Factors Influencing Milk Production among the Dairy Farms of SavarSub-district, Dhaka, Bangladesh

ABSTRACT

Milk production among the dairy farms is one of the important sources of income for the farmers.However, many reasons may influence milk production. In this aspect, the objective of the study was to assess the determinants or factors influence milk production in the dairy farm of Savarsub-district under Dhaka district of Bangladesh. A sample of 218 dairy farmers was randomly selected for data collection. The survey was conducted using a pre-tested structured interview schedule among the respondents.The data was analyzed using percentage, mean, frequency, standard deviation, and regression analysis. Majority of the farmers (96.8%) had up to 70 liters of milk production in their farm with an average of 18 liters.The statistical analysis showed that credit, total cow, milking cow, and livestock income significantly influences on the amount of milk produced in the farm. The Department of Livestock Service (DLS) and other related Non-Government Organizations (NGOs) may arrange more livestock income related programs for the dairy farmers focused on milk. Initiative like providing credit facilities either interest free or lower rate of interest to purchase milking cow may help the farmers to improve their livelihood through more milk production.

Keywords: Dairy farmers; Milk; livestock; influencing factors, Bangladesh

1. INTRODUCTION

Dairy farming is crucial globally, especially in developing countries, where farmers are vital for food security and income. Understanding milk production determinants is crucial for improving productivity and livelihoods, thereby enhancing agricultural economies. The dairy industry's expansion in developing nations has significantly improved milk production, living standards, job creation, and nutritional standards, especially for small and marginal farmers. Livestock plays a major role in Bangladesh's agricultural economy. About 16.52% of the

agricultural Gross domestic product (GDP) and 1.85% of the national GDP are derived from livestock [1,29-32]. Dairy is a crucial livestock product in Bangladesh, primarily produced by dairy farmers who keep cows for farm management and family consumption. The dairy cow significantly contributes to Bangladesh's robust agricultural economy and can significantly alleviate malnutrition, particularly among children. According to [2], dairy farming is a year-round occupation, a way of life and a business.In Bangladesh, dairy cattle are used for both domestic use and agricultural purposes.The majority of local cows are housed in stalls with limited access to fallow land, roadside, embankment slope, and grazing agricultural straw.Local cows produce an average of 300 to 400 liters of milk per 180 to 240 day lactation period[3].However, the milk production in a farm may vary due to various factors such as environmental, management and types of cows etc.

Environmental factors include the location, climate, and availability of water and pasture[4, 5]. Management practices for dairy cows include breed selection, feeding methods, healthcare, and housing conditions.[6,7].The breed of dairy cows, including crossbreeds and purebreds, is a key factor in determining milk production. The improved breeds generally producing higher milk[8,9].The adoption of improved breeds is often hindered by limited access to quality breeding services and the high costs associated with their maintenance [10].The well-being and productivity of dairy cows are significantly influenced by their housing conditions, which provide shelter and comfort housing can significantly enhance milk production by reducing stress and exposure to harsh weather conditions[11]. Additionally, modern technologies and practices, like artificial insemination and record-keeping, can enhance milk yield and farm efficiency [12].

Compared to other food items, milk has higher demand elasticity and is highly appreciated in the diet[13]. In Bangladesh, certain regions known as milk pocket areas(intensive milk production zone) have traditionally regarded dairy farming as a crucial part of their mixed farming systems. These areas are mainly found in the districts of Pabna, Sirajgonj, Mymensingh, Munshiganj, Rangpur, Chittagong, Magura, and Dinajpur[14]. Large farmers in this region raise dairy cows exclusively for the purpose of producing milk. Bangladesh produces 140.68 lakh metric tons (LMT) of milk annually, decreasing under of the 158.50 LMT required by approximately 17.82 LMT [1]. Bangladesh has the lowest milk

consumption among South Asian Association for Regional Cooperation (SAARC) nations (55 ml/h/day) as stated by [15].

Dairy farming is a type of farming that also makes continuous income for the crop farmers. They can rear dairy cattle beside crop cultivation. Milk and milk products sales positively impact rural households' cash flow and lifestyles [16].Bangladesh's rural dairy farmers predominantly utilize smallholder farming systems, with a herd size of 3.5 cattle per household, managed traditionally [17]. Around 70 to 80 percent of national milk output is produced by smallholders who rely on local cows to produce 1-2 liters of milk daily [18]. The primary basis of traditional smallholder farming practices is the milk production of indigenous cows, with some rearing indigenous cows for personal consumption and income generation. Dairy farming enhances milk production, improves household nutrition, empowers women and youth, reduces poverty, ensures food safety, enhances the nutritional status of families, and generates income and employment [19, 20].

There is limited survey-based research on dairy farming, encompassing all types of farmers, particularly those who are very large-scale. Moreover, these studies primarily concentrated on exploring marketing channels for dairy products and the obstacles farmers encounter in accessing veterinary services [21].In this context the present study has been undertaken with an aim to determine the level of milk production among the dairy farm and to determine the factors that influence milk production.

2. METHODOLOGY

The study was carried out in Savar Upazila, a 280.11 square kilometer area in the Dhaka District, which is situated between the longitudes of 90°16′00′ and 90.2667° east and the latitudes of 23°51'30" and 23.8583° north. The availability of dairy farming played a role in the selection of this Upazila. Under Savar upazila, there are twelve unions. For the study, three villages were chosen at random from each of the two unions in this Upazila. The study considered all dairy producers in three chosen villages in the SavarUpazila of Dhaka district. A total of 480 dairy farmers were located in the three selected villages which is considered as population for the study. Next, 218 farmers were chosen as sample using the formula below [22, 23].

$n=N/1+Ne^2$

Where, n= Sample size; N = Population size and e = Error (0.05).

To achieve study objectives, an effective interview schedule was created.Both closed- and open-ended questions were present in the schedule. The study considered two types of variables such as independent and dependent variables. The dependent variable of the study was milk production and farmers' socio-economic characteristics were considered as independent variables. In light of the dependent and independent variables, the questionnaire was designed with straightforward questions. A preliminary schedule was created prior to creating the final one. In the research regions, the suggested schedule was pre-tested.The interview schedule was adjusted, revised, and reorganized in line with the acquired knowledge and the objectives of the study. The researchers conducted in-person interviews with the selected respondents in order to collect data. After data collection, an excel sheet was utilized to consolidate, tabulate, and analyze the collected data in line with the study's objectives. The study utilized descriptive statistical measures such as mean, frequency, standard deviation and regression coefficients to analyze data on milk production in smallholder dairy farming using SPSS version 23.

3. RESULTS AND DISCUSSION

3.1 Milk production among the dairy farm

Milk production in the dairy farms ranged from 2 liters to 106 liters with an average of 18.39 liters. The range was equally divided into 3 groups and presented in the Table 1. Majority of the dairy farmers (89.4%)had milk production up to 35 liters. The average milk production is remarkable as this is higher than the national average of milk production(10liters) [1].This may occur due to the selection of intensive milk production zone and the effort of livestock staff and farmers. However, if we considered the average milk production consumption scenario then it can be said that there are still opportunities for increasing milk production among the dairy farms to take initiative by the authority.

Table 1. The distribution of respondents regarding amount of milk production in their farm

Categories	Number	%	Mean	Std. Error
2 to 35 liters	195	89.4	18.39	1.28
>35 to 70 liters	16	7.4		
>70 to 106 liters	7	3.2		
Total	218	100		

3.2 Socio-economic profile of the dairy farmers

In the study, farmer's fourteen selected characteristics such as age, education, family size, farm size, training, organization participation, livestock income, homesteads size(farmers' residence area), time spent in dairy farming, total cow, cattle herd size, credit access,Department of Livestock Service (DLS) contact and number of milking cows was considered as independent variables.The findings of the selected dairy farmingproducers' characteristics are shown in Table 2.Most of the farmers ranged in age from 18 to 80 and had extensive experience in dairy management. The average education level is 5.67 whichmean that most of the farmers were in secondary level. The score for primary and secondary level of education was 1 to 5 and 6 to 10 respectively. The average educational score is 5.67 which is equivalent to 6 and the score represents secondary level education.On average,the farmers were owners of small farm (agricultural land)but they earned considerable income from livestock.Most farmers lack cattle rearing training and media exposure. In case of total cow ownership, on average they own five cows. Regarding milking cows, the farmers had a range of 1 to 18 cowswith an average of 2 milking cows.They dedicated over six hours daily to farm management. The majority of them had moderate contact with the Department of Livestock Services (DLS) regarding milk production.

Table 2. Key characteristics of the dairy farmers (N=218).

Characteristics	Measurement unit	Observed range	Mean	SD
Age	Year	18-80	45.30	12.61
Education	Level of schooling	0-18	5.706	4.21
Family size	Number of family members	2-20	5.67	2.42
Farm size	Decimal(1 acre =100 decimal)	0-132	14.95	20.81
Training	No. oftraining receive days	1-50	2.62	6.59
Organization participation	Score(involve with number of organizations)	0-2	0.30	0.47
Livestock income	'000' Taka	30-1500	201.02	198.22
Homesteads size	Decimal	1-208	16.47	33.22
Time spent	Hours/week	1-26	6.71	3.52
Total cow	Number of cows	1-53	5.17	5.28
Milking cow	Number of milking cows	1-18	2.21	2.29
Cattle herd size	Decimal	1-100	5.1067	15.36
Credit	'000' Taka	0-3	0.15	0.39
DLS contact	Score	0-7	0.48	0.70

3.3 Contribution of farmers' characteristics on milk production among the dairy farm

In the study, the contribution of 14 selected farmer characteristics as independent variables to milk production was analyzed, with milk production as the dependent variable.Regression analysis was conducted to assess the impact of independent variables on the dependent variable, indicating the absence of significant high collinearity among the variables [24, 25]. The regression analysis results are presented in Table 3.

Table 3. The coefficients of multiple regression analysis of selected farmer characteristics on milk production

Independent variables	Std.Error	β	P
Age	.070	-.022	.575
Education	.219	.036	.371
Family size	.368	.000	.991
farm size	.049	-.006	.900
Training	.140	.036	.373
Organization participation	2.011	.001	.987
Livestock income	.005	.078	.049*
Homesteads size	.028	.065	.109
Time spent	.266	-.055	.186
Total cow	.382	-.221	.014*
Milking cow	.886	1.003	.000**
Cattle herd size	.070	.038	.418
Credit	2.302	-.139	.001**
DLS contact	1.350	.008	.845
R^2	0.708		
Adj. R^2	.687		
F statistics	35.081		
p	0.000		

*= Significant at 5% level of confidence, **= Significant at 1% level of confidence

The adjusted R^2 value of 0.687 indicates that the independent variables together account for 68% of the variation in the dependent variable. The F value is statistically significant at the 1% confidence level.These parameters showed the strength and validity of the analysis. The analysis indicates that livestock income, total number of cows, access to credit, and the number of milking cows are significant factors in milk amount. Among these significant variables, total cow and credit exhibited a negative relationship with milk amount. The rest variables showed a positive relationship with milk production.

The relationship between milking cow and milk amount was positive and significant. This implies if the number of milking cow increase, then the amount of milk production of the

farm will be increased.The finding is similar with the study of [26]. The study suggests that increasing the number of milking cows can enhance farmers' milk amount.Table 3 also demonstrates that an increase in credit in a dairy farm can lead to decrease in milk amount.This indicates access to credit did not help the dairy farmers to increase milk production among their farm. According to [27] in some cases credit don't fulfill the purpose due to various reasons.

The multiple regressions also revealed that the influence of livestock income on milk amount is positive and significant. This implies higher the income from livestock higher the milk production in the farm.According to the β-value of livestock income (0.078), dairy producers' milk yield increased by 0.078 units for every unit increase in livestock income. It was observed in the study area that the farmers who had much milk production had higher income from livestock. Farmers having more income have higher opportunities to invest in income generating activities [28].A negative and significant relationship was observed between the total number of cows and the amount of milk among smallholder dairy farms. This indicates higher the total cow lowers the overall milk amount in the farm. Total cow means the sum of milking and non-milking cows. If the number of total cows high then the farmers needs to spend more time to manage both types of cows. Then it may reduce their time to take care only milking cows.

4. CONCLUSIONAND POLICY IMPLICATIONS

The study revealed that majority of dairy farmers had higher than the national average of milk production.Considering the per capita milk consumption requirement, the overall milk production in the study area is still inadequate, indicating a need for further development. Livestock income, total Cow, milking cow, and credit accessis significantly influence farmers' milk amount.Except for credit the rest other factors influenced positively to increase milk production. This indicates the farmers who have higher income from livestock, higher the number of total and milking cows have more milk production.Emphasis given these factors by the extension agent and policy makers may help to increase milk production among the dairy farm. The Department of Livestock Services (DLS) and relevant non-governmental organizations (NGOs) could increase their engagement with smallholder dairy farmers by providing more income opportunities related to livestock and supplying additional milking cows. The Upazila (sub-district) livestock officers, along with local and national NGOs, could organize more seminars, group discussions, and motivational campaigns to

encourage and support farmers in raising milking cows. Public and private credit organizations could also provide loans to the dairy farmers and monitor on the proper use of credit. Such effort may help to improve dairy sector in Bangladesh.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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