Production characteristics and technical efficiency of buffalo farmers in Thanamalwila veterinary division

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Introduction

At present milk production from large ruminants only meet 17% of the countries requirements (Ministry of livestock and rural community development, 2012). According to Department of animal production and health (2012) *Thanamalwila* Veterinary division (VD) in *Moneragala* district has the highest buffalo population in *Uva* province which is well established over cattle rearing and plays an important role in income generation of rural farm households. Therefore, this study was conducted to identify the important socio-economic determinants of milk production and to estimate the technical efficiency of dairy production in *Thanamalwila* VD.

Materials and methods

Study was conducted in *Thanamalwila* VD. Fifty buffalo farmers were selected using multi stage sampling technique. Random numbers of buffalo farms were selected from each *Grama Niladhari* division to field survey based on buffalo farm population. Rearing buffalo as primary and secondary income source was the selected criteria for buffalo farmers. Primary data were collected using pre tested structured questionnaire and following models were used in the analysis of stochastic production function and inefficiency model. Then, data were analyzed using Minitab 14 and STATA 11 software packages.

Model 1: Cobb-Douglas model

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Where "ln" denotes logarithms to base e, while, Y_i= Milk yield (L animal^{-1} day^{-1}), X_1= Breed, X_2= Average birth weight (kg), X_3= Condition of the shed , X_4= Grazing duration (hours day^{-1}), X_5= Labor allocation (hour animal^{-1} day^{-1}), X_6= Frequency of water given (number of times per day), X_7= Cost of buffalo farming (LKR per month), X_8= Value of feed, V_i= Random variable, U_i= Non negative random variables.

Model 2: The inefficiency model specification (Battese and Coelli, 1995),

$$= \quad + \quad + \quad + \qquad + \qquad +$$

Where, Z_1 = Age of the farmer (Year), Z_2 = Education level (Year), Z_3 = Monthly income level (LKR), Z_4 = Experience of the farmer (Year),
W_i = Unobservable random variables

Result and discussion

All the buffalo farmers in the sample were male and majority was belonged to 21-30 age category (30%) and a high proportion (62%) of buffalo farmers had education up to grade 10. Only 6% of respondents had the education level beyond GCE ordinary level.

Most of the villages (98%) reared both local as well as exotic river type buffalo breeds and the preferable breed combination was local buffalo and Murrah or Niliravi cross breds. Only 2% of farmers reared solely local buffaloes. Herd size ranged between 2-185 animals and majority of respondents (38%) had a herd size of 21-40. Moreover, the predominant management system (94%) was the extensive management system. Interestingly, one farmer (2%) has practiced the intensive management system. Moreover, 6% of farmers practiced artificial inseminations (AI) in their breeding program. Feed availability, water availability, changes in rainfall pattern, and land availability were the most serious constraints faced by respondents. Elephant attack and illegal smuggling were also critical problems in buffalo farming in the area.

The *maximum likelihood estimates* (MLE) of the parameters of stochastic frontier production function are present in Table 01. The OLS function provided the estimates of the average production function while MLE model provided the estimates of stochastic production frontier. The MLE coefficient for breed, allocation of labour hours day^{-1} $animal^{-1}$ and average birth weight shows a positive and significant contribution to determine the output of stochastic production function. Therefore, by improving these aspects the farmer can enhance the milk output by the given MLE.

Table 01: Estimates of stochastic production function

Variable	Coefficient		Standard error		p value	
	OLS	MLE	OLS	MLE	OLS	MLE
Breed	0.4768**	0.5830***	0.1834	0.1428	0.013	0.000
Birth weight	0.5367	0.6169**	0.3802	0.2856	0.166	0.031
Shed condition	-0.1626	-0.2230	0.1798	0.1375	0.371	0.105
Grazing duration	-0.0047	-0.0833	0.2994	0.2237	0.988	0.709
Labour hours	0.0941 *	0.2054 ***	0.0528	0.0564	0.082	0.000
Frequency of water supply	0.0086	0.1461	0.1152	0.1183	0.941	0.217
Cost of buffalo farming	0.0341	0.0187	0.0275	0.0217	0.223	0.391
Feeding method	0.0954	0.0570	0.2038	0.1674	0.642	0.733
Constant	-1.1127	-0.7375	1.5874	1.1581	0.487	0.524

OLS= Ordinary Least Square estimation, MLE= maximum Likelihood estimation, *Significant at 10%, **Significant at 5%, ***Significant at 1%

Estimated variables of the inefficiency model are represented in Table 02. Monthly income was the only significant variable of inefficiency model in this study. Therefore, farmers with higher monthly income have the capacity to increase the efficiency of milk production. Moreover, farmers had tendency to invest their money on livestock than cash crop cultivation

because they considered cash crop cultivation as relatively risky business due to dry climatic condition in the area.

Table 02: Technical inefficiency estimates- buffalo farming

Variable	Coefficient	Standard error	p-value
Age	0.0459	0.039481	0.243
Education level	0.1189	0.615439	0.846
Monthly income	-0.0005*	0.000026	0.052
Experience	-0.1057	0.085551	0.217
Contact times of VS/LDI	-0.3871	1.024504	0.709

*Significant at 10% **Significant at 5% ***Significant at 1%

Moreover, mean technical efficiency for buffalo farmers in *Thanamalwila* VD is 86.83, which indicates that the output could be increased by 13.7%, if all farmers achieved the TE level of the best farmer.

Conclusion

Coefficients for breed, feed, average birth weight, and level of labor power allocation on dairy industry have significant impact on milk production of buffalo farms in *Thanamalwila* VD. Moreover, by reducing the technical inefficiency by 13.7% the farmers can increase the milk yield without increasing the level of inputs.

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