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Management and employment potential of small-scale dairy farming in Mymensingh

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Abstract

The study was conducted to interpret the socioeconomic characteristics of the dairy farmers, dairy farm management and income, impact of management activities on milk production and employment potential in dairy production. Three hundred households in three thanas of Mymensingh district were interviewed through a questionnaire. Thirty nine per cent dairy farmers were illiterate and this proportion was higher in rural areas. Ratio of dairy income to total income was higher for large farmers and in riverside area. About 52 per cent farms had single milch cow and there was 1.6 units of milk cow per dairy farm. Riverside area exhibits highest percentage of cows of local breed. Most of the cowshed were made by GI sheet and were in good conditioned. Most of the farmers do not maintain expected level of care to their milch cows. Women had significant participation in dairy milk production. Dairy farming activities of the rural people may be increased by increasing the number of dairy cows and through improving training facilities for the women and paid labourers for income generating purposes.

Keywords: Socioeconomic characteristics, Dairy farm management, Care index, Participation index

Introduction

Livestock is an integral component of complex farming system in Bangladesh. Dairy products like milk, butter, ghee and cheese have high nutritive values and contain all ingredients required by the human body in appropriate proportions. Despite substantial importance, less attention has been attached to the development of milk production by policy makers because of poor state of knowledge about method and problems of production and utilization of livestock in the country. Thus the importance of broad-based research work on dairy industry is conspicuous. The dairy enterprise is believed to be employment-intensive and income-bright.). According to Rahman, *et al.* (2003), dairy farming is a business, way of life, 365 days-a-year job, agro-climatic condition of Bangladesh is favourable for dairy farming and it could be an effective instrument for income and employment generation in rural areas. Dairy farming is marginally profitable and farmers have ample opportunities to increase output by using more of aggregate feed and hired labour inputs (Sikder *et al.*, 2001). The economics of dairying can be made more profitable by improving the productivity of animals through better breed, better feeding, health care and management of the existing stock.

The male labourers spend more time than women in agricultural activities. In most of the works related to dairy farming, the family members (male, female and children) and paid labourers share with each other. Livestock and rural development strategies should focus on the rural households, housewives, children and paid labourer to meet the basic needs of rural people. Therefore, ways must be sought to involve rural people in the process of national planning with a view to develop them for their self employment to contribute to food and animal production, bring improvement in dairy farming and rural life. Different types of care are required for dairy production. Again, various types of people (labour unit) provide their labour into it with varying degrees of involvement. A composite index, namely Care Index would be helpful to assess the impact of the cares taken to the animals on the production of milk.

The findings of the study are expected to be useful to the subsidized dairy farm owners by providing valuable insight into problems and potentials of dairying. The present study will be helpful to provide guidelines for recognition of dairying for the overall improvement of Bangladesh. Thus, an attempt has been taken to estimate the socioeconomic characteristics of the dairy farmers, livestock population and their management status, impact of selected management activities on milk production and extent of participation and care taken in dairy farming.

Materials and Methods

Three thanas out of 12 of Mymensingh district were selected on the basis of riverside, semi-urban and rural village and they were Trisal, Mymensingh Sadar and Fulbaria respectively. Four villages were selected in the same locality from each of the selected thanas. One hundred dairying households were selected at random from each locality. Data were collected from each of the selected households through a questionnaire. The data collection for the study was started from July 2001 and ended in June 2003. Collected data were analysed according to the objectives of the study.

Seven care components, e.g., grazing, food preparation, food distribution, treatment, cleaning, breeding and milking were recorded for milk production. Each care component was offered by four different labour units, e.g., male, female, children and hired labourer. These labour units contributed to each component in three different degrees of involvement, e.g., all the time, occasionally and never, getting different score assigned against the degree of involvement. One alternative to the degree of involvement would be hours spent by the labour unit and these units might vary in numbers. The weights of different labour units were different depending on the ability to work. Again, all the care components were not of equal weights for their contribution to the production (milk). Considering the above points a Care Index, C_x was proposed as follows.

$$C_x = \sum_{i=1}^7 a_i \sum_{j=1}^4 w_j n_{ij} x_{ij} \quad (1)$$

Where, x_{ij} is the score of j th labour unit of i th care component

w_j is the weight associated with the j th labour unit

a_i is the weight associated with the i th care component

n_{ij} is the number of j th labour unit employed under i th care component

This index can be generalized for number of labour unit and care component. The weights are the choices of the researcher based on experience. In our data set, the score were assigned $x_{ij} = 2, 1, 0$ for all time, occasionally and never respectively; $a_i = 1$ for all i ; $w_j = 1, 0.7, 0.3$ and 1 for male, female, children and hired labourer respectively and all n_{ij} is one.

A functional analysis was used to reveal the quantitative relationships between dependent variable (milk production) and a set of explanatory variables. To determine the effects of the explanatory variables, linear models were estimated for milk production. Many factors might affect milk production but it is quite difficult to include all the variables in a model due to theoretical and economic considerations. So the important variables were included to keep the model as simple as possible. Care was taken to ensure that the included variables were not multi-collinear. The multiple regression function was specified as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + U_i \quad (2)$$

Where,

- Y = Total milk production per household (litre/day),
 a = Intercept,
 X_1 = Number of milch cow,
 X_2 = Size of cowshed (sq. ft.),
 X_3 = Type of breed
 b_1 , b_2 and b_3 are the coefficients of respective variables; and
 U_i = Error term.

The Care Index was considered as an independent variable in the models but found insignificant result and hence dropped out from the final models. The reason behind such inconsistency may be the unexpected level of care provided irrespective of the number of milch cows as identified by the Care Index (Figure 1).

To measure the participation of dairy farmers in eight selected milk production activities, a three point modified Likert type scale was used (Quddus *et al.*, 1999). The score of 3 kinds of responses namely never, occasional and all the times was 0, 1 and 2 respectively. Frequency distribution of family members was done to reveal their participation in each of eight selected activities. For clear understanding, the selected activities were arranged in rank order by developing Participation Index (PI) as follows:

$$PI = P_{np} \times 0 + P_{op} \times 1 + P_{rp} \times 2 \quad (3)$$

Where,

- P_{np} = Percentage of participants with no participation
 P_{op} = Percentage of participants with occasional participation
 P_{rp} = Percentage of participants with regular participation

Results and Discussion

The main occupation of the farmers was agriculture while business, service and labour were the other important sources of their employment as well as income. Table 1 reveals that 43 per cent of household's main occupation was agriculture and 19 per cent was labourer. Riverside area showed higher (59 per cent) and semi-urban area showed lower (23 per cent) proportion of agricultural households. Semi-urban households had higher number of business and service compared to other locations. It appears from Table 1 that 39 per cent of the farmers were illiterate, 26 per cent of them were primary educated and remaining 35 per cent had secondary education and above. Rate of illiteracy was much higher in rural area whereas primary education was higher in riverside area. Semi-urban area possessed higher rate of upper education. About 43 per cent respondents had dairy farming experience less than 10 years, whereas 40 per cent of them had experience between 10-20 years and a small portion of them had experience above 20 years. Comparatively, highest numbers of more experienced farmers were located in rural areas.

Table 1. Percentage distribution of dairy farmers according to occupation, education level and experience

Locations	Occupation*					Education level				Experience in dairy farming (Year)			
	Agr	Lab	Bus	Ser	AO	Illit- erate	Prim- ary	Seco- ndary	Above Secon.	Ex ≤ 10	10<Ex ≤ 20	20<Ex ≤ 30	Ex>30
Rural	48	22	7	6	17	50	21	26	3	37	40	18	5
Riverside	59	11	12	2	16	28	40	28	4	49	38	9	4
Semi-urban	23	23	29	23	2	40	17	38	5	45	41	9	5
Overall	43	19	16	10	12	39	26	31	4	43	40	12	5

*Agr = Agricultural, Lab = Labour, Bus = Business, AO = Agriculture and others, Ex = Experience

The number of persons per family was 5.8 and the number of male person per family was higher than female in rural and riverside location but lower in semi-urban location. Primary educated member per family was higher in rural and riverside location but illiterate member was higher in semi-urban location and above primary educated member was very low in all the locations. Average farm size (cultivable land), defined as the amount of land owned by a farmer, was 0.28 ha, average size of homestead was 0.04 ha and pond area per household was 0.06 ha. The percentage of landless (0-0.019 ha), small (0.02-0.99 ha), medium (1.00-2.49 ha) and large farm (2.50 ha and above) were found 28.6, 62.0, 8.7 and 0.7 respectively. It appears that the per cent of small types of livestock household was found significantly higher compared to that of landless, medium and large types of farm (not shown in table).

Average per household monthly income according to sources and locations are shown in Table 2. The average total income per household was Tk.6208. This figure was the highest in rural area (Tk.11056) and lowest in riverside area (Tk.3491). Per household gross income from milk productions in different locations were more or less same and the overall value was Tk.1419. Income from poultry and fish culture was very low, specially, in semi-urban areas. Income from crop was highest for rural area and average from all locations was Tk.1642. Dairy farm households of rural area earned more money from selling their labour and business whereas, the households of semi-urban area earned more money from services. Furthermore, the proportion of income from dairying to total income was higher for large farmers because they had less use of draught power and hence it leads to high proportion of milk income. Income from milk was about 23 per cent of the total income of the households as a whole. This figure was highest for riverside area (40 per cent). Most of the rural dairy farm household was found having GI sheet and semi-pucca and pucca was observed in semi-urban area. In total, 20 per cent home was kutcha, 47 per cent was made by GI sheet and 33 per cent was semi-pucca and pucca. Sanitary system was better in semi-urban area and its type was depended on locations. All the semi-urban people enjoy electricity facilities but only 68 per cent of them watch television (not shown in table).

Table 2. Average per household income of the dairy farm households in different locations and sources

Locations	Dairy	Poultry	Fish Culture	Crop	Labour	Business	Service	Total	Ratio of dairy income to total income
Rural	1472	193	112	4631	1536	2752	360	11056	13.3
Riverside	1358	214	196	161	76	914	572	3491	38.9
Semi-urban	1427	50	1	134	222	1056	1189	4078	35.0
Overall	1419	152	103	1642	611	1574	707	6208	22.9

The average number of different species and types of animals are shown in Table 3. The proportion of farm household for keeping milk cow, dry cow, bull, ox, calf, goat/sheep or poultry or any combination of these are presented. Farmers seem to prefer keeping mixed livestock rather than a herd of one single species only. There was no dry cow, bull and ox for 76, 71 and 79 per cent respectively of the total households. There was a single milk cow for 52 per cent households, 2 cows for 38 per cent and above 2 cows for 10 per cent households. Only 13 per cent households kept goat and sheep whereas 50 per cent kept poultry. Goat/sheep and poultry were kept in riverside and rural locations. On an average, there were 1.6 units of milch cow, 0.3 unit of dry/pregnant cow, 0.1 unit of bull, 0.3 units of ox, 1.6 units of calf and 6.3 units of poultry per dairy farm. These results are fewer than results found by Alam *et al.* (1999), they found 3.99 units of milch cow, 4 units of dry/pregnant cow, 0.09 units of ox and bullock and 6.7 units of calf most probably due reduction of cattle farming

by this time and this result is based on one district only. Number of cattle per livestock household is 3.5 (Saadullah and Hossain, 2000) and that of 0.94 for all household (BBS, 2002). In the last 10 years the cattle population has increased by 0.3 per cent in contrast with 0.4 per cent of the world (Bhuiyan *et al.*, 2007). The number of crossbred cattle is increasing with the spread of artificial insemination practices throughout the country (Khan, *et al.*, 2001).

Table 3. Livestock ownership of dairy farm households in per cent and average number per household

Large ruminant						Small ruminant and poultry		
No. of animal	Milk Cow	Dry Cow	Bull	Ox	Calf	No. of animal	Goat / Sheep	Poultry
Nil	0	76	91	79	0	Nil	87	50
1	52	18	4	18	54	1-5	13	24
2	38	4	4	2	37	6-10	0	14
Above 2	10	2	1	1	9	Above 10	0	12
Av. No.	1.6	0.3	0.1	0.3	1.6	Av. No.	0.3	6.3

Housing of dairy animal is essential for control of animals and dairy production, disease control and animal comfort. Housing further assists in keeping out predators, thieves and helps in the protection of growing crops. It has been observed that various types of housing and confinement exist, which vary according to the types of farm, animal, climate, production system and socioeconomic and environmental condition. Most of this housing establishment requires a considerable cost to the farmer in investment and labour as such the landless and small farms built less expensive animal houses. Most of the cowsheds of the dairy farms were made by GI sheet (56 per cent) and puuca or semi-pucca (40 per cent) and some of the households had no cowshed (2 per cent) and they kept their cow in open yard (Table 4). These results were the improvement over the results found by Quddus (2000) who observed 72 per cent kutcha house and 18 per cent GI sheet. Cowshed size of the 55 per cent farms was below 150 square feet and 14 per cent was above 250 square feet. Comparatively, smaller cow sheds were located in semi-urban and bigger size was in riverside area due to availability of land resource. About 80.4 per cent cowsheds were in good conditioned and 19.6 per cent were in poor conditioned.

Table 4. Type, size and health conditions of the cowshed (in per cent)

		Rural	River-side	Semi-urban	Overall
Size of Cowshed					
	Below 150 sqft	53	26	85	55
	151-250 sqft	35	48	10	31
	250 & above	12	26	5	14
Type of Cowshed					
	No Cow shed	0	5	1	2
	Cutcha	3	2	0	2
	G.I.Sheet	54	63	52	56
	Pucca/semi-pucca	43	30	47	40
Health condition					
	Very Poor	4	4	2	3.3
	Poor	8	19	18	16.3
	Good	88	77	80	80.4

About three fourth of the dairy households managed animal feed by own source and remaining of them purchased the feed. About 60 per cent of the farm households depend mainly on green fodder and this percentage was the highest in the riverside. Intensive feeding was done in semi-urban and rural areas but extensive and semi-intensive feeding were done in riverside area due to having grazing facilities (Quddus and Islam, 2002).

The percentage distribution of households of local, exotic and crossbred cows and the average income per household for each type are presented in Table 5. The results reveal that 40.3 per cent households kept local cow, 44.3 per cent households kept exotic and 15.4 per cent households kept crossbred cows. Rural area exhibits highest percentage and riverside area exhibits lowest percentage of exotic cows. Riverside area also exhibits highest percentage of local cows. Exotic and crossbred cow show higher average income per household compared to local cow. Islam and Oliuzzaman (1992) reported that under village management condition of Mymensingh district the average milk production of local cow is very low. Milk production varies between 300 and 400 liters per lactation period of 180 to 240 days whereas milk yield of crossbred cows varies from 600 to 800 liters/lactation of 210 to 240 days. According to Khan *et al.* (2001) milk production of indigenous cows are significantly lower than that of crossbred cows.

Table 5. Percentage share of different types of milch cow and average dairy income per month

Breed	Percentage of households				Average income per household (Tk/month)
	Rural	Riverside	Semi-urban	All	
1. Local cow	20	75	26	40.3	1154
2. Exotic cow	65	17	51	44.3	1623
3. Crossbred	15	8	23	15.4	1546

Analysis of data suggests that average of Care Index was the highest for Sadar (25.2) which was followed by Fulbaria (22) and Trisal (19.6). The average Care Index increases as the number of milking cows increases for Fulbaria and Sadar except a dramatic decrease for 4 milking cows under Trisal (Fig. 1). However, the trend of the increase is not satisfactory except for Sadar. We can conclude that most of the livestock possessing households are not up to the expected level of businessman ship. Because, with our weight settings the Care Index varies from 0 to 48 and we expect for some of the households the Care Index will be reasonably close to 48 at least for higher number of milking cows.

Linear regression models were fitted for overall data and for Fulbaria, Trisal and Sadar separately. The results (Table 6) suggest that number of milch cows, size of cowshed and breeding of (crossbred) cows had significant positive effects on milk production for overall model and for the model for Trisal. For the models for Fulbaria and Sadar only number of milch cows was found to have significant positive impact on milk production. The coefficients for the overall model indicate that for one unit increase in number of milking cows milk production will increase by 1.336 units and one unit increase in size of the cowshed will result .011 unit increases in milk production. If the cow is crossbred instead of indigenous the milk production will increase by 1.793 units. Interpretations for other models will be similar.

Figure 1. Average Care Index by number of milch cows by region

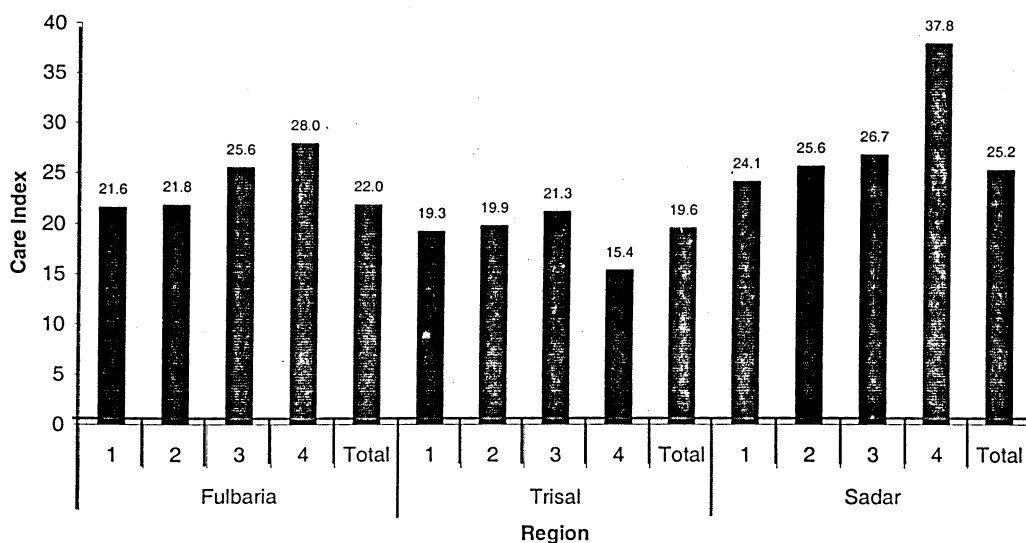


Table 6. Linear regression estimates for different independent variables on total milk production

Independent variables	Overall model		Model for Fulbaria		Model for Trisal		Model for Sadar	
	β	SE	β	SE	β	SE	β	SE
(Constant)	-.101	.588	.717	1.220	-.033	.567	-.387	1.191
No. of Milch cow	1.336***	.313	1.326	.678	1.039	.257	1.877***	.678
Size of cowshed (sqft)	.011	.006	.009	.010	.011	.005	.007	.019
Crossbred cow ^s	1.793***	.432	1.528	.991	2.590***	.393	.731	1.083

Note: SE means standard error; significance level * $p < .10$, ** $p < .05$, *** $p < .01$; § reference category is 'Indigenous'

Participation of household members in dairy enterprise is very important part of the employment potential. Keeping this in view the performance of household members with respect to livestock production in relation to specific tasks was studied. Eight major activities were studied, viz. grazing, preparing feed, feed providing, care and treatment, cleaning and bathing, crossing/breeding, milking and selling the milk. Twenty two per cent of the members in a family together contributed their time for grazing. This for feeding is 27 per cent, treatment/cleaning/care 20 per cent, breeding 6 per cent, milking 9 per cent and selling 16 per cent. Male and paid labourer spent more time in grazing, preparing feed, breeding, milking and selling milk whereas women and children spent more time in feed providing, care and cleaning.

Percentage distribution of households participated in each of the eight items of dairy production activities with participation indexes and rank order are shown in Table 7 according to various participants. The highest percentage of male, children and paid labourer fed regularly whereas the higher percentage of female cleaned animal regularly. Female participated in dairy activities for more than 50 per cent cases except grazing and breeding activities. Children participated regularly for around 40 per cent cases. Paid labourer

participated mainly for feeding (20%) and treatment purposes (16%) regularly. Participation index reveals that participation of grazing, breeding, selling milk and milking by females were comparatively less than the other activities. Children show less participation in breeding and milking activities whereas paid labour show more participation in feeding and treatment activities. Participation index reveals that highest participation was by adult males followed by adult females, then by children and then by paid labourer. The average of the participation indices for male, female, children and paid labourer were 194, 111, 90 and 19 respectively. This indicates that the rural and poor dairy farmers work themselves and they did not employ remarkable number of paid labour due to limited income from dairy production.

Table 7. Comparative participation dairy farmers in milk production activities and the participation index

Actives		Percentage of Participation			Participati on index	Rank order	Average particip. index
		Never	Occasional	Regular			
Male Participant							
	Grazing	3	2	95	192	5	
	Feed preparation	1	2	97	196	2	
	Feeding	0	2	98	198	1	
	Treatment	1	2	97	196	2	194
	Cleaning	2	2	96	194	4	
	Breeding / AI	4	2	94	190	6	
	Milking	2	2	96	194	4	
	Selling milk	2	1	97	195	3	
Female participants							
	Grassing	42	16	42	100	5	
	Feed preparation	32	14	54	122	1	
	Feeding	31	16	53	122	1	
	Treatment	36	10	54	118	2	111
	Cleaning	37	8	55	118	2	
	Breeding / AI	49	2	49	100	5	
	Milking	45	3	52	107	3	
	Selling milk	47	2	51	104	4	
Children							
	Grassing	49	11	40	91	4	
	Feed preparation	45	11	44	99	2	
	Feeding	43	11	46	103	1	
	Treatment	46	10	44	98	3	90
	Cleaning	54	6	40	86	6	
	Breeding / AI	58	5	37	79	7	
	Milking	60	2	37	77	8	
	Selling milk	54	4	42	88	5	
Paid labour							
	Grassing	92	1	7	15	3	
	Feed preparation	93	1	6	13	5	
	Feeding	80	0	20	40	1	
	Treatment	84	0	16	32	2	19
	Cleaning	92	2	6	14	4	
	Breeding / AI	92	2	6	14	4	
	Milking	94	0	6	12	6	
	Selling milk	94	0	6	12	6	

Participation indices of eight activities were not far different from each other i.e. range was 8 only for male. The indices were different from each other for the female, children and paid labourer participants. Feeding of animal was the highest index for all kinds of participants. Feed preparation and treatment were the second highest participation index. But breeding had the lowest index (190) for male and (100) for female participants and milking had the lowest index (77) for children and (12) for paid labourer. All the dairying activities exceeded participation index 100 for male and female participants that indicate that they had significant participation in dairy milk production activities. Children had significant participation only for feeding activity. Quddus *et al.* (1999) concluded that the female spent remarkable time for scientific feeding, milking and breeding. Kumari *et al.* (1988) reported that 80 per cent dairying operations in dairy milk production was performed by women. Dey (1977) pointed out that in rural setting women did most of the tasks associated with feeding and management of dairy animals.

Conclusion

Rate of illiteracy was much higher in rural dairy owners who had fewer possibilities to get service and business facilities but highest number of more experienced dairy farmers were located in that area. In addition to these dairy farm households of rural area earned more money from selling their labour. Thus, providing training to this rural people in dairy farming activities would be effective prosperous for income generating purposes. Most of the farm households kept a single milk cow and only 10 per cent farm had above two milk cows but the condition of their (82 per cent) cowshed was satisfactory. On the other hand, exotic cow show higher gross income i.e. income of 1.5 times in relation to local cow. Thus, there is an opportunity to increase the number of dairy cows, especially, exotic or crossbred cow for each of the dairy farms of the study area. To do this, dairy farmers should be motivated to increase the number of dairy cows and credit facilities may be created. More traditional management and feeding practice were used in riverside due to their less availability of monetary investment for dairying. Dairying contributed a better portion of total income of the farmers hence farmers should be motivated to invest and participate in this job. The farmers of riverside location should be trained up for intensive feeding.

Care index indicates that care provided to the milch cows was not up to the expected level and some time in proportionate to the number of milch cows. Female had significant participation in dairy milk production activities that comply with the findings of Paid labour show more participation in feeding and treatment. Thus, women and paid labours were involved and responsible for a significant portion of dairy activities and hence they need to be trained on technical know-how and skills in efficient dairy milk production activities.

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