIE diseases like FMD. FMD was generally not fatal in matured livestock, but increased the risk of spontaneous abortion among pregnant animals and caused mortality among young livestock [12].

Though an important disease there are relatively few studies that have been published on its impact at household level. It stops poor people having options for their future and for future of their families [13] and it is a fact that the socio-economic impact of FMD was not well documented in India. Hence this study was carried out to estimate the factors influencing the economic losses due to FMD in Tamil Nadu.

2. MATERIALS AND METHODS

The research design for the present study was ex-post facto since the incidence of the disease – FMD had already occurred in the cattle owned by the respondents. Among the 32 districts of Tamil

Nadu State, the study on impact of FMD affecting livelihoods of cattle owners was purposively carried out in Nagapattinam and Thiruvavur districts since these two districts recorded the highest incidence of FMD outbreak in the year 2013. The data was collected personally by the researcher through direct interview with cattle owners. The secondary data with respect to FMD outbreak, milk production, number of animals treated for FMD was collected from the Department of Animal Husbandry, Government of Tamil Nadu. Data pertaining to the FMD outbreak was utilized to select the highly affected districts for FMD affected districts.

The data was collected from 120 cattle owners whose cattle were affected with FMD from the purposively selected districts Nagapattinam and Thiruvavur of Tamil Nadu which had high incidence of FMD outbreak during 2013.

Multiple linear regression function of the following form was fitted separately to study the factors influencing economic losses due to FMD in farms.

$$Y_f = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \mu$$

Where,

- Y_f = Economic loss due to FMD in farms in `
- α = Constant term
- β_i 's = Regression coefficients
- X_i = Explanatory variables
- μ = Random disturbance term

The explanatory variables (X_i) used in this analysis include:

X_i	Explanatory variables
X_1	Number of days of illness due to FMD
X_2	Herd size (in numbers) of the cattle owners
X_3	Cumulative knowledge score of the farmer towards FMD
X_4	Cumulative awareness score of the farmer towards FMD
X_5	Cumulative attitude score of the farmer towards FMD
X_6	Vaccination status (1 if vaccinated, 0 otherwise)
X_7	Movement of the animal (1 if there was movement during the outbreak and 0 if otherwise)

3. RESULTS AND DISCUSSION

A multiple linear regression model was fitted to assess the factors influencing the total economic loss due to FMD and the results are presented in Table 1.

The co-efficient of multiple determination (adjusted R^2) for the model fitted for estimating factors influencing economic loss due to FMD was 0.502, which implied that about 50.2 per cent of the variations in the dependent variable. *i.e.*, economic losses due to FMD could be explained by the chosen independent variables. The 'F' statistic (16.11) showed that the estimated regression model fitted the data well.

Figures in parenthesis indicate the Standard Error.

The estimated regression co-efficient of the variable vaccination was found to negatively influence the economic loss due to FMD. In other words, if the animal is vaccinated, the disease loss due to FMD could be minimised by 2660.83 from its mean level ($P \leq 0.01$). Likewise the variables attitude and awareness level were found to decrease the disease loss due to FMD

Table 1. Factors influencing economic loss due to FMD

Variables	Co-efficient	t value
Constant	19184.92 (2729.59)	7.082
X_1 - Number of days of illness due to disease	171.71 (91.24)	1.882
X_2 - Herd size (in numbers) of the cattle owners	-105.37 (105.64)	-0.997
X_3 - Cumulative knowledge score of the farmer towards FMD	-131.32 (84.09)	-1.562
X_4 - Cumulative awareness score of the farmer towards FMD	-250.98* (106.64)	-2.354
X_5 - Cumulative attitude score of the farmer towards FMD	-306.76* (131.28)	-2.337
X_6 - Vaccination status	-2660.83** (359.57)	-7.400
X_7 - Movement of the animal	369.93 (382.06)	0.968
Co-efficient of multiple determinants (adjusted R^2)	0.502	
F statistic	16.112	
N	120	

* 5 per cent significant level ** 1 per cent significant level

and were significant at five per cent level. Although the factors like number of days of illness and movement of animals had positive impact on total economic loss due to FMD, they were found to be non-significant.

4. CONCLUSION

The estimated regression co-efficient of the variable vaccination was found to negatively influence the economic loss due to FMD. In other words, if the animal is vaccinated, the disease loss due to FMD could be minimised by 2660.83 from its mean level ($P \leq 0.01$). Likewise the variables attitude and awareness level were found to decrease the disease loss due to FMD and were significant at five per cent level. Although the factors like number of days of illness and movement of animals had positive impact on total economic loss due to FMD, they were found to be non-significant. Likewise the variables attitude and awareness level were found to decrease the disease loss due to FMD and were significant at five per cent level. Hence it can be concluded that intensive awareness campaign on importance of vaccination and prevention of FMD will help to improve the existing awareness and attitude towards FMD vaccination which in turn will help in prevention and control of FMD.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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