



Characterization of buffalo milk production system in Bangladesh

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Abstract

This survey study was conducted in Tangail, Jamalpur, Bogra, Sirajganj, Pabna and Thakurgaon districts for household farming, and in Bhola, Noakhali, Lakshmipur and Patuakhali districts for *bathan* farming to undertake an assessment on the management factors in household and *bathan* farming for identifying the potentiality and constraints in milk production from buffalo. A 90 number of pre-designed questionnaire was used for data collection by direct interviewing of buffalo farmers. From this study, it was revealed that 82% of the farmers have 1 to 3 buffalo per household and 73% of the farmers have 51 to 200 buffalo per *bathan*. Buffaloes were raised in homestead and approximately 5-7 hours were grazes per day in household farming. Small quantity of concentrate feeds were offered to buffalo by the rich farmers during dry season. On the other hand, in *bathan*, farmers were fully depended to feed the buffalo on grazing at public land. In household, the average daily milk production was 3 to 8 liters and total milk yield was 799 liters in a lactation length of 270 days. In *bathan*, the average daily milk production was 1 to 2 liters and total milk yield was 435 liters in a lactation length of 215 days. The average age of first calving, service per conception, gestation period and calving interval were 39 months, 1.9 numbers, 310 days and 490 days, respectively in household farming. The average age of first calving, service per conception, gestation period and calving interval were 40 months, 2.1 numbers, 315 days and 530 days, respectively in *bathan* farming; however, further study is required on the buffalo nutrition in the *bathan* farming.

Key words: Buffalo farming system, buffalo management system, buffalo milk, Bangladesh

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Introduction

Rapid economic growth, technological innovation, management technique, improvement in feed supplies, rise in income, urbanization, climate change, effect of environment, pattern of cultivation and pattern of food habits etc. brought about a lot of changes in Asia in the livestock sector (FAO 2009). These changes have implications for the ability of the livestock sector to expand the production sustainably in ways that promote food security, poverty reduction and public health. In Bangladesh, recent studies and reports also reveal the rapid growth of human population (approximately 1.6% per annum) with urbanization (10%, 1990-2010) (PPRC, 2011). Simultaneously growing population, poverty reduction, increase in middle class, and their increased income have changed their food preferences. These recent developments have major impacts on demand for animal derived

products such as milk, meat, butter, cheese, ice-cream, baby foods, locally made sweets which are heavily dependent on the availability of milk. While the consumption per capita of livestock products is much higher in developed countries, substantial growth has also occurred in developing countries of Asia except Bangladesh (FAO, 2009).

In Bangladesh about 20 % of the people fully and 75% of the rural people in Bangladesh rely on livestock to some extent of their livelihood (BBS, 2008). In Bangladesh, the total number of buffalo is estimated at 1.26 million (5.21% of Bovine animal) out of which 78% is adult and 22% is young stock (BBS, 2008 and Huque *et al.*, 2010). Within the adult buffalo, adult male and female were 58% and 33%, respectively, and, within the female, milking and dry buffalo were 27% and 37%, respectively (BBS, 2008). Domestic water buffaloes play an important role in providing milk, meat and draught power (Ghaffar *et al.*, 1991).

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Buffalo milk production in Bangladesh

Unfortunately, there is no organized buffalo improvement program until now in the country. There is no specific high yielding variety of buffalo but three distinct types, i.e., reverine, swamp and their crossbreds are found.

Traditionally, Bangladeshi people are used to depend mostly on cow milk which is highly insufficient (about 20% of demand is met with current production and rest 80% fed by imported milk at a high cost). Whereas, demand for milk is rising fast with buying capacity of the consumers and commercial users making sweets and confectionary items, the demand supply gap is also growing in an alarming rate. To minimize this gap, there is phenomenal potential opportunity to promote milk production through intensive buffalo production both in intensive household (stall feeding system) and commercial farming in the coastal area.

The average global growth of protein consumption is 0.8%, in developed countries 0.2%, in developing countries 1.5%, and in Bangladesh -0.4% of livestock products (SAARC, 2009). The total volume of World's buffalo milk was recorded 89.2 million tons in 2008 whereas Asian buffalo milk production represents 96.78% of total buffalo milk production (FAO, 2010). Buffaloes are significant sources of milk in this sub-region contributing as high as 68.35% of the total milk yield in Pakistan, and 56.85% in total milk production in India. Whereas in Bangladesh buffalo milk contributes less than 3.0% of total milk production (Estimated). In Bangladesh, daily average milk consumption is 40 ml/head against required daily allowance of FAO recommendation 250 ml/head with a deficiency of 210 ml/head as compared to India where consumption per capita is 245 gm against required allowance 250 ml (Kumar & Singh, 2010). The huge gaps are found in demand and supply of milk in Bangladesh. The objective of this study is to assess the management factors in household and *bathan* farming for identifying the potentiality and constraints in milk production from buffalo.

Materials and methods

The survey was conducted from two classes of buffalo farmers based on farming system namely (a) household farmers in non-saline zone and, (b)

bathan farmers in coastal saline zone. A total of 90 farmers from two different classes of which 54 farmers of household farming in non-saline zone from six selected districts (Tangail, Jamalpur, Bogra, Sirajganj, Pabna and Thakurgaon) and 36 farmers of *bathan* farming in coastal saline zone from four districts (Bhola, Noakhali, Lakshmipur and Patuakhali) of Bangladesh were selected. From the listed farm recorded at each District Livestock Officer (DLO) office, farmers were randomly selected based on the number of buffaloes per farm and on the experience of buffalo farming for face to face interview using prescribed questionnaire.

Data were collected directly from household and *bathan* visited by the qualified enumerators through face to face interviews. In some cases, a discussion was also conducted with the animal workers (hired labours) which were relevant to the animal workers, to confirm and recheck the information that collected from the farmers.

Data Analysis

All data were computed by Microsoft (MS) Excel program and analyzed in two factorial designs by using MS Excel STAT program.

Results

Characteristics of the farmers

The characteristics of the farmers belonging to the household and *bathan* farming were presented in Table 1. There was a broad age range between two classes of farmers. In the household farming, about one-third of the total farmers were above 55 years old while there was no managed above 55 years old involved in *bathan* farming. The farmers aged between 35 to 54 years were in higher concentration (79%) in *bathan* farming. Considering the sex, the vast majority of the farmers were male in both household and *bathan* farming (90 and 99%, respectively).

However, in household farming, 65% farmers' family size was more than five, 63% farmers was educated at least primary level and 75% farmers' occupation was only agriculture while in case of *bathan* farming, 65% farmers' family size was less than five, 79% farmers was educated at least primary level and 63% farmers' were also

involved in service and business as well along with agriculture (Table 1).

Table 1. Characteristics of the farmers

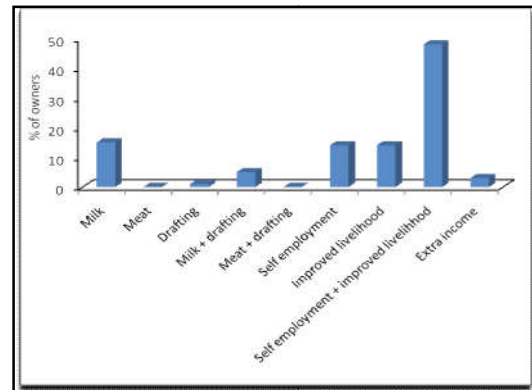
Parameters	Percent of respondents	
	Household	Bathan
Age (Years)		
<24	4	0
25-34	17	21
35-44	25	42
45-54	25	37
55+	29	0
Sex		
Male	90	100
Female	10	0
Family size (number)		
1-5	35	No data
5 +	65	No data
Educational level		
Non formal	38	21
Up to High School	50	58
Above High School	12	21
Occupation	75	37
Agriculture	4	16
Service man	8	37
Business	13	11
Fulltime farmers		
Land area		
Own	5	5
Leased land	5	15
Public land	90	80

Purposes of buffalo farming

It was found that 50% of the household farmers were maintained buffalo farms for both self-employment and improved livelihood, 20% for solely milk production, 20% for solely self-employment, 18% for improved livelihood and 5% for an additional income by producing milk and meat. However, only less than 5% farmers used their buffaloes for draft purposes mainly to carry the homestead goods along with milk production (Figure 1). Besides, in *bathan*

farming, buffaloes were raised for mostly meat production in which, milk yield was considered as an extra income.

Figure 1. Purposes of rearing of buffalo in household farming



Herd size and type of animal

The distribution of buffaloes between household and *bathan* farming systems were presented in Table 2. In the household farming, the average herd size was less than three and it was about 82% of total respondents. Consequently, 62% of the total respondents had 51 to 200 animals in *bathan* farming. In household farming, farmers mainly reared female animals and only 1% buffalo bull. On the other hand, in *bathan* farming, 70% buffaloes were female and the remaining 30% was male dominantly growing bull and bullock. Among the total female animals, the ratios between milch and dry buffalo were about 2:1 and heifer and adult cow 1:1 in both household and *bathan* farming. However, the number of breeding bull in the herd was a very few in number (about 1%) both in household and *bathan* farming.

Housing

In both household and *bathan* farming, animals were kept normally in open air place throughout the year. In the household system, dairy buffaloes were kept under semi-intensive system in the wet season and kept their animals outside their home only for night. Only 15% farmers provided shed having only roof but no concrete floor. In *bathan* farming, buffaloes were raised under extensive management system in the open

Buffalo milk production in Bangladesh

areas and provided no housing facilities (data not shown due to unavailable to the farmers).

Table 2. Herd size and type of buffalo

Parameters	Percent of respondents
Herd size (number)	
a) Household system	
1-3	82
4-7	15
8-10	3
b) <i>Bathan</i>	
<50	11
51-100	37
101-200	25
201-500	11
>500	16
Distribution of animal	
a) Household	
Adult	
Male (Bull)	
Female	1
Growing Calf	99
Male	
Female	3
b) <i>Bathan</i>	
Adult	
Male (Bull)	
Female	30
Growing Calf	70
Male	
Female	
	0
	100

Feeds and Feeding

Feeds and feeding of buffaloes in both farming systems were presented in Table 3. Farmers practiced in both, household (87%) and *bathan* (90%) farming depend on feeding animals at public land. Only few farmers have their own or leased land to feed their animals (Table 3). In the household farming, after morning milking, buffaloes were allowed to graze in fallow or road side land up to evening that covers approximately 8-9 hours per day. From the evening to next morning, animals were tied up in homestead and

they were offered mainly rice straw with little concentrate mixtures (wheat bran, rice bran, rice polish etc.). However, in *bathan* farming, buffaloes were raised in the open grazing area throughout the year. Except calves, all buffaloes (adult and growing heifers) were allowed to graze freely in the public *bathan* land. In the evening, calves were enclaved in an area locally called "kella" to protect from wild animals. In the *bathan*, different local grasses are available for animal grazing. During the scarcity of feed in *bathan* areas, some farmers transferred their buffaloes from *bathan* to their homestead area and grazed their animals in fallow land this period (January to March/April mainly the dry season). Any extra feed was not provided to buffalo in the *bathan* farming. Buffaloes were allowed to wallow in the river, canal and big pond excavated by 4-5 farmers jointly. In both of the farming scenarios (household and *bathan*), buffaloes were managed by the farmers himself or his family members or hired labour (3%) but animals were never given balanced ration during the year.

Table 3. Feeds and feeding of buffalo

Parameters	Percent of respondents	
	Household	Bathan
Sources of feed		
Own land	8	5
Public land	87	90
Leased land	5	5
Improved feed		
Mixed feed	No data	No data
Feed store	No data	No data
Feeding system		
Grazing in public land	12	100
Grazing in public land and cereal grain	88	0
Grazing in public land and rice gruel	0	0

Reproductive characteristics

The reproductive characteristics of buffaloes were presented in Table 4. Most of the respondents

reported that the average age at first heat was between 39 and 40 months in both household and *bathan* farming. However, it was also observed that the average service per conception, gestation length, calving interval, and post partum heat period in both household and *bathan* farming were found 1.9 and 2.1, 310 and 315 days 390 and 420 days and 125 and 130 days, respectively. The natural mating system was practiced in both the system of farming. Artificial Insemination (AI) was not yet practiced commercially in Bangladesh but sometimes Government and some private enterprise like Lal Teer Livestock Limited were tried to apply AI techniques through different projects.

However, it was observed that bull and cow ratio were very low in both the systems which reflects lower pregnancy rate in reproductive characteristics of buffalo farming which might be one of the reason not to rear buffalo. This is might be due to unavailability of technical knowledge on buffalo reproduction.

Table 4. Reproductive characteristics of buffalo

Parameters	Percent of respondents	
	House hold	Bathan
Age at first heat months)	37	38
Service per conception (no)		
Gestation length (days)	1.9	2.1
Calving interval (days)		
Post partum heat period (days)	310	315
Total lactation length (days)	390	420
Total milk yield/animal (liters)	125	130
Mating of buffalo		
Natural mating	95	99
Artificial insemination	5	No data

Milk production and milk marketing

The milk production characteristics and it sale status were presented in Table 5. The average total milk yield and lactation length was found 799 and 435 liters in 270 and 215 days in household and *bathan* farming, respectively

which showed that total milk yield in buffalo was very low. About 67% of the farmers milked their animal twice a day (morning and evening) and 33% of farmers milked their animals once (morning) in the household farming system. In the *bathan* farming milking was not done until the calves become strong enough which took sometimes up to two months. In contrast, about 87% of farmers milked their animals once (morning) and only 13% of farmers milked their animals twice in *bathan* farming.

Table 5. Milk production and marketing characteristics of buffalo

Parameters	Percent of respondents	
	House hold	Bathan
Milk production		
Milking once in a day	33	87
Milking twice in a day	67	13
Milk yield/animal/day (Litre)		
One to up to two	20	74
Two to up to five	38	26
Five and above	42	0
Milk marketing channel		
Through middle men	17	58
Farmer to milk processor	17	37
Farmer sale at local market	13	5
Family consumption and sale at local market	53	No data

The average daily milk yield was 3 liters in household farming (80%) whereas it was 1-2 liters in *bathan* farming (74%). There was no record keeping system about milk yield for individual animal in *bathan*. However, total daily milk yield of all buffaloes in a *bathan* of coastal area was measured by a local measuring system on a bamboo pot to calculate total monthly milk yield for selling to the local agents. In the household farming, it was found that farmers sold their milk in different ways. Seventeen percent farmers sold their milk through middlemen (goala), 17% of sold directly to milk processors,

Buffalo milk production in Bangladesh

13% of farmers sold directly at local market and the majority (50%) of farmers used the milk for family consumption and a very little amount sold at local market. Whereas in the *bathan* farming, 58%, 37% and 5% of farmers sold their milk through middleman (goala), directly to processor and directly at local market, respectively.

Discussion

Characteristics of the farmers

Ali *et al.* (2000) found that the highest percentage (40%) of farmers had agriculture as principal occupation. Whereas Rahman (1996) told that only 19% farmers had taken dairying as main business and 81% as side business.

Purposes of buffalo farming

In the present study, it was found that the farmers raised buffalo for milk production to improve the family livelihood and self-employment in the household farming. In this survey study, it was found that most of the buffalo farmers were poor and they have no capital to invest more money to either in buffalo or cattle farming at a commercial level. Furthermore, they are smallholders and do not own enough land for involvement in agricultural activities to improve their livelihood. But a specific report in household system was not available. On the other hand, it was found that in *bathan* farming, the purposes of buffalo raising were for meat production, and milk was the secondary purpose. Though the quality of buffalo meat was not considered by the Bangladeshi consumers as most of the buffalo is slaughtered at an old age when these animals are neither good for draft power or milk production and thus meat quality is very bad and some times, buffalo meat is found little salty taste. It is because the animals are slaughtered just bringing from saline zone. However, the specific reason for buffalo rearing for meat purpose in *bathan* zone is due to very low milk production of buffalo raised in

bathan, compare to household farming. It was also found that the livelihood improvement and self-employment, income generation and food security was the main purpose of *bathan* farming.

Herd size and type of animal

It was observed from the data that there is a variation between two systems i.e. household, non-saline zone system and *Bathan*, saline zone system in the buffalo number per holding of the country. In the household farming (non-saline zone), number of buffalo per household was 1-3 and in *bathan* farming (saline zone) the number of buffalo per household was 51-500. In this study, number of buffalo per household was higher than the census report and similar to that of Faruque and Amin (1994). The variability in the buffalo number per household may be fact that the utility of buffalo i.e. dairy, meat and draft purposes. The farmers raised dairy buffaloes had calves and heifers in addition to milch buffaloes whereas farmers kept buffaloes for draft purpose had a pair of buffalo of either male or female. From this study, it reveals that there is an acute shortage of male buffalo in the *bathan* farming which causes lower pregnancy rate and reduce benefit from buffalo rearing. The reason is not clear but may be unavailability of good quality bulls like Murrah, other Mediterranean improved breeds and etc or the absence of breed development program in Bangladesh or less interest to rear of male buffalo due to higher market price of live animal or absence of better feeding and management problems in both household and *bathan* farming.

Buffalo was not considered as potential milk animals in Bangladesh and especially dairy buffalo information was not available. This might be due to lower milk production of indigenous buffalo of Bangladesh and also may be the unconsciousness of the farmers and not understanding on milk production as a

commercial level. The Government did not take any initiatives to improve buffalo and no political and financial support provided like cattle. However, some reports published about the management and production system of dairy buffalo of other countries. Mudgal (1989) reported the semi-intensive management system of dairy buffaloes in the densely populated human settlement in India and Pakistan. Ranawana (1989) reported the intensive management system of dairy buffaloes in the coastal area of Sri-Lanka.

Feeds and feeding

It is known that the main cost in livestock production is in feeds and it accounts more than 70% of total production cost. It was found in the survey study that most of the farmers in both of household and *bathan* farming depend to feed their animals on public land (87 and 90%, respectively). In *bathan* (saline zone) farming, only few farmers, who have small herd (below 50) used their own land having natural grass for feeding their animals (5-10% only) during dry season (February to April) by moving their animals from *bathan* to own land. It was also observed that in household farming, rice field (after paddy harvest) used as grazing land of buffaloes for 3 to 4 months during the dry seasons (February to April) and rattan (after harvesting paddy) is the main feed sources for the buffaloes and thus animals were suffered seriously for feed shortage.

In both of the farming (household and *bathan*) farmers are not aware about nutrition requirement of buffaloes and they do not provide any concentrate or mixed feed which causes nutrient deficiency. Feeding of balanced diet of buffalo was not studied in Bangladesh. However, a few researches was conducted on buffalo feeding with urea-molasses straw and concentrate mixture in the semi-extensive

farming system and there was no significant effect on the milk yield for buffaloes producing 10 liters or less milk per day (Rai and Agarwala, 1991 and Chauhan *et al.*, 1995).

Reproductive characteristics

It was found that the age of first heat observed at 39 and 40 months in household and *bathan* farming, respectively. Nahar *et al.*, (2012) reported the similar results of age of first heat in Mymensingh and Laximpur district. It was reported (Mudgal, 1999) that the age at first calving for Nili-Ravi buffaloes ranges from 30-54 months and for Khundi buffaloes ranges from 48-57 months.

Milk production and milk marketing characteristics

The total milk yield per lactation and lactation period varied between the two systems due to management systems and genotypes of buffaloes. The buffalo raised under household (semi-intensive system) produced higher milk than those raised under *bathan* (extensive system) which results household farming is more attractive as it gives milk and meat both. The lactation yield in the household farming and *bathan* farming were 799 and 435 liters, respectively which are much lower than the Nili-Ravi buffaloes reported by Mudgal (1989), Khan (1995), and ICAR (2000). This result of this study coincide with the result of Faruque *et al.*, (1990), who also reported that the lactation yield was 712 kg for buffaloes of Mymensingh district. Faruque and Amin (1995) reported that the lactation yield of 280 liters for indigenous buffalo in Khulna region and Hussen (1990) found a lactation yield of 830 liters for buffaloes in Tangail district. It could be concluded from the discussion that the possible important factors is quality of breed/genotype for lower milk production along with other factors.

Buffalo milk production in Bangladesh

In household farming, most (approximately 50%) of farmers used buffalo milk for family consumption and partially sold at local market. About 34% of farmers sold milk through middlemen and milk processor companies. It could be demonstrated from this study that farmers raised buffalo for drinking milk for family members although about half of the farmers sold milk to maintain their family expenditure.

In *bathan* farming, farmers sold their whole milk at their *bathan* area through middlemen where fat content of milk is not considered as a factor and sometimes farmers could not sale their milk at proper price due to the lack of proper transport infrastructure and thus sold at localized processors for making yogurt and local sweets which patch less price than actual price. Family consumption of milk was not reported in *bathan* farming as in household farming. This could be due to long distance of *bathan* areas from their homestead and transporting milk from *bathan* to home was not possible.

Conclusion

1. Dairy buffaloes belong to the small-holder farmers tending 1 to 3 head of buffaloes per household.
2. Buffaloes are raised under semi-intensive or extensive management system depending upon the region and these buffalo rearing knowledge have acquired from their ancestors from long age practiced. No attempts were made to improve the buffalo breeds, production technology and management technique.
3. The milk production of Bangladeshi indigenous river type buffalo is much lower as compared to crossbred or improved breeds of buffalo due to absence of quality genotype and other relevant management.
4. The feeding system is still in backyard and buffaloes are suffering from lack of balanced ration or feed as they required. In many cases they were treated almost like semi-wild animal.

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