RESEARCH ARTICLE
Open Access

Journal of Veterinary and Animal Sciences
ISSN (Print): 0971-0701, (Online): 2582-0605
https://doi.org/10.51966/jvas.2022.53.2.241-245

Resource use efficiency of milk production among different types of dairy farms in Kerala#

Sabin George[1*], P. C. Saseendran[2], K. S. Anil[3], V. L. Gleeja[4], E. D. Benjamin[5], M. K. Muhammad Aslam[6] and S. Pramod[7]
Department of Livestock Production Management,
College of Veterinary and Animal Sciences, Mannuthy, Thrissur-680651,
Kerala Veterinary and Animal Sciences University, Kerala, India

Citation: George, S., Saseendran, P.C., Anil, K.S., Gleeja, V.I., Benjamin, E.D., Aslam, M.K.M., and Pramod. S.2022. Resource use efficiency of milk production among different types of dairy farms in Kerala. *J. Vet. Anim. Sci.* **53**(2): 241-245
DOI: https://doi.org/10.51966/jvas.2022.53.2.241-245

Received: 10.09.2021 *Accepted: 18.04.2021* *Published: 30.06.2022*

Abstract

The present study analysed the resource use efficiency of milk production among different types of dairy farms in Kerala. The area of study and the respondents were selected using a stratified multi-stage random sampling technique. The farmers/farm households were categorized into small farms (1-2 cows), medium (3-10 cows), and large farms (more than ten cows). The relationship between inputs and milk production has been explored through the production function approach. Resource use efficiency was essentially a comparison between the Marginal Value Product (MVP) of an input with its price that gave direction on the use of that particular input in order to maximize profit. The results showed that in small farms, the MVPs of two inputs viz. roughages and labour was significantly less than unity, signifying overutilisation of these inputs. The MVP value of concentrate was significantly higher than unity, indicating their underutilisation in the milk production process. The MVP of concentrate was positive and significantly greater than unity in medium and large farms, also indicating their underutilisation.

#Part of PhD thesis submitted by the first author to the Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala

1. *Assistant Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences, Mannuthy.*
2. *Professor and Head (Retd.), Department of Livestock Production Management, College of Veterinary and Animal Sciences, Mannuthy*
3. *Professor, Department of Livestock Production Management, College of Veterinary and Animal Sciences, Mannuthy*
4. *Assistant Professor and Head, Department of Statistics, College of Veterinary and Animal Sciences, Mannuthy*
5. *Assistant Professor, Department of Animal Reproduction, College of Veterinary and Animal Sciences, Mannuthy.*
6. *Assistant Professor, Base Farm, Kolahalamedu*
7. *Assistant Professor, Livestock Research Station, Thiruvazhamkunnu*

**Corresponding Author: sabin@kvasu.ac.in, Ph: +91-9446203839*

Copyright: © 2022 Sabin George *et al.* This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Keywords: *Resource use efficiency, milk production, Kerala*

Dairying provides employment as well as stable income to rural people. The dairy farmers were decisive and determined with regard to the actions that were concerned with efficient management of dairy enterprise to obtain better productivity and higher profit (Vidya *et al*., 2009). Maximisation of returns from dairy enterprises requires optimum utilisation of resources required for producing the milk. The profitability of dairy farms is dependent on various aspects such as the productivity of the cows, quality and quantity of the feed materials provided etc. Therefore, the knowledge of resource use efficiency is of great importance for improving the productivity of animals. For achieving optimum resource utilisation of the resources by the dairy farmers, it is necessary to assess the present level of resource use efficiency. It is especially imperative to study the resource use efficiency among different herd-size categories across members of milk cooperative societies. Hence the present study was conducted with a specific objective to find resource use efficiency in milk production among different types of dairy farms in Kerala

Materials and methods

The respondents selected for the present study were dairy farmers, who were members of dairy co-operatives and were enrolled in the Direct Benefit Transfer (DBT) scheme of the Government of Kerala. Since the total population of milk producers who were DBT members was nearly two lakhs, a total sample size of 350 farmers was selected for the study. The farmers/farm households were categorised into small farms (1-3 cows), medium farms (4-10 cows), and large farms (more than 10 cows) (KAU, 2010). Out of the 350 farmers selected for the study, the numbers of small, medium and large farms were fixed as 175, 100, and 75 respectively. A stratified multistage random sampling procedure was used to select the area of study and respondents. In the first stage, the state of Kerala was stratified into five agro-climatic zones (NARP, 1989). In the second stage, one district from each zone (strata) was randomly selected. In the third stage, from each district two blocks were randomly selected. The sample size for each category of farms in each block was determined in proportion to the number of farmers belonging to each category (probability proportion to size technique). For this, all the farmers in the selected blocks were enumerated and classified into small, medium, and large farms based on number of cows. The respondents in each group were chosen randomly in each block, proportional to their number in each block. Primary data were collected by means of observation, in-depth interview and questionnaires.

Milk production function

Production function approach was used to study the effect of different factors on milk production. The factors influencing milk production depends on the character of the milking animal, quality and quantity of feeds fed, labour, management etc. and several other intangible magnitudes that cannot be quantified (e.g. climatic factors, place etc.).

The specification of milk production is as follows

$Y = f(X_1, X_2, X_3, X_4, X_{5.....}X_n)$

Where Y= Value of milk produced per animal per day in Rs.

X_1 = Expenditure on concentrate fed per animal per day in Rs.

X_2 = Expenditure on dry fodder fed per animal per day in Rs.

X_3 = Expenditure on green fodder fed per animal per day in Rs.

X_4= Expenditure on labour (paid+ family) employed per animal per day in Rs.

X_5 = adoption index in percentage

Conceptually any input – output relationship could be expressed as follows

$Y_i = f(X_1, X_2, X_3, \ldots\ldots X_n)$

Where Y_i was the dependent variable or regressed and X1's were the explanatory variables or referred to as regressors. In the present study double log (Cobb-Douglas) production function (Cobb and Douglas, 1928) was fitted whose mathematical form was given below.

Cobb Douglas = $Y=a \Pi^{n}_{i=1} x_{i}^{bi}$

Where Y was the dependent variable, 'a' was the intercept, X_i's were the exogenous variables and bi's are the partial regression coefficient of the respective X_i's.

Marginal value product

Since inputs and outputs were taken in monetary terms, MVPs of all the factors in Cobb-Douglas production function were calculated at respective geometric mean level which was as follows.

$$MVPXi = b_i \frac{\overline{Y}}{\overline{Xi}}$$

Where $\overline{Y}$ = Geometric mean of Y

$\overline{Xi}$ = Geometric mean if ith input

b_i = partial regression co efficient of X_is

The MVPs were compared with the acquisition cost or unit price of the corresponding resources. Use of the concerned resource was recommended to increase if $MVP_{xi} - P_{xi} > 0$ while its use was advised to decrease if $MVP_{xi} - P_{xi} < 0$ the significance of the difference between MVP and unit price of the resource was tested using 't' test which was computed as follows,

$$\text{Calculated } t = \frac{MVPxi - Pxi}{SE\ (MVPxi)}$$

$$SE\ (MVPxi) = \frac{SE\ (bi)\ \overline{Y}}{\overline{Xi}}$$

where SE = Standard Error.

If the difference between MVP and unit price was statistically not significant it indicated optimal use of that particular resource.

Results and discussion

The Cobb-Douglas production function was estimated for different types of farms and overall. The estimated determinants of milk production and coefficient of multiple determinations (R2) of the function is presented in Table 1. The estimated milk production function for different farms revealed that coefficients of concentrate, total roughage and adoption index were positive and statistically significant ($P < 0.01$) in small farms with R^2 as 63.0 per cent, indicating the importance of these inputs in increasing milk production. The labour cost was positive and significant ($P < 0.05$) in small farms. In medium farms, the coefficient of concentrate was highly significant, and roughage was significant at a 5% level. In large farms, the coefficient of concentrate was highly significant. The overall results showed positive and highly significant effects of concentrate and adoption index and significant effect of total roughage ($P < 0.05$) with an R^2 value of 67.0 per cent. This finding assumes more significance as the price of concentrate feed was perceived by dairy farmers as the major constraint in the dairy production (George *et al*., 2017).

Resource use efficiency of milk production

The marginal value product (MVP) of inputs in milk production for different farms are presented in Table 2. The results showed that the MVPs of two inputs, viz. roughages and labour, were significantly less than unity in small farms, signifying overutilisation of these inputs. On the other hand, the MVP value of concentrate was significantly higher than unity, indicating their underutilisation in the milk production process. In medium farms, the MVP of concentrate was positive and significantly greater than unity, indicating their underutilisation. In large farms, the MVP value of concentrate was positive and significantly greater than unity, indicating their sunderutilisation.

Similar works on resource use efficiency of milk were conducted in different parts of the country showing both supporting and contrary results. Kumar and Singh (2004) conducted a study in Tamil Nadu and found that in crossbred cows, the spending on feed factors like concentrate and dry roughage significantly affect the returns from the enterprise, whereas expenditure on green fodder was non-significant. They also concluded that MVPs of dry fodder and concentrates were significantly more than unity, indicating their underutilisation, while green fodder and labour were non significantly different from unity, indicating their optimal use. Mahajan and Chauhan (2011), Bardhan and Sharma (2013), Sharma *et al*. (2014), Rangnath *et al*. (2015) and Prusty and Tripathy (2016) also made investigations on resource use efficiency with similar results.

Table 1. Estimated Coefficients of milk production function

Farm size/ (Observations)	Parameter	Regression coefficient		R2 (%)
		B	Std. Error	
Small (175)	(Constant)	-0.958	0.922	63
	Concentrate	0.619**	0.051	
	Roughage	0.191**	0.045	
	Veterinary Service	-0.008	0.029	
	Labour cost	0.088*	0.04	
	Adoption Index	0.589**	0.218	
Medium (100)	(Constant)	0.153	1.229	81.4
	Concentrate	0.734**	0.058	
	Roughage	0.091*	0.046	
	Veterinary Service	-0.045	0.045	
	Labour cost	0.018	0.08	
	Adoption Index	0.377	0.31	
Large (75)	(Constant)	4.224	0.94	65.7
	Concentrate	0.585**	0.056	
	Roughage	0.018	0.024	
	Veterinary Service	-0.007	0.061	
	Labour cost	-0.039	0.064	
	Adoption Index	-0.262	0.227	
Overall (350)	(Constant)	-0.126	0.599	67.0
	Concentrate	0.671**	0.032	
	Roughage	0.053*	0.022	
	Veterinary Service	0.002	0.023	
	Labour cost	0.031	0.032	
	Adoption Index	0.512**	0.141	

** Significant at 1% level

* Significant at 5% level

Table 2. Marginal value products of various inputs under different farm sizes

Farm size	Inputs	MVP
Small	Conc.	1.54**(0.13)
	Roughages	0.59** (0.14)
	Labour	0.21** (0.1)
Medium	Conc.	2.02** (0.16)
	Roughages	0.63(0.32)
Large	Conc.	1.68**(0.16)

Figures in the parenthesis are standard errors of regression coefficients.
** Significant at 1% level

Conclusion

The analysis of resource use efficiency of milk production using the Cobb-Douglas production function demonstrated the importance of inputs like concentrate, total roughage, and labour and adoption index in increasing milk production in small farms. The coefficient of concentrate was significant in medium and large farms also. In small farms, the MVPs of two inputs, viz. roughages and labour, were less than unity, signifying over utilisation of these inputs. On the other hand, the MVP value of concentrate was significantly higher than unity, indicating their underutilisation in the milk production process. If an input is over-utilized, the quantity of that input can be reduced without affecting the output of milk, and if an input is underutilised, its amount can be increased to improve the production of milk. As per the results of the present study, the quantity of concentrate can be increased for improving milk production in all types of farms.

Conflict of interest

The authors declare that they have no conflict of interest

References

Bardhan, D. and Sharma, M.L. 2013. Resource productivity in milk production at farm household level in Kumaon region of Uttarakhand. *J. dairy. Foods Home Sci.*.**32**: 275-282.

Cobb, C.W. and Douglas, P.H. 1928. A Theory of Production. *American Economic Review.* **18** *(Supplement): 139–165*. Retrieved 26 September 2016.

George, S., Saseendran, P.C., Anil, K.S., Rajkamal, P.J., Shaheena, P., Gleeja, V.L. and George, P.R. 2017. Constraints perceived by dairy farmers of Kerala affecting the sustainability of the dairy sector. *J. Vet. Anim. Sci.* **48(2):**29-33.

KAU. 2010. Package of Practices Recommendations, Veterinary and Animal Husbandry (6th Ed.). Kerala Agricultural University, Thrissur, Kerala.

Kumar, G. B. and Singh R.V. 2004. Resource use efficiency of cow milk production in Tamil Nadu. *Indian J. Dairy Sci.* **57**: 137-140.

Mahajan, S. and Chauhan, A. K. 2011. Resource use efficiency in milk production inrural andperi-urban dairy farms in Ludhiana dist(Punjab). *Indian J. of Dairy Sci.***64**:148-153.

NARP. 1989. National agricultural research project (ICAR) status report. Thrissur, Kerala: Kerala Agricultural University.

Prusty, R.S. and Tripathy,S. 2016. Economics of milk production in organised and unorganised sector in Cuttack district of Odisha- a comparative analysis. *Indian J. Dairy Sci.* **69**:360-367.

Rangnath, P.S., Agarwal, S.B. and Das, G. 2015. Study on resource use efficiency in milk production in the scarcity zone of Western Maharashtra, India. *Indian J. Anim. Res.* **49**: 523-526.

Sharma, S.K., Malhotra, R. and Mahajan, S. 2014. Resource-use efficiency in milk production in Malwa region of Madhya Pradesh. *Indian J. Dairy Sci.* **67**: 531-534. Vidya, P., Manivannan, C. and Sudeepkumar, N.K. 2009. Situational and psychological profile of dairy farmers of Kannur district in Kerala. *J. Vet. Anim. Sci*. **40**:37-39. ■