

# Factors influencing economic losses due to ketosis in dairy farms #

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## ABSTRACT

*Ketosis is the common disease and one among the important metabolic disorder in lactating dairy animals. It is a condition marked by increased levels of circulating ketone bodies with or without the presence of the clinical signs. It causes severe economic losses through reduction in milk yield. For the study, 30 ketosis affected dairy animals (both cows and buffaloes) were selected through multistage random sampling technique from Namakkal and Karur districts of Tamil Nadu. Data were collected from the respondent farmers through personal interviews, using pretested interview schedule. A multiple linear regression function model was fitted to study the factors influencing economic loss due to ketosis in dairy farms. The estimated regression coefficient of three variables viz., order of lactation, season summer and number of days illness included to explain the variations in the losses due to ketosis were found to be significant at one per cent level ( $P \leq 0.01$ ) and the other factors such as season winter and milk yield were found to be significant at five per cent level ( $P \leq 0.05$ ).*

**Key Words:** Ketosis, Metabolic diseases and multiple linear function

## INTRODUCTION

The livestock sector particularly dairy farming plays a significant role in securing the livelihood of rural farmers by providing income and employment generation in rural areas. However, this sector is facing several disease problems due to introduction of exotic germ plasm for higher productivity and changing global climate which cause huge economic loss resulting from mortality and low productivity of animals (Singh and Shivprasad, 2008).

The coefficient of order of lactation was 62.811 which implied that the economic losses due to ketosis would increase by Rs.62.81 as the order of lactation increases by one unit from its mean value.

Livestock diseases particularly metabolic disorders in dairy animals causes reduction in production efficiency leading to severe economic losses (John Christy and Thirunavukkarasu, 2006). Among metabolic diseases, ketosis is the common disease in lactating dairy animals (Kaneene and Scott, 1990 and Thirunavukkarasu *et al.*, 2010). Ketosis is marked by increased levels of circulating ketone bodies without the presence of the clinical signs, causing severe economic losses in terms of heavy reduction in milk yield and impaired

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reproductive performance (Ardavan Nowroozi *et al.*, 2011). Analyzing the various causative factors involved in ketosis is important to help in understanding the effective management and prevention of this disease, which can aid in losses to be avoided in dairy farming. Keeping the above facts in view, this study was conducted in Karur and Namakkal districts of Tamil Nadu State.

## MATERIALS AND METHODS

For the study, 30 ketosis affected female bovines were selected through multistage random sampling technique from Namakkal and Karur districts, five animals from each block. Affected dairy animals were identified by case registers of veterinary dispensaries and clinics of Veterinary College and Research Institute, Namakkal and practicing private veterinary doctors in both districts. This study is based on the primary data collected through personal interviews with the farmers using pre tested interview schedule. The data collected from the sample respondents included information on size of animal

holdings, breed, parity, stage of lactation, frequency of occurrence, stage of calving, feeding practices, number of days illness, system of rearing, milk yield, season of disease occurrence and production losses were also collected.

A multiple linear regression function of the following form was fitted to study the factors influencing economic loss due to ketosis in dairy farms.

$$Y_j = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + U_j$$

Where,  $Y_j$  = Per animal annual economic loss due to metabolic diseases (Ketosis)

( $j$  = ketosis)

$a, b_i$  = Coefficients to be estimated

$U_j$  = Error term

The description of variables used in multiple linear regression analysis for ketosis in dairy animals is presented in Table 1. Based on the principles of ANOVA, linear regression models (Rothamsted Experimental Station, UK, 31.12.1995) were fitted for assessing ( $Y$ ) the contribution of different factors to the economic loss arising due to ketosis in dairy animals. (a)

**Table 1. Description of variables used in Multiple Linear Regression analysis for Ketosis in dairy animals**

Explanatory variables	Levels	Specifications	$X_i$
Stage of lactation <sup>a</sup>	Early stage; Mid stage;	1-if Mid; 0-Otherwise	$X_1$
	Late stage	1-if Late; 0-Otherwise	$X_2$
Breed	Non-descript; Crossbred cow / Graded buffalo	1-Crossbred Cow/ Graded Buffalo; 0-Otherwise	$X_3$
Parity (Order of lactation)	Continuous	In number of calving	$X_4$
Season <sup>b</sup>	Summer; Winter;	1-if Summer; 0-Otherwise	$X_5$
	Monsoon	1-if Winter; 0-Otherwise	$X_6$
Number of days illness	Continuous	In number of days ill	$X_7$
Average daily milk yield	Continuous	Litres per day	$X_8$
Species of dairy animal	Cow; Buffalo	1-if Cow; 0-Otherwise	$X_9$

<sup>a</sup> reference category: Early lactation ; <sup>b</sup> reference category: monsoon.

## RESULTS AND DISCUSSION

Based on the results of ANOVA, linear regression models were fitted for ketosis to

assess the contribution of different factors to the economic loss arising due to ketosis in dairy animals and the results are presented in Table 2.

**Table 2. Regression Coefficients of Linear models fitted to analyse the factors influencing Ketosis in dairy animals (Dependent variable: Ketosis in dairy animals)**

Variables	Coefficients
Constant	561.745 (53.861)
Breed	2.024 (25.921)
Order of lactation	62.811** (8,648)
Stage of lactation 2	44.843 (23.533)
Stage of lactation 3	32.158 (24.055)
Milk yield	4.938* (2.363)
Season summer	-110.221** (23.362)
Season winter	-72.912* (27.863)
Number of days illness	80.716** (22.163)
Species	4.855 (20.062)
Coefficient of multiple determination (adjusted R <sup>2</sup> )	0.851
F statistic	19.389
N	30

\* - Significant at five per cent level ( $P \leq 0.05$ )

\*\* - Significant at one per cent level ( $P \leq 0.01$ )

(figures in parentheses indicate standard errors) (d)

The coefficient of multiple determination (adjusted R<sup>2</sup>) in the model fitted for ketosis was 0.851 which implied that the model was a good fit. About 85.10 per cent of the variation in the dependent variable, i.e., economic losses due to ketosis might have been explained by the chosen independent variables. The 'F' statistic also showed that the fitted regression model was founded to be significant.

The estimated regression coefficient of three variables viz., order of lactation, season summer and number of days illness included to explain the variations in the losses due to

ketosis were found to be significant at one per cent level ( $P \leq 0.01$ ) and the other factors such as season winter and milk yield were found to be significant at five per cent level ( $P \leq 0.05$ ). The coefficient of average daily milk yield per animal (4.938) indicated that the economic loss due to ketosis would increase by Rs.4.938 per affected animal as the average daily milk yield of the animal increases by one litre of milk from its mean level. Herdt *et al.* (1981) found higher milk yields put cows at an increased risk of developing subclinical ketosis. Increased milk production might be associated with increased fat mobilization and a greater risk

of hyperketonemia (Lean *et al.*, 1992). The coefficient of order of lactation was 62.811 which implied that the economic losses due to ketosis would increase by Rs.62.81 as the order of lactation increases by one unit from its mean value. Bendixen *et al.*, 1987 and Grohn *et al.*, 1989 observed similar scenario and stated that the incidence of ketosis increased with age of cattle and the peak incidence might be in lactation number from third to six. The coefficient of duration of illness (80.716) indicated that as the duration of illness extends by one day from its mean level, the economic losses are liable to increase by Rs.80.716. The variables of summer and winter seasons dummy were found to be significant and negative, which implied that they had inverse relationship with the economic loss when compared to the monsoon season. This may be due to farmer taking extra care to feed greens to dairy animals by purchasing outside source and feeding mineral mixture to overcome heat stress especially during summer, hence these seasons having negative influence.(b)

### CONCLUSIONS

The results of this study, as it analyzing the factors involved in ketosis in dairy farms, will aid the researchers, planners and policy makers to design suitable policy decisions and appropriate preventive measures to combat this disease. Creating awareness about the important of this disease and nutritive values of various commonly used feed ingredients at field level through extension programmes to minimize this disease loss. Disseminating knowledge about the clinical signs of this disease to take early measures to avoid heavy economic loss during and after the

course of the disease. These metabolic diseases are common problem in early lactation. Hence, the farmers advised to go for dry cow management and monitoring programmes during the first few weeks of lactation to avoid metabolic diseases. (c)

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