

RESEARCH ARTICLE

Exploring the Determinants of Milk Production among Smallholder Dairy Farming: A Case of Pirojpur District, Bangladesh

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ABSTRACT

Dairy farming is a good income source of the smallholder dairy farmers in Bangladesh to maintain their livelihood. In this aspect, the objective of the study was to assess the determinants or factors influencing milk production in the smallholder dairy farms in Pirojpur district of Bangladesh. A sample of 93 smallholder dairy farmers was randomly selected for data collection. A pre-tested structured interview schedule was employed to conduct the survey among the respondents. The data were interpreted by using percentage, mean, frequency, standard deviation and regression analysis. Majority of the farmers (84.9%) had low to moderate milk production in their farm. The milk production was influenced by training in cattle rearing, smaller cattle herd size, farmers' higher knowledge on milk production, and a greater number of milking cows. The Department of Livestock Service (DLS) and other related NGOs may arrange more training programs for the smallholder dairy farmers focused on milk production. Initiative like providing credit facilities either interest-free or lower rate of interest may help the farmers to be owner of more milking cow as well as increase farm income of the smallholder dairy farmers.

Key words: Smallholder farmers; Milk production; Livestock; Influencing factors.

Livestock is an important socio-economic component of Bangladesh agriculture and accounts for 2.5 percent of the country's Gross Domestic Product (GDP) (Anonymous, 2020). Livestock sub-sector alone contributes 25 to 30 percent to the overall agriculture sector. Around 3-4 percent of the total GDP is contributed by the livestock sector, with animal husbandry accounting for approximately 2.53 percent of this (Anonymous, 2019). Most of the rural households are engaged in livestock production which contributes a large share of the livelihoods of smallholder and landless farmers. Most poor rural households raise livestock, which provide power for cropping, transport, threshing, and oilseed crushing; manure, as a source of fertilizer and fuel, a ready source of cash, as well as dairy and meat for consumption. Livestock provide business opportunities for smallholders. Livestock production provides essential food products, draught power, manure, employment, income, and export earnings. In terms of value, milk is the most significant livestock produced (Patel and Ashwar, 2019).

In Bangladesh, there are some milk pocket areas where dairy farming has traditionally been an important and a major component of mixed farming system. These areas are particularly located in Pabna, Sirajgonj, Mymensingh, Munsiganj, Rangpur, Chittagong, Magura, and Dinajpur district. (Goni et al., 2001) There are some large farmers in this area, who keep dairy cows only for milk production. However, the scenario in other areas is different. Small-scale dairy farming is observed in most of the regions of the country. Therefore, the country produces less milk than the national requirement. Bangladesh produces 106.80 lakh metric ton (LMT) milk against the annual requirement of 154.94 LMT (Anonymous, 2020). The consumption of milk in Bangladesh among the SAARC countries is the lowest (55 ml/h/day) (Joshi et al., 2007)

The average number of dairy cattle per family was one (Islam and Oliuzzaman, 1992). On average, milk production per cattle per year was about 620 and 1580 liters in local and cross-bred farms, where the estimated value were Tk 37266.40 and Tk 71815.85, respectively

(Talukder and Tujuddin, 2000). Small farmers were generally the owners of the cow and buffaloes (Rahman and Rahman, 1991). Farmers gained substantially by keeping milch animal. Net returns were positive and higher for high-yielding buffaloes and cows. There are some crucial problems in this sector such as high feed cost, low yield for indigenous breeds, lack of livestock credit and insurance for dairy development.

Dairy farming is a crucial component of rural economy which has the highest potential of generating income and employment through augmenting productivity of milch animals (Triveni et al., 2018). There are few survey-based studies on dairy farming that consider all categories of farmers, especially large farmers. Those studies mostly focused on the marketing channels of dairy products or problems faced by farmers in receiving veterinary services (Imtiaz and Rana, 2014). Improving milk production potential within limited resources can be achieved by applying the latest scientific know-how and awareness programs (Sharma et al., 2021). Therefore, the present study has been undertaken to consider factors that influence milk production in the small-scale dairy farm. The objectives of the study are:

- i. To assess the average milk production in the smallholder dairy farms;
- ii. To describe the socio-economic characteristics of the dairy farmers; and
- iii. To identify the contributory factors of milk production.

METHODOLOGY

The study was conducted in Bhandaria Upazila (Sub-district) under Pirojpur District. Bhandaria Upazila covers an area of 163.56 sq. km and is located between 22°22' and 23°33' north latitudes and between 89°54' and 90°08' east longitudes. This Upazila was chosen based on the availability of dairy farming. There are seven unions within Bhandaria Upazila. Four villages from two unions within this Upazila were randomly selected for the study. The total smallholder dairy farmers in the selected four villages under the Bhandaria Upazilla of Pirojpur district were considered as the population for the study. A list of smallholder dairy farmers who are currently rearing dairy cattle was prepared with the help of the Upazila Livestock Officer, Veterinary Surgeon, and their field staffs. The number of dairy farmers in the selected four villages were 229. Then, 93 farmers were selected as

the sample for the study using the following formula (Kabir and Rainis, 2015; Islam et al., 2022).

$$n = N / (1 + Ne^2)$$

Where, n= Sample size; N = Population size and e = Error (0.08).

A well-structured interview schedule was designed in accordance with the objectives of the study. Both open and closed-ended questions were used in the questionnaire. The questionnaire was constructed containing direct and simple questions in view of the dependent and independent variables. Before preparing the final schedule, a preliminary schedule was developed. The draft schedule was pretested in the study areas. The interview schedule was then changed, modified, and rearranged according to the experience gathered and in light of the objectives of the study. The researchers collected data through face-to-face interview from the selected respondents. After completion of data collection, all the data were compiled, tabulated and analyzed by using excel sheet according to the objectives of the study. Local units were converted to standard units. The collected data were analyzed using the tabular technique in accordance with the objectives of the study. The statistical measures such as range, means, standard deviation, number and per centage distribution were used to describe the variables. SPSS (version 25) computer program were used for analyzing the data. Regression coefficients were used to identify the determinants of milk production in smallholder dairy farming.

RESULTS AND DISCUSSION

Milk production in the smallholder dairy farms: There was a variation in milk production (from less than 2 liters to more than 4 liters) among the dairy farms. Based on the range of milk production, the dairy farm were divided into three groups: low production, medium production, and high production (Table 1). It was observed that the majority of the dairy farmers achieved edium production, followed by low and high production, respectively. More than one-third of the farmers had milk production of up to 2 liters per day, which is not consistent with the expense of cow rearing. Therefore, there is still scope to take initiatives for increasing milk production among † smallholder dairy farms.

Socio-economic profile of the smallholder dairy farmers :In the study, eleven characteristics selected from the farmers such as age, education, farm size, annual family income, training in cattle rearing, extension

Table 1. Distribution of respondents according to determination of milk production

Categories	No.	%
Low production (up to 2 liter)	34	36.6
Medium production (>2 to 4 liter)	45	48.3
High production (above 4 liter)	14	15.1
Total	93	100
Mean	2.73	
SD	1.39	

Table 2. The salient features of the smallholder dairy farmers (N=93)

Characteristics/Category	No.	%	Mean	SD
<i>Age (22-85 years)</i>				
Up to 35	14	15.1	50.61	12.83
36 to 50	47	50.5		
Above 55	32	34.4		
<i>Education (0-17 years of schooling)</i>				
Illiterate	15	16.1	6.45	3.85
Primary	31	34.4		
Secondary	38	40.8		
Above	9	9.7		
<i>Farm size (1.65-358.37 decimal)</i>				
Marginal	27	29	103.69	81.17
Small	66	71		
<i>Annual family income (81-627 BDT)</i>				
Low	20	21.5	218.13	86.71
Medium	49	52.7		
High	24	25.8		
<i>Training in cattle rearing (0-11 days)</i>				
0 day	71	76.3	0.81	1.96
Up to 5 days	15	16.2		
Above 5 to 11 days	7	7.5		
<i>Extension media contact (0-7 score)</i>				
No	3	3.2	2.87	1.53
Low	56	60.2		
Medium	34	36.6		
<i>Length of experience in dairy farming (2-50 year)</i>				
<5	38	40.9	21.08	15.23
>5 to 20	18	19.3		
Above 20	37	39.8		
<i>Time spends in cattle rearing (2.5-12 hour/day)</i>				
>4	39	41.9	5.16	2.03
4 to 8	45	48.4		
>8	9	9.7		
<i>Cattle herd size (1-11 cattle)</i>				
1 to 4	80	86	3.26	1.60
5 to 7	11	11.8		
>7	2	2.2		
<i>Farmers' knowledge on milk production (4-17 score)</i>				
Poor	10	10.8	10.14	2.99
Fair	62	66.6		
Excellent	21	22.6		
<i>Number of milking cow (1-3 numbers)</i>				
1 cow	77	82.8	1-1.19	0.45
2 cows	14	15		
3 cows	2	2.2		

media contact, length of experience in dairy farming, time spent in cattle rearing, cattle herd size, farmers' knowledge of milk production, and number of milking cows were taken into consideration. The composite findings of the selected factors of smallholder dairy farming are presented in Table 2. The majority of the farmers' age was from 36 to 50 with long experience in dairy management. The literacy rate among the farmers was 83.1% which is higher than the national average (Anonymous, 2021). All the farmers were owners of small farms, and they gained a moderate annual income. Most of the farmers had no training experience in cattle rearing and had little contact with various media. On average, they had 3 cattle among which one was a milking cow and they spent more than 5 hours a day managing their farm. Most of them had a fair knowledge of milk production.

Contribution of the characteristics on the milk production : In the study, farmers' selected 11 characteristics were considered as independent variables and milk production was treated as dependent variable. Regression analysis was run to assess the contribution of the independent variables on the dependent variable. Before running the analysis, multicollinearity was checked among the independent variables and found no high collinearity among the variables (Mazumder and Kabir, 2022; Kabir et al., 2023). The result of the regression analysis is presented in Table 3.

The adjusted R² value (0.663) indicates that all independent variables combined explained 66% of the dependent variable. Moreover, the F value is significant at the 1% level of confidence. These parameters show the strength and validity of the analysis. The analysis shows that training in cattle rearing, cattle herd size, farmers' knowledge on milk production and number of milking cow are significant factors for milk production. Among these significant variables, only cattle herd size showed negative relationship with milk production. The rest of the variables showed a positive relationship with milk production.

The relationship between farmers' knowledge and milk production was positive and significant. This implies if farmers' knowledge regarding milk production increases, then the milk production of the farm will increase. The finding is logical because gaining knowledge helps farmers broaden their outlook and manage the farm more efficiently. Patil et al. (2009) observed that the knowledge level is an important issue for dairy farmers of Nagpur district, India.

Table 3 shows that milk production can be increased with an increase in the number of milking cows on a dairy farm. The finding is consistent with the general trend. Farmers with more milking cows obtained higher milk production than those with fewer milking cows.

From the multiple regressions, it was also observed that the contribution of training in cattle rearing in milk production is positive and significant. The higher the training opportunities for farmers, the higher the milk production on their farms. The β -value of farmers' training in cattle rearing (0.131) indicates that as the level of training in cattle rearing for farmers increases by one unit, milk production in smallholder dairy farms increases by 0.131 units. This may be because training helps farmers to increase their skills to manage dairy farms. *Raina et al. (2017)* mentioned that training is valuable and significant in reducing the existing technological and adoption gap among dairy farmers in India.

There was a negative and significant relationship between cattle herd size and milk production among the smallholder dairy farms. This indicates that the larger the cattle herd size, the lower the overall milk production on the farm. This may be because farmers not only keep milking cattle but also non-milking cattle in the same herd in smallholder dairy farms. Non-milking cattle have no direct contribution to milk production.

Table 3. Coefficients of multiple regression analysis of farmers' selected characteristics on milk production

Independent Variables	β	p
Milk production		
Age	-0.008	0.430
Education	-0.039	0.224
Farm size	-0.003	0.101
Annual family income	0.002	0.074
Training in cattle rearing	0.131	0.043*
Extension media contact	-0.073	0.508
Experience in dairy farming	0.008	0.398
Time spends in cattle rearing	0.131	0.335
Cattle herd size	-0.376	0.035*
Farmers' knowledge	0.203	0.000**
Number of milking cow	3.071	0.000**
R ²	0.703	
Adj. R ²	0.663	
F statistic	17.426**	
p	0.000	

** Significant at $p < 0.01$ and * Significant at $p < 0.05$

CONCLUSION

Dairy farming in Bangladesh has been practiced for a long time on a small scale. This is one of the good sources of income generation among small holder dairy farmers. It was observed from the study majority (84.9%) of smallholder dairy farmers had low to medium milk production capacity. It is therefore, to note that the overall milk production performance was not satisfactory in the study area and needs more development in small-scale dairy farming. Training in cattle rearing, knowledge on milk production, cattle herd size, and the number of milking cows significantly influenced farmers' milk production. The Department of Livestock Services (DLS) and respective non-government organizations (NGOs) may engage more with smallholder dairy farmers by facilitating training opportunities and supplying more milking cows. The Upazila (sub-district) level livestock officer and local and national NGOs may arrange more seminars, group discussions, and motivational campaigns to encourage and support farmers to rear milking cows. Public and private credit organizations may also make credit available for smallholder dairy farmers.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

REFERENCES

- Anonymous (2019). Annual Report, Ministry of Fisheries and Livestock. Government of the People's Republic of Bangladesh.
- Anonymous (2020). Statistical pocket book of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning. Government of People's Republic of Bangladesh, Dhaka.
- Anonymous (2021). Statistical pocket book of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning. Government of People's Republic of Bangladesh, Dhaka.
- Goni, M.D.; Miah, A.G.; Khan, M.R.S. and Islam, M.N. (2001). The performance of cross breed cows available in milk pocket area of Bangladesh. *Indian J. Ani.Sci.*, **71** (12): 1166-1168.
- Imtiaz, M. A. and Rana, (2014). Problems faced by the small-scale dairy owners in receiving veterinary services in selected areas of Chittagong. *Bangl. J. Vet. Med.* **12** (1): 63-65.
- Islam, M. A. and Oliuzzarnan. M. (1992). A study on the existing distribution pattern rearing practice and

- some economic productive and reproductive dairy characters of indigenous cows in some selected areas of Mymensingh district, Annual Report, BAURES, 7 (A).
- Islam, M. R.; Islam, M.R.; Ali, M.S. and Kabir, M. H. (2022). Impact of small enterprise loan programme of Palli Daridro Bimochon Foundation on the beneficiary's socio-economic development: A Case of Bangladesh. *Asian J. Agril. Ext., Eco. & Socio.*, **40**(10): 1198-1205.
- Joshi, P.K.; Gulti and Waldo, R. (2007). Agricultural diversification and smallholders in South Asia. pp. 626.
- Kabir, M. H. and Rainis, R. (2015). Adoption and intensity of integrated pest management (IPM) vegetable farming in Bangladesh: an approach to sustainable agricultural development. *Envir., Devel. and Sustain.*, **17**(6):1413-1429.
- Kabir, M.H.; Afroz, S.; Alam, M.M. and Rahman, M.S. (2023.) Rural women's attitude and involvement in post-harvest processing of vegetables. *J. Animal and Plant Science*, **33**(2). <https://doi.org/10.36899/JAPS.2023.2.0622>
- Mazumder, M.S.U. and Kabir, M.H. (2022). Farmers' adaptations strategies towards soil salinity effects in agriculture: the interior coast of Bangladesh. *Climate Policy*. **22** (4): 464-479. DOI: 10.1080/14693062.2021.2024126
- Patel, N. and Ashwar, B. (2019). Factors in economics of milk production on commercial dairy farms in Aravalli district of North Gujarat. *Indian Res.J. Ext. Edu.*, **19** (2&3): 83-88
- Patil, A.P.; Gawande, S.H.; Nande, M.P. and Gobade, M.R. (2009). Assessment of knowledge level of dairy farmers in Nagpur district and the co-relation between socio-economic variables with their training needs. *Vet. World*. **2** (5) : 199.
- Rahman, M.M. and M.H. Rahman (1991). An economic analysis of dairy enterprise in four selected villages of Mymensingh district in Bangladesh. Unpublished Research Report Submitted to the Bureau of Socio-Economic Research and Training.
- Raina, V.; Sharma, N.; Khajuria, S.; Kumar, K.; Choudhary, S. and Hussain, K. (2017). Training needs of dairy farmers. *Intl. J. Agri., Envir. and Biotech.*, **10** (2) ; 245.
- Sharma, S.; Singh, S. K.; Singh, A. and Rashmi (2021). Adoption behavior of rural youth towards dairy farming practices. *Indian Res.J. Ext. Edu.*, **21**(4): 80-84
- Talukder, R. K. and M. Tajuddin (2000). Economics of milk production in Bangladesh. An Unpublished Contract Research Report Submitted to Bangladesh Agricultural Research Council, Farmgate, Dhaka-1215.
- Triveni, G.; Sharma, G.R.K.; Satyanarayana, Ch.; SarjanRao, K. and Raghunandhan, T. (2018). Knowledge level of dairy farmers on adoption of dairy innovations in Andhra Pradesh - An analysis. *Indian Res.J. Ext. Edu.*, **18** (1): 1-4.

