Technical Efficiency of Cattle Farming in Moneragala Veterinary Region: A Stochastic Frontier Approach

R. Thiwyadharsan, R.M.S.D. Rathnayaka *and* A.M. Samaraweera
Uva Wellassa University, Badulla, Sri Lanka

Introduction

"Farming System is a complex inter-related matrix of soil, plants, animals, implements, power, labour, capital and other inputs controlled in parts by farming families and influenced to varying degrees by political, economic, institutional and social forces that operate at many levels" (Mahapatra, 1992). Dairy sector is the most important of all livestock sub sectors primarily because of the influence it can make on the rural economy. Dairy sector is predominantly based on small holders keeping 2-5 cows. In the dry zone the herds tend to be large, though the animals are mostly of the indigenous types with poor milk yields. However, the production of milk in Sri Lanka has still not yet met the national demand. Increasing the efficiency in production assumes greater significance in attaining potential output at the farm level. There are comparatively less research on 'technical efficiency' of dairy farming in Sri Lanka. Therefore, this study aimed to identify the important socio economic determinants of milk production and thereby to find out the technical efficiency of milk production in Moneragala veterinary region.

Methodology

The Moneragala Veterinary region was selected for this study. The Veterinary regions were arranged in descending order of livestock population. The Moneragala Veterinary region, which has maximum number of livestock population in the district, was selected for the study. A multi stage random sampling technique was used for the selection of the sample/respondent. The study covered 10 villages of Moneragala veterinary region to form the sample of 80 respondents. The data collection was carried out by using the structured questionnaire. This questionnaire was subjected to the pre testing by the survey of ten samples.

Empirical model and variables

Stochastic Frontier production models (Cobb-Douglas production & inefficiency function) were employed to identify the contributory factors for milk production and the technical efficiency of farmers using dependent variable and independent variables. . Data were coded and analyzed by using the Statistical Package of STATA 11.0 and Minitab 15 software package.

$$\ln Y_{it} = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 + \beta_{10} \ln X_{10} + \beta_{11} \ln X_{11} + \beta_{12} \ln X_{12} + \beta_{13} \ln X_{13} + \beta_{14} \ln X_{14} + U_{it}$$

Where, β_0 to β_{14} = coefficient, U_{it} = error term

Table 1. Description of variables for empirical model

Notation	Variables	Remarks
Y_{it}	Milk yield	Liter/animal/day
X_1	Number of labors	Animal/day
X_2	Breed of the animal	Scores
X_3	Value of feed	Scores
X_4	Grazing time	Hours/day
X_5	Capital cost	Cost/animal
X_6	Shed type	Scores
X_7	Gender of the farmer	Male = 1, Female = 0
X_8	Age of the farmer	Years
X_9	Innovativeness	If yes = 1, Otherwise = 0
X_{10}	Level of Education	Scores
X_{11}	Income level	Rupees/month
X_{12}	Extension services	If yes = 1, Otherwise = 0
X_{13}	Knowledge	Scores
X_{14}	Experience	Years

Results and Discussion

This paper summarizes the most important demographic details, production details and socio economic details of cattle farming in Moneragala veterinary region. The parameter γ, must lie between 0 and 1 and if the γ equals zero, the difference between farmers yield and efficient yield is entirely due to statistical noise. On the other hand γ = 1 indicate the differences is entirely due to inefficient use of technology (Coelli, 1995).

Table 2. Production frontier estimates

Variables	Coefficient	Standard error	P value
Value of feed	.5469	.0992	0.000***
Grazing time(Hrs/day)	.1845	.1928	0.339
No of labors/Animal/day	-.0939	.0733	0.201
Breed	.2226	.0560	0.000***
Shed Type	.0693	.0440	0.115
Capital cost/Animal (Rs)	-.0429	.0482	0.373
Cons	.6791	.5546	0.221
σ^2	.2590		
Γ	0.9649		
Log likelihood	-14.825649		

**** Significant at 1 %*

As indicated by the Table 2, the estimation of γ is 0.964, which indicates that the majority of error variation is due to the inefficiency error Ui. (not due to the random error Vi). The estimated ML coefficient of value of feed showed a positive value of 0.5469 which was 1% significant. Therefore, increment of the inputs of value of feed by one per cent will increase output of milk yield/Animal/day by 0.5469 per cent, because feed is a major factor for milk production. The high quality feeds such as roughages, concentrates, mineral supplement and adequate amount of water were the reason to achieve high amount of milk yield. Asturkar *et.al.* (1980) concluded that feeding concentrates significantly increased milk production over sole roughage feeding. Telford and Jennings (1997) states that restriction in feed or water supply will result in a drop in milk production. The estimated ML coefficients for breed showed positive values of 0.2226 at 1% significant level. This indicates that increment of breed by one per cent will increase output of milk yield/Animal/day by 0.2226 per cent. High quality breeds such as Jersey and Sahiwal cross breeds were reason for this result. Because these breed are well suited for the environmental condition of Moneragala veterinary region, which helps to farmer to get high production. But the availability of feed is low. Therefore they cannot achieve the maximum level of output from the animal.

As indicated by table 3, the coefficient of the variable, level of education is positive and significant at 10% level in the inefficiency model. This study indicates that a higher level of education can help the dairy farmers to increase the efficiency, because they are better able to obtain new knowledge and skills to improve management practices in farms and Education enable an individual to plan properly for the feeding rations and sales of milk leading to better economic performance. The coefficient of the variable, knowledge of farmer is positive and significant at 5%. Knowledge provides a persistent reorientation to the livestock farmers, where in, they follow more improved technologies in livestock production leading to increase in livestock out puts resulting in high income from livestock. Some farmers have high level of knowledge but the usage in practice was less.

The average level of technical efficiency has been estimated as 69 percent for farm as a whole, implying that on an average the sample farmers tend to realize around 69 percent of their technical abilities. Hence, on average approximately 31 percent of the technical potential are not realized. Therefore, it is possible to improve the yield by 31 percent by following efficient resource management practices without increasing the level of inputs application.

Table 3. Technical inefficiency estimates

Variables	Coefficient	Standard error	P value
Gender of the farmer	-.4283718	.6177934	0.488
Age of the farmer	-.053397	.0387429	0.168
Innovativeness	1.183875	1.087493	0.276
Level of Education	-.7126078	.3687864	0.053*
Income level/month	-.0000591	.0000648	0.361
Extension services	.8120681	.6651203	0.222
Knowledge	-1.384012	.4955227	0.005**
Experience (years)	-.0009289	.0523328	0.986

** Significant at 10 % ** Significant at 5 %*

Conclusions

According to the results obtained from stochastic frontier estimation, the average technical efficiency of farmers given by the Cobb-Douglas model is 69 percent. This indicates that there is scope of further increasing the milk production by 31 per cent without increase the level of inputs or by reducing technical inefficiency among dairy farmers.

References

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