



Livelihood improvement of farmers through buffalo farming at Madarganj upazila of Bangladesh

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ABSTRACT

The study was conducted to investigate the socio-economic profile of the buffalo farmers and livelihood improvement at three unions namely Balijuri, Jorekhali, and Karaichura of Madarganj upazila of Jamalpur district. Three villages were selected from each union with 90 farmers in Jamalpur district. Data was collection from October to December, 2018 through personal interviewing with pre-tested questionnaire. The investigation revealed that buffalo rearing was practiced by middle (30-45 years) and old (>45 years) aged farmers. 22.22 % of buffalo farmers were illiterate, 44.44 % primary education and <SSC 33.33 %. The major occupation of selected farmers were buffalo (55.55 %) followed by beef (16.67%), sheep/goat (16.67 %) and crop farming (11.11%). The buffalo farmers had training skills (61.11%) and maximum farmers (72.22 %) used ASA/SDF loan where 27.78 % used own capital for buffalo's production. The buffalo farmers purchased usually one pair of buffalo (50.00%) and reared at least for 2 years. The farmers fed their buffaloes with locally available road side and river side grasses and some practiced concentrate feeding. Semi-intensive feeding system was practiced (66.67 %) for rearing of buffaloes followed by extensive feeding system (33.33 %). Most of farmers allowed wallowing buffaloes once or twice per day. Main diseases were found Foot and Mouth disease (38.89 %) followed by diarrhoea (33.33 %), black quarter (16.67 %) and hemorrhagic septicemia (11.11 %). Most of the farmers practiced vaccination and de-worming regularly. The highest portion of the farmers used average cost of one buffalo at 103,667.00 BDT. The annual total cost of production was BDT 114,167.00, and return was 52,883.00 BDT per buffalo. The annual food and cloth purchasing capacity of buffalo farmers were found to be increased to 33.36 and 30.46 %, respectively and all other impact parameters were also increased through buffalo rearing. Considering all parameters, ameliorating livelihood would easily improved by buffalo farming of farmers in studied areas.

INTRODUCTION

Buffalo is a large bovine domestic animal, frequently used as livestock in southern Asia and also widely in South America, Southern Europe, Northern Africa, some of the part in Bangladesh and elsewhere. These ruminant mammals are, in fact, inhabitants of the Northern Hemisphere and bear some similarity in appearance to cattle. The water buffalo or Indian buffalo, *Bubalus bubalis* is found in Southeast Asia, where it was domesticated at a very early period. As a truly wild animal, it is found in Nepal, Assam, the old

Central Provinces and perhaps-other parts of India, Myanmar and Borneo. Buffalo is also found in several other countries including Sri Lanka, Indonesia and Malaya. Buffalo is a long-headed, large ox-like animal. It is massive and rather clumsy built. The large horns are triangular in cross section, spread outward and upward and approach each other towards the tip. Buffalo and cattle are considered as major breed for production. The domestic buffalo is an important animal in the agricultural economy of many tropical and subtropical countries (Suhail et al., 2009). Buffalo is also known as "Asian Animal"

plays very vital role in agricultural economy as integral part of farming system. Buffaloes are raised in a mixed crop livestock system. It plays a very important role in Bangladesh, for the lives of millions of people by ensuring work, power and food at the end of their career as work animals. Ninety six percent (96%) of the world buffalo population is found in Asia (FAO, 2009), where only 0.6 per cent buffaloes are found in the particular agro-ecological zones in Bangladesh (Faruque et al., 1990). The economy of Bangladesh is primarily depending on production of crop, livestock and fisheries. The livestock sub-sector contributes 1.78% to the GDP, contributes 16.71% to the agricultural GDP, generates 20% of country's employment directly and 40% indirectly, contributes 4.31% to country's total export earning, provides 25% of households energy supply, produces 125 MMT of organic manure utilized for crop production. In financial year 2014-15, the livestock population is 539.72 lakh (ruminant) whereas the buffalo is 14.64 lakh BER, (2018) (Bangladesh Economic Review), Ministry of Planning, Government of the People's Republic of Bangladesh. Buffaloes hold strategic place in overall livestock economy of Bangladesh and serve three important purposes such as milk, meat and draught power supply (Kumar et al., 2017). It provides high quality milk and meat, dung used as fuel and organic fertilizer; mechanical or draft power and hides and skins as raw material for industry (Das and Khan 2010 and De-La-Cruz-Cruz, 2014). Buffalo have significant contribution to GDP through production of meat, milk and skin representing about 27.0, 23.0 and 28.0%, respectively to the total production from livestock sector in Bangladesh (FAO, 2008). It is widely used to plough, level land, plant crops, puddle rice fields, cultivate field crops, and pump water, carts, sleds and shallow-draft boats. It is also used to carry people, thresh grain, press sugar cane, haul logs, and more. Buffalo have an advantage over other draught animals in wet or muddy areas, with their large hooves. Their legs can withstand wet conditions better than cattle. Therefore, the additional income every year through the sale of surplus milk is vital to their well-being and economic security. The most important and desirable quality of the water buffalo is its extraordinary capacity of utilization less digestible feeds (straw, sugar cane wastes etc.) than cattle. So

it requires less concentrate feeds than cattle. This mean that it can produce excellent quality meat and milk using only crop residues, pasture, minerals, and salts, without the addition of supplement concentrates. Buffalo is highly adaptable and healthy animal that can resist infectious and contagious diseases. However, they must receive same vaccines, hygienic care and dedicated attention as to cattle. The females, because they produce nutritive milk, transfer their calves more resistance to dangerous diseases. Buffalo enriched soil structure and fertility while tracking paddy field. Each year, an adult buffalo produce 4-6 tons of wet manure plus additional urine as bio-fertilizer (Hamid et al., 2016). This reduces the requirement of chemical fertilizers as well as provides soil humus that chemicals cannot provide. Buffalo can survive against tidal wave better than any other livestock species. This is evidence from the cycles that occurs frequently in the coastal area of Bangladesh. Buffalo does not require expensive house like cattle. It can live in open air throughout the year. This is true in many parts of world. But commercial production of buffalo, feeding and housing play a pivotal role in exploiting the genetic potential of animal. Feeding alone contributes about 60-70 % of total cost of milk production and offers the greatest scope to bring the input-output relationship to an economical level. Besides, providing proper housing to dairy animal is also equally important in order to achieve maximum return from the animals. Better housing arrangements not only provide shelter but also keep the animals in comfortable zone especially during severe environmental conditions i.e. either extreme cold or hot when animals are most vulnerable to get afflicted with stress conditions (Kumar et al., 2017). Inherent qualities as meat producer buffaloes have a unique ability to utilize coarse feeds, straws and crop residues converting them into protein rich lean meat. Hence, buffaloes survive well in poor countries having poor feed resources. Buffalo properly managed and fed as a meat producing animal and slaughtered at 16 to 20 months of age yields a highly satisfactory top quality meat at a much lower cost than the cattle (Karim et al., 2013). Since buffaloes have been used as draught animals for centuries, they have evolved with exceptional muscular development. Buffaloes are lean animals. The sub-cutaneous fat

layer of the carcass is usually thinner than that on comparably fed cattle. Fat is low even under feed lot conditions. More lean and less fat compared to cattle, has created a demand for it among health conscious consumers (Viswkarma et al., 2018). Reasons for the selection of these areas are based on abundant natural green grasses in the river bank of old Brahammaputra and Jumuna River, suitable temperature, ecology and good transport facilities. However, the production potential of livestock depends mostly on the management practices under which they were reared and these practices vary significantly across various agro-ecological regions due to many factors. Understanding of livestock management practices followed by farmers in a region is necessary to identify the strengths and weaknesses of the rearing systems and to formulate suitable intervention policies (Gupta et al., 2010). Buffalo is our wealth in Bangladesh. Besides solving economical problem, in future we can earn more foreign money from buffalo. Buffalo rearing increases livelihood status of the farmers especially for the farm women and development of this sector is the potential way to rural prosperity (Kumar et al., 2017). Very little work has been done so far on the socio-economic status as well as livelihood improvement of the buffalo farmers and the management practices of buffalos in Bangladesh. Per capita fresh milk and milk products consumption is one of the most important index to measure the living standard of a nation. The more the people enjoy living standard in the world, the more they consume healthy milk and milk products (Aneja, 1990). Buffaloes hold strategic place in overall livestock economy of Bangladesh and serve three important purposes such as milk, meat and drought power supply (Ghaffar et al., 1991).

Wallowing behavior was a learnt behavior. An animal that had not wallowed from birth with other animals would not do so on its own teaching such an animal was wallowed almost impossible for humans. The buffalo had to learn it from other buffaloes; even so, the adult buffalo would be very suspicious and might not be wallowed by its own choice. If any water or mud hole was available, the buffaloes behave would more like cattle. They will seek shade and graze more during the cool hours and less during the hot hours. Under these circumstances, they spent less time grazing than

animal able to wallow (Tulloch, 1974). As a means of thermal regulation, shade and wallows were found to have similar effects in terms of rectal temperature changes. However, there appeared to have been no measurements of differences in productivity between grazing swamp buffaloes provided with shade only and those given wallows (Tulloch and Litchfield, 1981). Swim baths or deep dips are inappropriate for parasite control since buffaloes regard them as wallows. Also, they become fouled due to defecation or urination by the animals (Cockrill, 1974). Buffaloes are raised under an extensive system in costal and hilly areas where large scale pasture land and enough green forage are available. Buffaloes are raised under a semi-intensive system on plain and marshy land areas where there is limited pasture land. In Jamalpur district large numbers of buffaloes were found in most of the upazilas. Most of the land of this district is inundated areas. Most of the buffaloes were reared by the traditional methods. The information related to buffalo production by farmers in Bangladesh is very limited. Detailed study is needed in different district of Bangladesh to know the present status and recommended buffalo production program as a means of livelihood improvement of the farmers for their best option of income generating activities (IGAs).

There is a great potentiality of buffalo production in Bangladesh both for satisfying animal protein requirements and production of quality meat and milk as well as properly utilized of rural draft power. For this, it is a prime importance to find out present status of buffalo production in Bangladesh. So, the present study was undertaken to investigate the present status of buffalo production, to explore the potentialities of buffaloes as well as ameliorating livelihood of farmers.

MATERIALS AND METHODS

Selection of study area

The study was conducted at Madarganj Upazilla of Jamalpur District in the Division of Mymensingh of Bangladesh. Madarganj is located at 24.8917°N 89.7500°E. It has 41,058 household units and a total area 225.38 km². There are seven unions and

three unions namely Balijuri, Jorekhali, Karaichura and thirty farmers were selected from each union due to abundant natural green grasses in the river bank of old Brahammaputra and Jamuna, suitable temperature, ecology, good transport facilities and flood plain area. There are also char areas where a lot of grazing land for buffaloes. Therefore, this area is suitable for

buffalo rearing and side by side to improve livelihoods of poor farmers. Madarganj upazila is a vulnerable area for ever companion of river erosion, over flooded, draught and changing of livelihood option of local dwellers. Buffalo is only their suitable option of income generating activities (IGAs) in the studied areas.

Table 1: District, upazila, union, village and respondents' number in study areas

District	Upazila	Union	Village	No. of farmers
Jamalpur	Madarganj	Balijuri	Ghoshpara	30
		Jorekhali	Barabataga	30
		Koraichura	Mohishbathan	30

Preparation of interview schedule

The interview schedule was carefully prepared based on objectives of the study. A draft schedule was developed before preparing the final schedule. The draft schedule was then pre-tested with selected farmers' areas and then it was rearranged and modified as required of study. The schedule was developed so simple manner to avoid misunderstanding and to get accurate information from respondents of research areas. Then it was finalized according to the experience gathered in primarily field level survey.

Data collection

The researchers collected all information through personal interview from individual respondent in their own house. An introductory visit was made to study area when the aims and objects of the study were explained to the most of the respondents. This helped to create a friendly atmosphere of respondents. Brief information regarding the nature and purpose of study was made to the respondents before actual interview. The researchers also established desired rapport building systematically and explained whenever it was felt necessary. The information supplied by respondents was recorded directly on the interview schedule. The information was cross checked carefully before leaving study area to avoid errors. Data was collected in local unit. These were subsequently converted into desirable standard unit. The respondents were interviewed at their house so they could give proper information

without any hesitation. Excellent cooperation was received from all respondents during data collection period. Data were collected during October to December, 2018. The selected variables in this study were educational status, occupational status, socio-economic status, livestock status, feeding, housing condition, disease and health care, routine activities of farmers for buffalo rearing, annual cost of production, income, and impact of income for livelihood improvement of poor farmers in the studied areas.

Daily routine works of farmers for beef fattening

Buffaloes were kept inside the house at night and 6-7 hours were in field for grazing green grass. The house was cleaned every morning. Buffaloes were supplied with pure drinking water. All tube wells were done arsenic test by the technician of the Department of Public Health and Engineering (DPHE). Some supplements were fed in the morning and rest in the afternoon. Animals were bathed daily with fresh water using body brush. Regular combing was done twice daily. As a result external parasites and dust would be removed from their body. Animal practiced wallowing at nearby pond of the farmer's house in the studied areas. Green grass, fodders, rice straw, protein concentrates were fed to buffaloes routinely.

Wallowing of buffaloes

Wallowing has two purposes; the most obvious was that of cooling, the other was protection from insects. Wallowing during daytime was done during the hottest hours. Wallowing during night time was instead a way for the animal to protect itself from insects. The buffalo had few sweat glands and a dark skin which makes it difficult for them to maintain their body temperature in hot and humid environments. Wallowing is a very important way for the buffaloes to maintain their body temperature. When buffaloes enter into water, they defecate and/or urinate. This was seemed to be a way to mark their wallowing.

Roughage and concentrate feed ratio

The ratio of supplied ration in the studied area was 30:70 in which roadside green grass, river side green grass, cultivated fodder and forage, tree leaves etc. were mainly treated as roughage and concentrate mainly dominated by sesame oilcake and soyabean meal.

Chemical analysis of feeds and fodder

Proximate composition of locally available feeds and fodder were done to investigate crude protein (CP), Crude fiber (CF), ether extracts (EE), and nitrogen free extracts (NFE) and ash. The analysis was done in Animal Science Laboratory of BAU according to the method of AOAC (2004).

Loan taken and repayment of installment

All respondents were received loan from Association of Social advancement (ASA)/ Social Development Foundation (SDF) Office. Interest percentage was 12%. The repayment installment was 45-50 per year with principal amount and interest. All respondent paid their installment weekly basis. Farmers paid their savings money to ASA/ SDF office weekly basis at the amount of BDT 50-100 for their future family protection.

Data analysis

After completion of field survey all interview schedules were set for its data tabulation for coding and reduction. All individual variables of

interview schedules were transferred to master sheet to facilitate tabulation. Data were analyzed by descriptive statistics such as number, tabular, mean, percentage, standard deviation etc. The data was analyzed with the help of SPSS-v-16 computer package program.

RESULTS AND DISCUSSION

Socio- economic condition of buffalo farmers

The socio-economic of buffalo farmers at Madarganj upazila, including age, educational status, occupation, training skill, source of capital, purchasing capacity of farmers, repayment rate of loan.

Status of buffalo farmers

The age, education and occupational status of buffalo farmers are presented in Table 2. The buffalo rearing was practiced by the middle (72%) and old aged (28%) farmers. More than 44% buffalo rearing farmers had primary level education, only 33% was under SSC but 22% were illiterate. Islam et al. (2012) reported that 46, 10.7 and 5% had primary, SSC and HSC level of education, respectively. In study areas, 55.55% of selected farmers were engaged with dairy buffalo rearing followed by sheep/goat, beef fattening, crop farming.

Training skill and source of capital of buffalo farmers

Training skill and source of capital of buffalo farmers are presented in Table 2. Most of the farmers received training from SDF and ASA offices in collaboration with Upazila Livestock Office (ULO). They had practiced buffalo rearing as their family profession. All the farmers received loan from ASA/SDF office to purchase buffalo.

Purchasing capacity of buffalo farmers

The purchasing capacity of buffalo and the duration of rearing buffalo are presented in Table 2. Most of farmers purchased one buffalo in studied area and duration of buffalo rearing was 12 months of second cycle production stage. Loan

recovery rate was 96-98%. The recovery rate of Grameen Bank was 97.2 to 97.53% from 2010-2014 financial year and schedule bank 78.97-98.06 in the same range of financial year (Mamun et al., 2019). The present study is in accordance with the results of Hossain et al. (2018).

Availability of feeds and fodders in the selected locations

Availability of feeds and fodders and their usage are presented in Table 3. Various types of feed ingredients were used in study areas for buffalo. The common ingredients were roadside green grass wheat bran, rice bran and tree leaves. All farmers used sesame oil cake as protein source for buffalo. The farmers were mainly depended on green grasses and tree leaves because of their availability. More than 90% farmers used fodders

and tree leaves and 100% farmers reported that feeds are available in selected areas.

Feeding system

The feeding system of buffalo in studied areas is presented in Table 3. The farmers were practiced semi intensive (67%) and extensive (33%) system in studied areas.

Durba and Helencha were found higher CP compared to other unconventional grasses (Table 4). CP content of feed stuffs in study areas is comparable and even higher than those of other unconventional fodder leaves and higher than the minimum range of NRC for high producing buffalo (190g/kg). Hossain et al. (2016) reported that DM and CP of rice straw and wheat bran were 850 & 875 and 53 & 154 g/kg, respectively.

Table 2: Status of buffalo rearing farmers and duration rearing beef cattle in studied areas

Parameter	Category	Frequency	Percent
Age	Middle aged (30-45)	65	72.00
	Old age(>45)	25	28.00
Education	Illiterate	20	22.22
	Primary	40	44.44
	<SSC	30	33.33
Occupation	Beef cattle	15	16.67
	Buffalo	50	55.55
	crop farming	10	11.11
	Sheep/Goat	15	16.67
Training skill	Without training	35	38.89
	With training	55	61.11
Source of capital	Own capital	25	27.78
	Loan from ASA/SDF	65	72.22
Purchasing capacity	1-2 buffalo	45	50.00
	3-4 buffalo	30	33.33
	5-6 buffalo	15	16.67
Repayment rate	96-98%	90	100.00

Table 3: Availability of feeds, fodders and feeding system in studied areas

Types of feeds	Frequency	Percent
Durba, helencha, noll	90	100
Cultivated fodders (Napier, maize, para, sugarcane top, rice straw etc.)	80	90
Tree leaves (Jackfruit, banana, bamboo etc.)	90	100
Sesame oil cake, rice bran, wheat crushed	45	50
Feeding system		
Extensive	30	33.33
Semi-intensive	60	66.67

Table 4: Chemical composition of feedstuffs in studied areas (% DM)

Name of feeds	CP	CF	EE	NFE	Ash
Durba	15.6	22.1	4.0	46.3	10.5
Helencha	20.3	15.5	14.3	43.6	6.2
Noll grass	4.6	16.1	4.0	57.8	12.6
Napier	9.5	12.8	3.8	67.1	5.6
Maize	12.2	16.2	10.1	49.4	12.2
Jack fruit	203	9.5	11.2	50.5	6.5
Sesame oil cake	30.2	11.0	25.8	30.2	7.4

Hossain et al., (2016) reported that DM and CP of sesame oil cake were 890 and 311g/kg, respectively which are almost similar with this study. CF content of feed stuffs was lower indicated a good quality feed for buffalo. The presence of high CF in feeds is reported to decrease dry matter digestible in animals and therefore, provides a good indication of the nutritional value of feeds. The highest EE content was recorded in Sesame oilcake (30.2%) and lowest was found in Noll grass (4.6%) and Napier grass (9.5%), respectively. This result was almost similar to the findings of Hossain et al. (2018).

Major diseases of buffalo

Four major diseases were found where the occurrences of FMD 38.89%, followed by diarrhoea, black quarter and hemorrhagic septicemia. Hossain et al., (2018) stated that Anthrax, Foot and mouth, Black quarter and Hemorrhagic septicemia were 100, 75, 83 and 67, respectively in their study (Table 5).

Table 5: Health care practices of buffalo in studied areas

Name of disease	Frequency	Percent
Diarrhoea	30	33.33
Foot and mouth disease	35	38.89
Black quarter	15	16.67
Hemorrhagic septicemia	10	11.11
Vaccination and deworming		
Performed of vaccine and deworming	90	100
Sources of vaccine and deworming tablets		
Local market	85	94.44
Livestock Office	05	05.56

Sources of vaccination and de-worming

The study revealed that 100% farmers performed vaccination (Anthrax, FMD, BQ and HS) and de-worming tablets to their buffalo like Endex and Levex collected from local market and minor portion collected from Livestock Office (Table 5).

Cost of buffalo purchased

Price of animals varies according to the size, color and utility (Table 6). Price of one buffalo was ranged from 60000- 160000 BDT in studied areas. To analyze the cost return, it was necessary to describe the feed cost, breeding cost, housing cost and equipment for buffalo rearing. Cost per year of housing and equipment was more or less similar with feed cost (Table 7). The major cost of healthcare was medicinal cost followed by vaccination program. Some Local Service Provider (LSP) of study areas did several programs on vaccination, de-worming and treatment. All LSP were well trained by SDF/ULO as TOT on Para vet build up program and they were certificate holder. As a result it was very helpful to buffalo farmers of these areas. Average rearing cost of one buffalo was 10500 BDT. Hossain et al., (2018) reported that rearing cost of dairy cattle was 13500 BDT which was higher than the present study.

Table 6: Purchase cost of one buffalo

Cost of per buffalo	Frequency	Percent
60000-80000	25	27.78
81000-120000	50	55.55
121000-160000	15	16.67

Average per buffalo purchased cost 103667 BDT

Table 7: Different expenditure of per buffalo in studied areas

Category	Expenditure (BDT)
Average feed cost (12 month)	5500
Average housing and equipment cost (12 month)	1600
Total	7100
Medicine and vaccine cost	
Average medicine cost (12 month)	2000
Average vaccine cost (12 month)	1400
Total healthcare cost	3400
Total rearing cost	10500

Total and net income from buffalo rearing

Average income per buffalo was 167050 BDT (Table 8). In India, net annual income from rearing one cross breed cow and one buffalo was Rs. 30784 per year (Kalash et al., 2009). The net income from one buffalo was 52883 BDT which is not similar with the present study indicated that rearing buffalo in studied areas was profitable. Farmers were well equipped by practicing of buffalo rearing and learning mistaken from first year rearing of 2nd year and find actual market and sale their animal to direct consumer avoiding market actors. They maintained strong linkage with well known market and consumers to sell their buffalo to ensure real price. Their mentally strength were strong and well known to all rearing practicing, medication and well communicated to Upazila Livestock Office and other service providers. As a result they were more benefitted in 2nd year than that of 1st year of buffalo rearing in studied areas.

Table 8: Total and net income from buffalo rearing in studied areas

Category	Income	Minimum (BDT)	Maximum (BDT)
Per buffalo	165000	150000	180000
Dung sale	2050	1350	2750
Total	167050		

Net income per buffalo = Total income - Total expenditure (167050 - 114167) = 52883 BDT

Cost of farmer's family members

Average expenditure of per farmer per year is presented in Table 9. Food cost was found highest among the total expenditure. The second highest expenditure was to maintain social status followed by the cost for clothing, education, healthcare, and housing.

Table 9: Average expenditure (BDT) per farmer per year in studied areas

Category	Average expenditure	Minimum	Maximum
Food	8400	3600	10500
Cloth	1050	420	1500
House	435	375	720
Education	750	450	1350
Treatment	525	300	1380
MSS	1800	1200	2550

MSS, maintaining social status (decoration, gift, furniture, recreation, attend various festival, invitation etc.)

Livelihood improvement of buffalo rearing farmers

Buffalo rearing increased livelihood status of farmers especially the farm women and the development of this sector is the potential path to rural prosperity (Kalash et al., 2009, Hossain et al. 2018).

Impact of purchase capacity

The food and cloth purchasing capacity of buffalo rearing farmers are presented in Table 10. Before rearing buffalo, farmers spent only 8400 BDT for purchasing food but they were able to spend 12605 BDT after they had started rearing buffalo which was 33.36% more than the previous capacity. This finding is in agreement with the finding of Hossain et al. (2018). On the other hand, farmers spent only 1050 BDT for purchasing cloths but they were able to spend 1510 BDT after they had started rearing buffalo, which was 30.46% more than previous status. This result is almost similar with the findings of Hossain et al. (2018).

Impact of social status, education and healthcare

The impact on social status, education and healthcare are presented in table 10. Before rearing buffalo, farmers were able to spent only 1800, 750 and 525 BDT to keep their social status, education and health care respectively but they were able to spent 2370, 870 and 630 BDT for maintaining their social status, education and healthcare after they had started rearing buffalo, which were 24.05, 13.79 and 16.67 % more than the previous status of the farmers.

Table 10: Impact of buffalo on livelihood activities in studied areas

Category	Initial value	Final value	Percent	Ranking
Food purchasing	8400	12605	33.36	1
Cloth purchasing	1050	1510	30.46	2
Housing	435	500	13.00	6
Education	750	870	13.79	5
Treatment	525	630	16.67	4
Social status	1800	2370	24.05	3

Impact on housing

The impact on housing is presented in Table 10. Before rearing buffalo, farmers spent only 435 BDT for their housing purpose but they were able to spent 1300 BDT for their housing after they had started rearing buffalo, which was 13% more than the previous status. This condition indicated that buffalo farmers were less interested to spent money for housing rather than other purposes as assessment of the impact of livelihood.

CONCLUSION

The study revealed that buffalo rearing is the best option of income generating activity for poor and hard core poor farmers for their ameliorating livelihood. The study showed drastic livelihood improvement through buffalo rearing in studied areas. Considering all the parameters, buffalo production was a profitable IGA in the selected areas and improvement of the socio- economic status and livelihood of farmers were possible in the studied areas. The loan recovery rate was better than that of other

microfinance institutions due to better income generation through applied good livestock management practices and improved scientific approaches and technology.

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REFERENCES

- AOAC (2004). Official method of analysis. 18th edition. Association of Official Analytical Chemists, Washington, D.C. USA.
- Aneja RP (1990). Processing and distribution of buffalo milk Proceeding of the XXIII International Dairy Congress, Montral, 1: 383-396.
- BER (Bangladesh Economic Review) (2018). Ministry of Planning, Government of the People's Republic of Bangladesh.
- Cockrill WR (Ed.) (1974). The Husbandary and Health of domestic buffalo FAO, Rome. Italy, pp. 591-602.
- DLS (Directorate of Livestock Services) (2017). Livestock Economy Report. Dhaka, Bangladesh.
- De-La-Cruz-Cruz LA (2014). Buffalo welfare and behavior: physiological aspects. Master's Thesis, Facultad de Medicina Veterinaria Zootecnia. National Autonomous University of Mexico, Mexico City pp-140.
- Das GK and Khan FA (2010). Summer anoestrus in buffalo- a review; Reproduction in Domestic Animals. 45: 483 – 494.
- FAO (2008). Production Year Book, Vol. 41. Pp-89.
- FAO (2009). Selected indicators of Food and Agriculture Development in Asia pacific region, 1993-2003. Food and Agriculture Organization of the United Nations, Bangkok, Thailand, pp, 119-121.
- Faruque MO, Hasnath MA, Siddiqe NU (1990). Present status of buffaloes and their productivity raised by the small farmers of Bangladesh. Asian-Australasian Journal of Animal Sciences, 3: 287-292.
- Ghaffar A, Khan M I M, Mirza A and Prizada W H (1991). Effects of year and calving season on some traits of economic importance in Nili-Ravi buffaloes. Pakistan Journal of Agriculture Research, 12(3): 217.

- Gupta PV, Kumar V, Jain S, Masood J, Ahmad N and Srivastava JP (2010). Newborn care practices in urban slum of Lucknow City, UP. *Indian Journal of Community Medicine*, 35: 82-85.
- Hossain MA, Islam MS, Rahman MF, Islam MS and Zulfikar MIM (2018). Livelihood improvement of poor women through cow rearing. *International Journal of Applied Research*, 4:24-29.
- Hossain MA, Hashem MA and Khan MAS (2016). A basic study on production performance of lactating cows under a typical village condition of Mymensingh district. *Journal of Environmental Science and Natural Resources*, 9(2):115-120.
- Hamid MA, Ahmed S, Rahman MA and Hossain KM (2016). Status of Buffalo Production in Bangladesh Compared to SAARC Countries. *Asian Journal of Animal Science*, 10(6): 313-329.
- Islam MH, Hashem MA, Hossain MA, Islam MS, Rana, MS and Habibullah M (2012). Present status on the use of anabolic steroids and feed additives in small scale cattle fattening in Bangladesh. *Progress Agriculture*, 23(1-2):1-13.
- Kalash P, Rathore, R and Kumar M (2007). Livelihood improvement of farm women through Cattle and Buffalo rearing in Jhunjhunu District of Rajasthan. *International Journal of Rural Studies*, 16:1-3.
- Karim MR, Hossain MZ, Islam MR, Parvin MS and Matin MA (2013). Reproductive productivity, productivity and management system of indigenous buffalo (*bubalus bubalis*) cows in coastal areas of Pirojpur and Borguna district of Bangladesh. *Progressive Agriculture* 24: 117 – 122.
- Kumar R, Singh PK, Goyal RK, Singh H and Kumhar BL (2017). Existing housing and feeding management practices of Buffaloes in Firozabad District of Uttar Pradesh, India. *International Journal of Current Microbiology and Applied Science*, 6(5): 1831-1838.
- Mamun A, Harun BAL and Tologa KABAS (2019). Microcredit and Social Business Movement as catalyst for Poverty Eradication: The Grameen Experience. *International Journal of Management Science and Business Administration*, 5(5):32-42.
- Suhail SM, Qureshi MS, Khan S, Ihsanullah and Durrani FR (2009). Inheritance of swamp buffaloes. *The Malaysian Agricultural Journal*, 47(2): 203-206.
- Tulloch, D.G. and Litchfield, R.T., (1981). Wallowing for buffalo. *Australian Wildlife Research*, 8: 555-565.
- Tulloch, D.G., (1974). The feral swamp buffaloes of Australia's Northern Territory. In: Cockrill, W.R. (Ed.) (1974). *The Husbandry and Health of domestic buffalo* FAO, Rome. Italy, pp. 591-602.
- Skunmun P, Chantalakhana C, Pungchai R, Poondusit T, Prucsa Sri P. 2002. Comparative Feeding of Nale Dairy, Beef Cattle and Swamp Buffalo. 1. Economics of Beef Production. *Asian-Australasian Journal of Animal Science*, 15(6): 878-883.
- Taher, Khaleque MA, Pasha TN and Bhati JA (2002). Comparative evaluation of maize bran, wheat bran and rice bran on milk production of Holstein Friesian cattle. *International of Agriculture and Biology*, 4(4).
- Viswkarma R, Singh R, Kushram P, Singh SK and Sharma S (2018). Existing status of buffalo husbandry practices in Jabalpur. *The Pharma Innovation Journal*, 7(2): 08-11.