CATTLE FEEDING PRACTICES FOLLOWED BY FARMERS ADJACENT TO DHAKA CITY: CHALLENGES FOR SUSTAINABLE CATTLE NUTRITION

LOVELY AKTER

DEPARTMENT OF ANIMAL NUTRITION, GENETICS AND BREEDING

SHER-E-BANGLA AGRICULTURAL UNIVERSITY
DHAKA-1207

DECEMBER-2022

CATTLE FEEDING PRACTICES FOLLOWED BY FARMERS ADJACENT TO DHAKA CITY: CHALLENGES FOR SUSTAINABLE CATTLE NUTRITION

BY

LOVELY AKTER

REGISTRATION NO. 14-05974

A Thesis

Submitted to the Faculty of Animal Science & Veterinary Medicine,

Sher-e-Bangla Agricultural University, Dhaka-1207,in Partial

Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE (MS)

IN

ANIMAL NUTRITION

SEMESTER: JULY-DECEMBER/2021

APPROVED BY:

Prof. Dr. Md. Mufazzal Hossain
Supervisor
Department of Animal Nutrition, Genetics and Breeding
Sher-e-Bangla Agricultural University, Dhaka-1207

Bishrat Farhana Amy
Co-Supervisor
Department of Animal Nutrition, Genetics and Breeding
Sher-e-Bangla Agricultural University, Dhaka-1207

Dr. Al-Nur Md. Iftekhar Rahman
Associate Professor & Chairman
Department of Animal Nutrition, Genetics and Breeding
Sher-e-Bangla Agricultural University, Dhaka-1207

Dr. Md. Mufazzal Hossain
Professor
Department of Animal Nutrition, Genetics and Breeding
Sher-e-Bangla Agricultural University
Sher-E-Bangla Nagar, Dhaka-1207, Bangladesh
Mobile No: +8801912-102104
E-mail No: mufazzal_hossain@yahoo.com

CERTIFICATE

*This is to certify that the thesis entitled, "**CATTLE FEEDING PRACTICES FOLLOWED BY FARMERS ADJACENT TO DHAKA CITY:CHALLENGES FOR SUSTAINABLE CATTLE NUTRITION**."*

*Submitted to the Department of Animal Nutrition, Genetics and Breeding, Faculty of Animal Science and Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE** (MS) in **Animal Nutrition** embodies the result of a piece of bonafide research work carried out by **LOVELY AKTER**, Registration No. **14-05974**, Semester: **JULY-DECEMBER/2021** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that such help or source of information, as has been availed of during the course of this investigation has been duly acknowledged by her.

Prof. Dr. Md. Mufazzal Hossain
Supervisor
Department of Animal Nutrition, Genetics and Breeding.

Date:
Place: Dhaka, Bangladesh

Sher-e-Bangla Agricultural University, Dhaka-1207

Dedicated

To

My Beloved Parents

ACKNOWLEDGEMENT

All praises are due to Almighty Allah Who enable me to complete this thesis. I would like to express my heartfelt respect, deepest sense of gratitude, profound appreciation and ever indebtedness to my ***Supervisor Dr. Md. Mufazzal Hossain****, Professor, Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University (SAU), Dhaka for his sincere guidance, scholastic supervision, constructive criticism, and constant inspiration throughout the course and in preparation of the manuscript of the thesis.*

The author expresses her sincere appreciation, profound sense, respect and immense indebtedness to respected ***Co-Supervisor Bishrat Farhana Amy, Assistant*** *Professor, Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University (SAU) for extending generous help, scholastic guidance, constructive criticism, continuous inspiration during the research work and preparation of the manuscript of the thesis.*

The author is especially grateful to Md. Mahfuj Ullah Patoary, Assistant professor, Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University (SAU), Dhaka-1207 for his advice and sincere co-operation in the completion of the study.

The author acknowledges Sher-e-Bangla Agricultural University Research System (SAURES) for providing financial aid that enable her to complete the research work more smoothly.

The author would like to express her last but not least profound gratitude to her beloved father, mother, brothers and sisters who sacrificed all their happiness during the whole study period in her life as well as during this MS study. She is grateful to all of her relatives for their inspiration, blessing and encouragement that opened the gate of higher studies in her life.

Finally, the author is also boundless grateful to all the staffs of the Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University, Dhaka-1207 for their co-operation.

The Author

LIST OF CONTENTS

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATION

ABBREVIATION		FULL MEANING
ADF	=	Acid Detergent Fiber
ANOVA	=	Analysis of Variance
Avg.	=	Average
BBS	=	Bangladesh Bureau of Statistics
COVID	=	Corona Virus Disease
CP	=	Crude Protein
CRD	=	Completely Randomized Design
D	=	Day
DLS	=	Department of Livestock Services
DM	=	Dry Matter
DMI	=	Dry Matter Intake
e.g.	=	For Example
Et al.	=	And Others
Etc.	=	Etcetera
FAO	=	Food and Agricultural Organization
FY	=	Fiscal Year
GDP	=	Gross Domestic Product
Gm	=	Gram
i.e.	=	That is
ILCA	=	International Livestock Centre for Africa
Kg	=	Kilogram

NDF	=	Neutral Detergent Fiber
No.	=	Number
NRC	=	National Research Council
OM	=	Organic Matter
RDP	=	Rumen Degradable Protein
SNF	=	Solid Not Fat
SPSS	=	Statistical Package for Social Sciences
STD	=	Standard Deviation
TK.	=	Taka
TMR	=	Total Mixed Ration
UMS	=	Urea Molasses Straw
UMB	=	Urea Molasses Block

CATTLE FEEDING PRACTICES FOLLOWED BY FARMERS ADJACENT TO DHAKA CITY: CHALLENGES FOR SUSTAINABLE CATTLE NUTRITION

ABSTRACT

The study was undertaken to explore the present cattle feeding practices followed by farmers adjacent to Dhaka city, to collect mixed concentrate feed for crude protein analysis and find out the challenges of cattle rearing in selected areas. A field survey was conducted to collect data from 50 farmers of Mohammadpur, Keranigonj and Sher-e-Bangla nagar in Dhaka district with a pretested survey questionnaire. The collected mixed concentrate feed samples were evaluated through crude protein analysis. Results showed that farmers used rice straw, different types of cultivated grass such as jumboo, napier, maize, kolmilota, panchun grass as roughage source and wheat bran, rice bran, broken rice, lentil bran, mugbean bran, blackgram bran, broken maize, chickpea bran, soyameal, soyabean bran, cow mixture standard, bipro cattle feed, jaker dairy mixed feed as concentrate source. Most of the farms were medium size farm (27). Number of cattle per small, medium and large scale farm were 4.5, 11.19 and 86.23 respectively. Milch cow per small, medium and large scale farm was 10, 167 and 741 respectively. Total cow was found in small ,medium and large scale farm in 18, 302 and 1639 respectively. Most of the farmers reared cross breed cattle (87.76%) and indigenous and cross breed reared only 9.69% and 2.55%. Average concentrated feed provided per dairy cow in small, medium and large scale farm was 4.9kg, 6.23kg and 8.30kg. Milk production liter/cow in small, medium and large scale farm was 10.3litre, 13.5litre and 15.4litre respectively. Green grass provided to cattle per day in small, medium and large scale farm was 8.33kg, 9.50kg and 9.64kg respectively. Straw provided to cattle per day in small, medium and large scale farm was 1.94kg, 1.72kg and 1.99kg respectively. The average price per kg of wheat bran in small, medium and large scale farm was TK. 50.5, 46.29, 44.75 respectively. Average price per kg of rice bran in small, medium and large scale farm was Tk.17.15, 16.88, 16.45 respectively. The average price per kg of lentil bran in per farm was Tk.28.67, 27.62 and 26.55 respectively. 70% Farm owner cultivated green grass. Farmers cultivated green grass such as jumboo, maize, napier, kolmilota, panchun and khesari.

Most of the farmers cultivated jumboo grasses (54%). Chopper and cleaner machine used 72% farm owner. Milking machine used only 26%. Farmers got training only 8% and 92% farmers have no training facility. Average CP% in mixed concentrate feed in small, medium and large scale farm was 16.3, 18.2 and 19.6 respectively. Shortage of green grass showed from January to February 12%, from September to October 14% and there was no rest of the shortage 74% of the month of the year. 50 farm owner claimed higher price of feed as the key challenges and farmers suggested that reducing feed cost was the primary solution to overcome the challenges regarding cattle feeding.

CHAPTER I

INTRODUCTION

The livestock sector is playing an important role in Bangladesh and contributed to GDP in FY 2018-2019 is 1.47% (DLS, 2020). Among livestock, cattle playing an important role because of most of the farmers (about 80 to 85 households) rear cattle as a source of income along with financial support during the crisis (Kamal *et al.*,2019). Total 41.93% households were rearing cattle and the total number of cattle in Bangladesh was 28487415 (BBS, 2019). The up-gradation of breed and feeding system increase the production of cattle (Rashid *et al.,* 2007). Hence, feed availability varies over the year in this area that may affect the cattle nutrition, production and reproduction. Livestock feed in Bangladesh is primarily derived from crop residue, grass and tree leaves as roughage and cereal by products and very negligible amount of grain as concentrate. There are some problems regarding feed and nutrition of cattle; crop residual, grass, tree leaves, cereal by-product and a very negligible amount of concentrate feeds were supplied to the cattle (Talukder *et al.,* 2019). Based on the dairy cattle population, Bangladesh has secured 15th position among the top dairy cattle populated countries in the world (FAO, 2012). There are over 264 million dairy cows in the world, producing nearly 600 million tone of milk every year (FAO, 2012) whereas in Bangladesh total cattle population is 23.7 million (DLS, 2016).The current milk production in Bangladesh is about 13.07 million whereas the demand is 15.66 million Metric Ton considering 250 ml per head/day (DLS, 2022). Though Bangladesh has potentiality to increase milk production in order to minimize the shortage and save huge amount of money which is being spent for importation of milk but there are some extent of problems and one of them is feed and nutrition. It is recommended that fodder conservation and different feed technologies need to practice to supply feed to the cattle for year round (Khan, *et al.,* 2009). The cattle farmers are lacking awareness about housing, feeding and nutrition, hygienic management, biosecurity and disease control (Rahman *et al.,* 2013). Dairy cattle production in the country is characterized by low productivity levels due mainly to genetic and nutritional constraints. Small holder mixed crop livestock system continue to be a dominant agricultural production system in Bangladesh. Dairy farming is a part and parcel of many such systems, and it is often seem as an important livelihood

option to increase household income of mixed farms in Bangladesh. The classical approach in increase dairy production is through genetic means by crossing with improved breeds. Unless feeding management is improved, these animals may be limited to fully express their potential genetic superiority. It is fundamental approach to provide good quality diets to dairy cattle in sufficient amounts to maximize production. But in the country there is heavy shortage of feed both in quantity and quality. The traditional feeding system for dairy cattle is based on the use of rice straw, natural grasses supplemented with a little or no concentrates. The quantity and quality of fodder available from natural pasture shows seasonal fluctuation. There is an acute shortage of feed supply during the dry season and the available feed during this period is of very poor quality. Poor nutrition results in low production and reproductive performance slow growth rate, loss of body condition and increased susceptibility to diseases and parasites. Thus, effective utilization of the available feed resources (agricultural and agro-industrial byproducts, natural pastures and browse) and appropriate supplementation of poor quality natural pasture and crop residue based diets appear to be the necessary steps to alleviate the nutritional problems of dairy animals. Different supplementation strategies could be applied depending upon the type, accessibility and price of supplementary feeds in a given area. Fodder conservation practices particularly hay and silage making should be developed in order to enable a stable of feed throughout the year. Evaluation of the nutritive value of naturally occurring tree leaves and pods, which are commonly used as dry season feed resources, would be important to enhance their proper utilization. In view of this situation, research should be directed towards the development of alternate feeding system which makes better use of local resources that are available throughout the year.

Cattle-farming safeguards food security and enhances access to animal protein (FAO, 2011). In addition, improves household income and empowers the resource-poor communities (Paris, 2002). Cattle-farming is increasing day by day in Dhaka District, even in COVID-19 pandemic situation it is still raising with multi-stored building (Seraj *et al*., 2021). Therefore, the aim of the study is explore the present cattle feeding practices followed by farmers adjacent to Dhaka city and to collect mixed concentrate feed for crude protein analysis and finally identify the challenges of cattle rearing in selected areas of Bangladesh.

Objectives

- ✓ To explore the present cattle feeding practices followed by farmers adjacent to Dhaka city.
- ✓ To evaluate the quality of mixed concentrate feed by crude protein analysis.
- ✓ To identify the challenges of cattle rearing in selected areas of Dhaka city.

CHAPTER II

REVIEW OF LITERATURE

It is very important to review the past research works which are related to the proposed study before conducting any type of survey or experiment. Literature on available feed resources and feeding practices for cattle, impact on dry matter and crude protein, productive and reproductive performance of cattle. The literatures reviewed here have been limited to those which are considered pertinent and related to the objectives of the present study.

2.1 Feed resources and feeding practice

Uddin *et al*. (2011) conducted a study on Feeds and feeding practices at peri-urban areas of Bangladesh stall feeding done with supplemented by concentrate and green fodder for superior local cattle, crossbred of Holstein-Friesian, Jersey and Sahiwal in intensive care. While the feeds used by the selected dairy cattle farmers were found oil cake, broken rice, broken maize, bran, commercial cattle feed, straw, pulses, sugarcane pulp, broken pulses and fodder used by farmers were napier, napier-puckchong, maize etc. Most of the farmers were cultivated fodder in the study area.

Zaedi *et al*. (2009) stated that Bathan is one kind of strip of sandy land rising out of a river bed and also a large area of pasture land for Napier (*napier spp*.), Jamboo, Local Durba and Carpert green grasses, and Khesari (*Lathyrus sativa*) and Matikalia (*Vigna sinensis)* legume production. They also added that cattle were housed in temporary shed and allowed to graze daily about 6-8 hours, and two times concentrate feeding per day (11 am and 3 pm).

Shahjahan *et al*. (2017) who reported that the feeding management system in Pabna and Sirajganj districts at household levels revealed that ad libitum fodder and straw supplying was practiced based on the availability of fodder in 60 and 40% households, respectively. In summer, the dairy farmers of Pabna district allowed cultivating fodders to their cattle but reverse situation (mainly straw) found in Sirajgonj because green fodder is usually available during Bathan feeding at winter season.

Rashid *et al.* (2007) observed that concentrate feed of dairy cattle was prepared by rice bran, wheat bran, pulses bran, mustard oil cake, till oil cake, crushed rice, molasses and salt.

Shamsuddin *et al*. (2006) reported On the other hand, Napier fodder cultivation was practiced in Sirajganj and Satkhira but at Sirajganj and Chittagong had limited, periodic grazing facilities for cattle though, availability of fodder increased milk production and decreased disease occurrence).

Hossain *et al*. (2016) reported most of the farmers (83%) of Sirajganj district used cultivated fodder and only 17% farmers used cultivated fodder and roadside grass during rainy season. About 37% farmers used commercial vitamin mineral supplement feed for beef cattle production.

Talukder *et al*. (2019) conducted a study to investigate the available feed resource of dairy cattle in rural villages of Pabna district. Results showed that highest number of farmers (82%) used rice straw for cattle feeding as roughage source while 76% farmers used Jambo and 44% farmers used Napier grass. Beside these 54% farmers used maize crush, 46% used wheat bran, 26% used til oil cake, 24% used til bran and 44% used mixed for cattle fattening.

Khan *et al.* (2009) stated that paddy and wheat were the most important cereal crops grown in the country which occupied 80% of the total cropped area and byproducts were fed to the dairy animals. Rice straw was the main roughage for dairy cows which is low in nutritive value and palatability whereas it contributes 90% of the roughage feed to animals. The amount of green fodder fed to the cattle each day depend on the time given by the farmers to collect the grass or weeds from roadsides, agricultural land or weeds harvested from the crop fields, rather than the requirement of the cattle. Most of the time of the year, the cattle did not get adequate feed. Rice polish, wheat bran and oil cakes were common concentrate feed. Farmers who had low milk production could not afford to buy required amount of concentrate. Farmers having high yielding cross breed cows fed concentrate regularly to their animals and grew fodder crops at limited amounts. A similar study was conducted by Rahman *et al.* (2012) in Dinajpur district and they also reported same feeding practices by the farmers. Moreover, they found that many farmers had knowledge on high quality fodder cultivation but none of them was found to cultivate fodder crops. More than

34.7% farmers used beef fattening tablets, 28.0% used urea molasses straw (UMS), 26.7% used urea molasses block (UMB) in beef 2 fattening. About 93.3% farmers reported high cost of feed, 66.7% percent reported shortages of animal feed, 50% reported lack of credit as the major problems of small-scale beef fattening. 85% farmers mentioned that lowering the feed cost was main solution to overcome the problem.

Das *et al*. (2003) stated that although legume fodders were available in the Baral river for the Bathan animals the farmers also provided a concentrate mixture of rice polish, mustard oil cake and common salt once a day while the fodder were replaced by straw during stall feeding.

Bhuiyan *et al.* (2007) reported that small holder farmers maintained the majority of the animal adjunct to crop agriculture as having significant dependence on livestock which were generally maintained on crop residues and other agricultural by-products. Rice straw was the basic feed item satisfying over 80% roughage needs throughout the country. Farmers allowed cattle to graze on roadside, fallow land, riverbank or on crop harvested lands for partially fulfilling the green roughage requirement. Rice polish, wheat or pulse bran etc. as concentrate sources had played important role in livestock enterprises throughout the country in variable level.

Kamal *et al.* (2019) reported that, 96.3% farmers gave both roughage and concentrate and 3.8% farmer gave only concentrate. They did not use any total mixed ration (TMR). 61.3% farmer gave roadside grass as the source of roughage, 8.8% gave straw and 30% gave cultivated fodder as the source of roughage. As a source of concentrate, 18.8% used commercial pellet feed, 33.8% used hand mixed feed which was made by different raw materials found locally and 47.5% gave both pellet and hand mix feed. Among the farmers only 30% farmer treated straw with urea and rest of the farmers didn't follow any treatment. Most of the farmers (72.5%) did their ration formulation by own and the rest from the technical person. For this reason, maximum animal didn't get proper nutrition for maintenance and production.

Sarker *et al.* (2017) reported about river basin area of Bangladesh that rice straw and naturally grown green grasses were the main roughages for cattle. About 95% farmers fed rice straw and about 81% farmers fed cut and carry green grasses to their cattle. There were no seasonal variations on feeding rice straw but variations occurred for

supplying cut and carry green grasses. Rice polish, wheat bran, broken rice, pulse bran and mustard oil cake are commonly used concentrates, among which rice polish and wheat bran were supplied by more farmers (about 93% and 75%, respectively). The variation of supplying concentrates among seasons were very negligible. Although, there were about 1.14% farmers who cultivated some fodder crops, they harvest grains for human consumption and residues for their cattle. However, high yielding varieties of fodders were rarely cultivated by the farmers for feeding cattle in the riverside regions. They obtained 48 different native green grasses among which most available native green grasses were durba, badla, kawn, shama, khesari, gamma, ura, gobra, shama and mashkalai.

Huque & sarker (2014) stated that ruminant animal in Bangladesh was mostly raised on fibrous crop-residues and cereal milling by-products. The total roughage production in the country was estimated to be 51056x103 MT in 2012 of which 5781x103 MT comes from cut and carry and road side grazing and about 27316x103 MT (53.5%) was used as animals feed. Major types of concentrate are cereal milling by-products, grains and oilcakes. The annual availability of the three types concentrate was about 2916x103 MT (58.0%), 2042x103 MT (40.6%) and 67.6x103 MT (1.34%), respectively. The country produced around 72.0x103 MT of molasses every year and a major part of it was exported and used for ethanol production locally. The country produced 6.54.0x103 MT of cotton seed cake and around 96.5.0x103 MT of fruit and vegetable waste.

Hasanuzzaman *et al.* (2014) conducted a study to compare rice gruel (kitchen waste) and molasses as a source of readily fermentable energy. They obtained rice gruel was less effective than molasses as fermentable energy source, however in situation where molasses was not available or costly, rice gruel could be an alternative as readily fermentable energy source. Additionally, rice gruel diet ensured a bit better rumen metabolite for growth and multiplication of rumen bacteria, protozoa because their number was slightly higher than molasses. Rice gruel contains 4.10% dry matter and 4.06% crude protein (DM basis).

Kamal *et al.* (2009) reported that feeding of crushed maize increased milk production and net income. The maize-based ration proved cost-effective in promoting milk production in small-scale dairy farm.

2.2 Impact of crude protein

According to NRC (2001) underfeeding or overfeeding CP to dairy cows had detrimental effects on milk production, efficiency of nutrient utilization, reproduction, the environment and the overall profit of the dairy operation. NRC Dairy Committee resulted in an equation that predicts responses in milk production of 0.75 kg/d when CP increased from 15 to 16% and 0.35 kg/d when CP increased from 19 to 20%. Maximum milk production was achieved at 23% CP in the diet.

Ghorbani *et al.* (2011) reported that increasing dietary CP from 19.5 to 21.4% significantly increased milk production and protein. However, increasing CP had no effect on milk fat, lactose and SNF. Dietary crude protein levels had significant effects on DMI and digestibility of NDF, ADF and CP ($p<0.05$). Increasing dietary CP limited DMI and increased NDF, ADF and CP digestibility in diets with 21.4 and 23.4% CP compared to 19.5% CP. The highest digestibility of NDF, ADF and CP was observed for treatment with 21% CP.

Mutsvangwa *et al.* (2016) reported that for the low CP diets, cows fed the high RDP diet had a greater DM intake compared with those fed the low RDP diet, but the opposite trend was observed for cows fed the high CP diets. On the low CP diet, both DM and OM digested in the rumen were greater in cows fed the high RDP diet as compared with those fed the low RDP diet, but no differences in DM and OM digested in the rumen were observed between cows fed the low- and high RDP diets on the high CP diet. Milk yield was unaffected by dietary treatment. For milk component yields, protein and lactose were unaffected by dietary treatment; however, on the low CP diets, milk fat yield was greater for cows fed the low RDP diet compared with those fed the high RDP diet but was unaffected by RDP concentration on the high CP diets ($p = 0.05$).

Amaral *et al.* (2014) reported that there was no effect of the protein levels (11% and 13%) in the initial (1-36th days of treatment) and final phases (37-72th days of treatment) on intake of dry matter, organic matter, CP, non-fiber carbohydrates, and total digestible nutrients. No differences were observed among treatments ($p<0.05$) for average daily gain and carcass traits. They also suggested using a fixed level of 11% CP during the entire feedlot period, and this diet is economically viable and environmentally sound.

Leonardi *et al*. (2003) reported no effect of dietary CP content on DMI and milk yield of dairy cows when dietary CP was increased from 16.5 to 18.5% and from 16.1 to 18.9%, respectively. They also found that protein yield was unaffected (1.35 and 1.34 kg/d) and milk protein content actually decreased (3.25 and 3.18%) when dietary CP was increased from 16.1 to 18.9%; however, fat content and yield increased significantly in response to dietary CP.

Broderick *et al*. (2003) reported a linear increased in DMI when dietary CP was increased from 15.1 to 16.7 and 18.3%; milk yield increased from 33.0 to 34.1 Kg/d only with the first CP increment, with no further change at 18.3% CP, resulting in lower feed efficiency (milk/DMI) at the highest CP. He also reported that yields of fat and protein improved when the dietary CP increased from 15.1 to 16.7 but with no further increased at 18.4% CP.

2.3 Dairy cattle population in three regions of selected farms in North-East Bangladesh

The study was carried out in three regions of north-east Bangladesh: Sadar Upazila (Sub-district) of Sylhet district; Sreemangal Upazila at Moulavi Bazar district and Chatak and South Sunamgonj Upazila at Sunamgonj district of Sylhet division. A total of 90 dairy farms (15 urban, 30 suburban and 45 rural), 30 from each region were selected.

Hossain *et al*. (2020) observed that a total of 1491 cattle from 90 dairy farms were analyzed, of which 783 were cows (554 milking and 229 dry), 105 bulls, 132 heifers, 214 male calves and 254 female calves (Table 1). The dairy cattle populations of urban, suburban and rural areas were 447 ± 13.8, 727 ± 8.8 and 317 ± 2.2, respectively. Among the cattle population, the total milking cows were 37.2%. In urban, suburban and rural areas, the percentages of milking cows were 11.5, 19.8 and 5.8%, respectively. The replacement heifers, male 3 and female calves were 9.0, 14.4 and 17.0%, respectively among total cattle population. The total milking cows' population was below the standard (50%) of an economically profitable dairy farm (Shamsuddin *et al*., 2006; Nordlund *et al*., 2007; Nor *et al*., 2015). The deficit of replacement heifers, 9.0% against the target of 30 - 40%, would prevent farmers

culling the less productive cows (Shamsuddin *et al*., 2006; Nordlund *et al.,* 2007; Nor *et al*., 2015) and so would increase production costs.

Table 1: Dairy cattle population in three regions of selected farms in North-East Bangladesh (Hossain *et al*., 2020)

Parameter	Urban area (Mean ± STD) (n = 15, (%)	Suburban area (Mean ± STD) n = 30, (%)	Rural area (Mean ± STD) n = 45, (%)	Total (Mean ± STD) n = 45, (%)	Percent (%)
All cattle	447 ± 13.8(29.9)	727 ± 8.8(48.8)	317 ± 2.2(21.3)	1491 ± 12.5	100
Dairy cows	243 ± 7.7(16.3)	402 ± 5.3(26.9)	138 ± 1.4(9.3)	783 ± 8.7	52.5
Milking cows	172 ± 5.2(11.5)	295 ± 4.1(19.8)	87 ± 0.8(5.8)	554 ± 6.2	37.2
Bull	34 ± 2.9(2.3)	43 ± 0.9(2.8)	28 ± 0.7(1.9)	105 ± 1.2	7.0
Heifer	45 ± 2.5(3.0)	62 ± 1.5(4.2)	30 ± 0.6(2.0)	135 ± 1.5	9.0
Male calves	54 ± 2.3(3.6)	102 ± 1.5(6.8)	58 ± 0.7(3.9)	214 ± 2.4	14.4
Female calves	74 ± 2.6(4.9)	118 ± 1.4(7.9)	63 ± 0.8(4.2)	254 ± 2.8	17.0

Talukder *et al.* (2019) reported, there were three types of cattle breed reared by the farmers for dairy purpose in selected areas. Table 2 reveals that Holstein-Friesian crossbred, Sahiwal crossbred and Deshi cow were reared by 82.40%, 11.00% and 6.60 farmers respectively. The highest numbers of dairy cow were found Holstein-Friesian crossbred in the study areas and the lowest was Deshi cow.

In another study Hossain *et al.* (2020) reported, among all cattle 68.3% were Holstein-Friesian cross, 4.0% Jersey cross, 8.1% Sahiwal cross, 4.3% Red Sindhi cross and 15.2% indigenous. In rural areas no exotic crosses were reared, and no indigenous cattle were found in urban and suburban areas (Table 2). The result agrees with the findings of Khan *et al.* (2010); Gizaw *et al.* (2017) but differs from findings of Dipu *et al.* (2019).

Table 2: Breeds of cattle reared in North-East Bangladesh (Hossain *et al*., 2020)

Breeds of cattle	Dairy cows			Bull			Heifer			Calves			Sub-total (%)
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural	
Holstein Friesian X	203	324	0	26	30	0	38	47	0	127	227	0	1019(68.3)
Jersey X	21	39	0	0	0	0	0	0	0	0	0	0	60 (4.0)
Sahiwal X	12	23	22	6	10	7	2	8	8	0	0	23	121(8.1)
Red Sindhi X	7	16	9	2	3	6	0	3	3	0	0	15	64 (4.3)
Indigenous	0	0	107	0	0	18	0	0	20	0	0	82	227 (15.2)
Sub-Total	243	402	138	34	43	28	42	62	30	128	220	121	-
Percentage	16.3	26.9	9.3	2.3	2.9	1.9	2.8	4.2	2.0	8.6	14.8	8.1	
Total	1491(100%)												

2.4 Factors associated with dairy cattle management:

The dairy farmers identified many constraints to health and production Overall, 64.8% of farmers reported high price of concentrate feed, which followed by inadequate knowledge on scientific feeding (55.8%), scarcity of green grasses (47%), lack of pasture (46.8%) and lack of quality food (35.0%). The dairy farmers of urban and suburban areas were facing more challenges on feeding compared to rural farmers. The scarcity of green grasses was more often reported in urban areas (53.0%) compared to suburban and rural areas. Due to higher price of concentrate food and shortage of green grasses net returns of farms were decreasing.

Rashid *et al*. (2007) showed that 36% farm owner had taken dairying as main business and 65% farm owners as side business and the highest percentage (36%) of farmers had dairy farming as the principal occupation.

This result contradicts to the information of Rahman *et al*. (1996), where dairying was taken by 19% as main business and 81% as side business and the highest percentage (42%) of farmers had business as the principal occupation.

Ali *et al*. (2000) also showed that the highest percentage (40%) of farmers had agriculture as principal occupation. Only 12% of the dairy farmers were dependent on bank loan for establishing dairy farms, 66% from their own source and 22% by bank loan as well as own source which is near about similar to the information of Rahman

et al.(1996) where 25, 58 and 17% of farmers were dependent on bank loan, own source and both, respectively.

Rashid *et al.* (2007) observed that average number of milch cow per farm was 5.12, average number of total cattle per farm was 12.64 and percentage of milch cows was 40.51 and out of 632 cattle,118 were pregnant (18.67%). According to Rahman *et al.* (1996), average number of milch cow per farm was 7 and percentages of milch cows and pregnant cows were 36.38% and 13.32%, respectively.

Rashid *et al.* (2007) observed that the tendency of rearing crossbred cows at small-scale dairy farms in Jessore is increasing. Among 50 small dairy farmers of Jessore District, 96% farmers had semi-closed house and 4% farmers had closed house. Among these houses, 54%, 222% houses were semipucca, Kacha and Pucca, respectively. Proper ventilation and drainage were 90% and 66%, respectively.

Hossain *et al*. (2004) found that 3%, 63% and 34% houses were open, closed and semi-closed, respectively and in these houses, proper ventilation and drainage were 73 and 33%, respectively, which contradict to the present study.

Rashid *et al.* (2007*)* also observed that very little number of indigenous cattle found in this survey of private farm. Because, most of the farm owners used artificial insemination technique for breeding purpose, the cause of these huge numbers of crossbred dairy cow available. For this reason, a good number of Holstein Friesian, Shahiwal and Sindhi crossbred stock found in this area. The data showed that 76% cows were inseminated artificially and 24% by both naturally and artificially.

No remarkable deviation had been observed with observation made by Rahman *et al.* (1996), who showed the use of artificial insemination was 75% and both artificial and natural was 25%.

Survey in the households of two districts nearby the Baghabari Milk Vita plant revealed overall farming status in which about 67% were medium scale farming with up to 20 milking cows. Small scale (27%) farming mainly found in Pabna district while large scale dairy farming (7%) in Sirajgonj district.

Zaedi *et al.* (2009) classified different dairy farmers in Milk Vita region and found average 3.9 (small scale), 8.4 (medium scale) and 19.9 (large scale) crossbreeds cows in each farm and these findings agreed with the present study.

2.4.1 Milk production and marketing

Milk yield is the most economic traits of a lactating cow. In Mithapukur region the milk yield/day of Jersey, Holstein Friesian, Sahiwal, Red Sindhi cross were7.73±0.73, 12.9±1.2, 5.51±0.40, 4.1±1.01 respectively. Highest milk yield found in Holstein Friesian cross (12.9±1.2) than other milch cow. L×SL were 8.90±2.1 liters per day and 12.54±3.50 liters for L×HF crossbreed cows.

The variation of study in different periods indicated genetic progress on milk production. Das *et al.* (2003) recorded service per conception (1.36) and average milk production (8.28 liters) in Local (Pabna) x Friesian genotype at Bagharaighat region of Sirajganj.

From the Rashid *et al.*(2007) observed data, 100% farmers milked their cows manually and milking done by male 76%, female 20% and both male and female 4%.

Milking was carried out twice a day, morning and evening, in most of the cases and in 6% cases three times a day morning, evening and night.

Average milk production per day per cow was 5.78 liter in the study farms. Ali *et al.* (2000) mentioned that it was 4.10±1.57 and 2.28±0.85 liters for cross bred and indigenous cows, respectively. Forty four percent, 26% and 30% of the farms disposed their milk by window delivery, home delivery and both window and home delivery system, respectively.

The information contradicts to the information of Rahman *et al.* (1996), who reported that 16% farmers disposed milk by window delivery and 58% farmers by both window and home delivery. Container used for milk carrying to consumers and market was small drum in most of the cases. Twenty eight percent respondents sold their milk to neighbors and restaurants, 24% to neighbors and sweet makers, 22% to neighbors and vendors and 15% to vendors. Hossain *et al*. (2004) studied that 42% farmers sold their milk to milk plant. Rahman *et al.* (1996) showed that 15% respondents sold it open market.

2.4.2 Problems on dairy cattle management faced by the farmer and their suggestion

Islam *et al.* (2002) found that the major constraint of fodder cultivation was shortage of land. Other constraints realized by them were lack of farmer's awareness, lack of technologies, geographical hazards etc. They also studied on identification, screening and nutritive value of forages available throughout Bangladesh and identified more than fifty different type of local green grass from different AEZs in Bangladesh. They noticed that durba, baksha, lota, poa, khesari, beju, mati kalai, kolmi, gamma, badam, durba, chailla, helencha, shama were mostly common and more potential native gras.

The dairy farmers identified many constraints to health and production. Overall, 64.8% of farmers reported high price of concentrate feed, which ranked 1, followed by inadequate knowledge on scientific feeding (55.8%), scarcity of green grasses (47%), lack of pasture (46.8%) and lack of quality food (35.0%). The dairy farmers of urban and suburban areas were facing more challenges on feeding compared to rural farmers. The scarcity of green grasses was more often reported in urban areas (53.0%) compared to suburban and rural areas. Due to higher price of concentrate food and shortage of green grasses net returns of farms were decreasing. The lack of pasture was more prominent in urban and suburban areas. Rural farmers grazed their cattle on nearby pasture or roadside grass, except during the rainy season. The present findings are similar to those of Uddin *et al*. (2012); Hafeez and Rahman, (2014); Nararyan *et al*. (2014); Onono and Ochieng (2018); Didanna *et al*. (2019). Many farmers lacked knowledge on scientific feeding, similar to the findings of Uddin *et al.* (2012); Hafeez and Rahman (2014). The results agree with findings of Quddus *et al*. (2012); Rajpoot *et al*. (2018); Panchbhai *et al.* (2017); Onono and Ochieng (2018). Due to lack of clean floor the cattle suffered infectious diseases. The result accords with the findings of Quddus, (2012); Narayan *et al.* (2014). Calf mortality was reported as a challenge by 14.5% of respondents. This finding is similar to the results of Yeasmin *et al*. (2014) and Panchbhai *et al.* (2017).

Rashid *et al.* (2007) said that animal feed was the greatest problem. Lack of training, bank loans, low price of milk and lack of veterinary services were the problems for dairy cattle production in Bangladesh. About 82% farmers have the problem of the milk marketing. The real price of milk is a great problem. During the period of high production, farmers did not preserve milk due to lake of chilling plant. As a result

they did not get actual price. The need for improved feed technology, fodder cultivation program and government subsidy on animal feed were the most important suggestions and put forward by 98, 96 and 96% of the farmers, respectively. From the above discussion, it can be concluded that the management condition of small dairy farm in Jessore is more or less traditional. Government should take some important steps immediately like- subsidy on animal feed, cultivation of fodder, providing milk marketing facilities and financial support, expansion of veterinary service, reasonable price of milk, giving management training of farm owners etc. for improvement of small dairy farms. Dairy cattle rearing can be recommended as an income generating activity at the farmers' level of Bangladesh. Quantitative and qualitative shortage of feed and fodder affects the performance of milking animals, through both under and over feeding occurs and this effects of economies of milk production negatively. Feed shortage in the dry season is the most serious problem of the small dairy producers. Rice straw is the only roughage during this period. On the other hand, urea treated straw is not widely practiced by the farmers. Utilization of other crop residues such as sugarcane top is also not well adopted. High cost of concentrate feed, which goes up day by day becomes out of buying capacity of the farmers is an acute problem in rearing milking animal. Another constraint is shortage of high yielding dairy cattle, the growth in the number of local cross bred is significant and imported cattle are rather expensive and are not well adopted with the environment. Ways to increase the productivity and reduce cost of production much greater emphasis must be placed on developing the knowledge and skill.

Datta *et al.* (2019) reported that feed cost was the main cost items capturing 61% shares in total variable cost. Islam *et al.* (2010) observed that feed cost for indigenous (96%) and crossbred (95.76%) cows was almost similar.

The constraints of milk marketing are depicted in lack of marketing infrastructure (67.8%) was the main constraint in all three zones. Lack of milk co-operative society, low milk price, irregular payment by gawala (middle man) and absence of milk storage facilities were in the 2nd, 3rd, 4th and 5th rank, respectively. In north-east Bangladesh, no milk market infrastructure has been developed and no co-operative society has been formed, and all respondents of urban and suburban areas reported these as main constraints of milk marketing. The result coincides with the findings of Quddus *et al.* (2012); Kumar *et al.* (2011). In this region the farmers sold their milk to

nearby sweet shops or to the local vendors. Some farmers sold their milk door-to-door in their areas. Conversely, in Australia, New Zealand, UK and USA milk marketing system is well established (FAO, 2011; Wouters and Lee, 2009). Other constraints were poor bargaining power, with low milk price and irregular payment by middlemen for the farmers of all three areas. An organized milk market channel and milk co-operative society can improve milk price and the farmers' economic condition. The findings agree with those of Quddus *et al.* (2012); Marma *et al*. (2019); Narayan *et al.* (2014). The farmers were also facing the absence of milk storage facility, in agreement with the results of Panchbhai *et al.* (2017).

CHAPTER III

MATERIALS AND METHODS

A survey under the experiment was conducted at selected area to find out the feeding practices for cattle and then nutrient composition of available concentrate feed was evaluated through proximate analysis.

3.1 Description of the experiment

A single-visit-multiple-subjects formal survey method (ILCA,1990) was applied to collect data from the farmers including personal information of farmers, feed resources used by the farmers, feed shortage faced by the farmers, challenges regarding cattle feeding and farmers suggestion to overcome the problems. The survey was done during the period from August 2022 to September 2022.There are two assessment system were followed during the experimental period, these are-

1. To conduct a survey to find out the feeding practices of cattle
2. To collect mixed concentrate feed for crude protein analysis.

3.2 Methodology for survey work

3.2.1 Survey location

The survey was conducted in Dhaka district adjacent to Dhaka city.

3.2.2 Sampling unit

A sampling unit was referred to any single farm. In this case sampling unit or respondent was a smallholder or commercial cattle farmer.

3.2.3 Sample size

The required sample size was determined based on confidence level and precision rate to be followed. The advantage of this approach is that the

statistical validity of a sample does not depend on its size relative to the population being investigated. Rather what matters is the required level of probability (confidence level), required degree of precision and variability of the population. The following formula (Lwanga & Lemeshow, 1991) was used to estimate the required sample size.

$$n = \frac{Z^2\, p(1-p)N}{E^2\,(N-1) + Z^2\, p(1-p)}$$

Where,

n= Required number of sample size = 50

Z= Confidence level 95% =1.96

p= 0.5

E= Design Effect (0.073)

N= Number of household rearing cattle in the selected area= 1959

3.2.4 Survey instrument

This research is a survey based exploratory as well as explanatory. The statistical information was collected via questionnaire survey from farmers. The total sample was50 smallholder or commercial cattle farmers in the study area.

Questionnaire for farmer:

A questionnaire was developed to collect all relative data from the farmer. Before starting of field survey, the questionnaire was pre-tested by interviewing some cattle farmers and subsequently refined. Conversation with the farmer was done in Bangla Language.

3.2.5 Data collection

- Nos. of cattle (according to type)
- Breed/verity of cattle
- Available cattle feed resources used by the sampled farmer
- Source of cattle and cattle feed
- Price of purchased cattle feed
- Amount of green grass provided to cattle per day

- Amount of silage provided to cattle per day
- Amount of straw provided to cattle per day
- Amount of concentrate feed provided to cattle per day
- Inclusion level of concentrate feed
- Price of feed ingredients (Tk./kg)
- Technologies adopted (chopper, cleaner, auto groomer, milking machine, etc.)
- Cultivation of green grasses
- Challenges faced by the sampled farmer regarding cattle feeding (feed cost, grass cultivation, feed nutrients, breeding practices, availability of genetic resources, food safety issue, etc.)
- Time (months) of cattle feed shortage faced by the sampled farmer

3.3 Crude protein analysis of mixed concentrate feed

Mixed concentrated feed items were collected from farmers for crude protein analysis.

3.3.1 Sample collection

Mixed concentrate feed items used by the farmers was collected for proximate analysis. Feed sample was collected in plastic bag from farmers during survey period with proper labeling.

3.3.2 Preparation of the samples

Collected feed sample was preserved in refrigerator until proximate analysis was conducted. Before lab test, the samples was taken from the refrigerator and kept in room temperature for few hours. Then the required amount of sample was kept in airtight container for subsequent protein analysis.

3.3.3 Sample analysis

The analysis of feed was carried out in the Animal Nutrition Laboratory of the department of Animal Nutrition, Genetics and Breeding in the Faculty of Animal Science and Veterinary Medicine, Sher-e-Bangla Agricultural

University (SAU), Dhaka-1207.The laboratory had available facilities for the determination of dry matter and crude protein of the feed sample.

3.3.3.1 Determination of dry matter

Procedure for moisture determination:

- Firstly, a porcelain crucible was cleaned, dried and weighed
- 2-3 Gram sample was weighed in the pre-weighed porcelain crucible
- Then the crucible was placed in a hot air oven at 103^0 C for about 4 hours and cooled in a desiccator and weighed.
- Re-dry for 30 minutes and repeat the process until constant weight was achieved.

  The percentage of dry matter was calculated using the following equation:

$$\text{Moisture\%} = \frac{\text{Dried sample weight (gm)}}{\text{Sample weight (gm)}} \times 100$$

3.3.3.2 Determination of crude protein

Crude protein of the samples was estimated by using Kjeldahl nitrogen determination method. This method includes three steps such as digestion, distillation and titration.

Digestion:

- 1gm of prepared sample was weight out on a N_2 free paper and placed it into a kjeldahl flask
- About 2g of catalyze mixture and 20ml conc. $H_2SO_4$was added to the content of the flask
- The flask was heated and turned occasionally until a colorless solution was obtained
- The flask was removed after digestion; cooled and 100 ml of distilled water was added

Distillation:

- 20 ml 2% H_3BO_3 solution was taken in a conical flask and 2-3 drops of mixed indicator was added and placed on the collection arm of the distillation apparatus
- 90 ml of 40% NaOH solution was poured into the Kjeldahl flask and also few Zn and glass pieces was added placed quickly on the distillation set and fitted with condenser

Titration:

- About 90-100 ml of distillate was collected in the conical flask containing H_3BO_3 solution
- The conical flask was removed with the distillate and titrated against standard 0.1N HCl solution

The percentage of crude protein was calculated using the following equations:

$$\text{Nitrogen\%} = \frac{\text{Titration value (ml)} \times 0.014 \times \text{Normality of HCl (0.1N)}}{\text{Sample weight (gm)}} \times 100$$

$$\text{Crude protein\%} = \text{Nitrogen\%} \times 6.25$$

3.4 Statistical analysis

3.4.1 Data of field survey

A Microsoft Excel program was developed for data entry. Different types of statistical tools like number, mean, median, mode, standard deviation and percent was used. A singular tabular technique was presented in the study to classify the data into meaningful categories.

SOME PICTORIAL VIEW OF SURVEY AREA

Plate 1: Calf rearing in the survey area

Plate 2: Feeding milking cow

Plate 3: Beef fattening practices in the survey

Plate 4: Cultivated fodder for green roughage source

CHAPTER IV

RESULTS AND DISCUSSION

The results of the survey contain available size of the farm, number of cattle per farm, type of cattle reared, breed of cattle, milk production per cow, feed resources, cost of the feed, feed shortage & challenges faced by the farmers & farmers suggestion to overcome the challenges of selected area. The results have been presented and discussed with the help of table. From the study the following results were obtained.

4.1 Size of the farm

Table 3 showed that most of the farms were medium scale farm. Medium scale farm number was 27 and the percentage of medium scale farm was 54%. On the other, small scale farm number only 4 and the percentage was 8% and large scale the percentage of 38%.

Survey in the households of two districts nearby the Baghabari Milk Vita plant revealed overall farming status in which about 67% were medium scale farming with up to 20 milking cows. Small scale (27%) farming mainly found in Pabna district while large scale dairy farming (7%) in Sirajganj district.

Table 3: Size of the farm in the study area

Size of Farm	No. of farms	Percentage (%) of farm
Small Size (1-5)	4	8
Medium Size (6-25)	27	54
Large Size (>25)	19	38
Total	**50**	**100**

4.2 Number of cattle per farm

Table 4 showed that large farm average number of cattle was 86.23 where the small farm average number of cattle only 4.5 and medium scale farm average number of cattle was 11.19.ln the large farm average number of cattle was higher because some large farm reared cattle more than 100.That's why large scale farm average number of cattle was higher than other farm.

Zaedi *et al.* (2009) classified different dairy farmers in Milk Vita region and found average 3.9 (small scale), 8.4 (medium scale) and 19.9 (large scale) crossbreeds cows in each farm and these findings similar with the present study in small and medium scale farm where small scale farm average 4.5 and medium scale farm average 11.19 per cow but large scale farm was not similar to this study.

Zaedi *et al.* (2009) showed 19.9 nos. (Large scale) crossbreeds cows present in each farm, however in the present study (table 4) it was 86.23 nos. (Large scale) crossbreds cows in each farm.

Table 4: Number of cattle per farm in the study area

Farm	Number of cattle per farm
Small	4.5
Medium	11.19
Large	86.23

4. 3 Type of cattle reared in dairy farm

Table 5 showed that three type cattle reared in dairy farm .These were calf, milking cow and beef cattle. In small scale farm number of milking cow was 10 and percentage of milch cow 55.56%. Whereas Rahman *et al.* (1996), average number of milch cow was 7 and percentages of milch cows were 36.38%. Percentage of small, medium and large scale farm was 100%.

Hossain *et al.* (2020) observed that a total of 1491 cattle from 90 dairy farms were analyzed, of which 783 were cows (554 milking and 229 dry), 105 bulls, 132 heifers, 214 male calves and 254 female calves . The dairy cattle populations of urban, suburban and rural areas were 447 ± 13.8, 727 ± 8.8 and 317 ± 2.2, respectively.

Among the cattle population, the total milking cows were 37.2%. In urban, suburb and rural areas, the percentages of milking cows were 11.5, 19.8 and 5.8%, respectively. These findings can relate with table 5. It was observed that a total of 1639 cattle from 50 dairy farms which milking cows 10, 167 and 741 were found in small, medium and large farm. Among the cattle population, the total milking cows were 55.56%, 55.30% and 45.21%, respectively in small, medium and large scale farm.

Table 5: Type of cattle reared in dairy farm

Type	No. & Percentage	Small Size	Medium size	Large Size
Calf	Number	7	110	488
	Percentage	38.89	36.42	29.77
Milking Cow	Number	10	167	741
	Percentage	55.56	55.30	45.21
Beef Cow	Number	1	25	410
	Percentage	5.56	8.28	25.02
Total Number		**18**	**302**	**1639**
Percentage		**100**	**100**	**100**

4.4 Breed/variety of cattle

Table 6 showed that most of the farmers reared cross breed cattle. The percentage of cross breed cattle was 87.76%, on the other indigenous breed reared only 9.69% where Rashid *et al* .(2007) also Hossain *et al.* (2020) reported among all cattle 68.3% were Holstein-Friesian cross, 4.0% Jersey cross, 8.1% Sahiwal cross, 4.3% Red Sindhi cross and 15.2% indigenous. In rural areas no exotic crosses were reared, and no indigenous cattle were found in urban and suburban areas. In another study Talukder *et al*. (2019) reported there were three types of cattle breed reared by the farmers for dairy purpose in selected areas such as Holstein-Friesian crossbred, Sahiwal crossbred and Deshi cow were reared by 82.40%, 11.00% and 6.60 farmers respectively. The highest numbers of dairy cow were found Holstein-Friesian crossbred in the study areas and the lowest was Deshi cow. This data was similar to present data which shown below table 6.

Table 6: Breed/variety of cattle in the study area

Breed/variety of cattle	Number of cattle	Percentage (%) of breed
Cross	1719	87.76
Indigenous	190	9.69
Bhutani	50	2.55
Total	**100**	**1959**

4.5 Mixed concentrate feed provided per dairy cow

Table 7 showed that Small farm average concentrated feed was given only 4.9 kg per cow where the medium and large scale farm average concentrated feed was given 6.23 kg and 8.30 kg per cow.

Dairy farmer are recommended to feed 1 kg concentrate for 2-3 kg of milk yield. Shahjahan *et al*. (2017) reported most of the farmers provided hand mixed concentrate feeds (maximum 6 kg by two times) for milch cows to ensure the milk production. These findings can relate with pressent data which showed below the table 7.

Table 7: Mixed concentrate feed provided per dairy cow in survey area

Farm	Average concentrated feed provided(kg)/Cow
Small Farm	4.9
Medium Farm	6.23
Large Farm	8.30

4.6 Milk production per dairy Cow

Table 8 showed that small scale farm average milk production was 10.3 liter per cow where as the medium and large scale farm average milk production was 13.5 liter and 15.4 liter per cow. The average milk production was higher in medium and large farm than small scale farm because a large farm 1 or 2 cow reared which cow milk was given 24 liter and medium farm 1or 2 cow reared which cow milk was given 20 liter. That's why average milk production was higher in medium and large than small scale farm.

In Mithapukur region the milk yield/day of Jersey, Holstein Friesian, Sahiwal, Red Sindhi cross were 7.73 ± 0.73, 12.9 ± 1.2, 5.51 ± 0.40, 4.1 ± 1.01 respectively. Highest milk yield found in Holstein Friesian cross (12.9 ± 1.2) than other milch cow.

Rashid *et al.*(2007) was conducted to know the management system, to determine cost and benefit, to identify constrains and to make recommendations for development of such small dairy farms in Jessore District. From this study, it was revealed that the milch cow per farm was 5.12 and average milk yield per day per cow was 5.78 liter.

Hossain *et al.* (2004) reported that the average milk production per cow per day was 5.2 liters in small scale farm. This result was similar in table 8.

Table 8: Average milk production per dairy cow

Farm	Average milk production (liter)/Cow
Small Farm	10.3
Medium Farm	13.5
Large Farm	**15.4**

4.7 Feed price per kg

Available concentrate feed items in the survey area are shown in below the table 9. It was observed that highest number of farmers used wheat bran, rice bran, lentil bran, dabli bran and rice broken. Rice bran and broken rice are byproduct of rice hulling process. Rice bran is mainly used for cattle feed and it was the main concentrate feed

in study area. Wheat bran was second popular feed in study area. The use of molasses was not popular in the study area.

These findings can relate with Sarker *et al.*(2016) who reported that concentrate feed items used by the farmers in the coastal region were mainly rice polish, wheat bran, broken rice and mustard oil cake. Rashid *et al.* (2007) observed that concentrate feed of dairy cattle was prepared by rice bran, wheat bran, pulses bran, mustard oil cake, till oil cake, crushed rice, molasses and salt. Uddin *et al*. (2011) conducted a study on Feeds and feeding practices at peri-urban areas of Bangladesh stall feeding done with supplemented by concentrate and green fodder for superior local cattle, crossbred of Holstein-Friesian, Jersey and Sahiwal in intensive care. While the feeds used by the selected dairy cattle farmers were found oil cake, broken rice, broken maize, bran, commercial cattle feed, straw, pulses, sugarcane pulp, broken pulses used by farmers.

Hafeez *et al.*(2014) reported, feed cost was one of the principal cost items for dairy farming. The cost of feed included expenses on concentrate (rice bran, wheat bran, oil cake, lentil bran molasses, broken rice, maize salt etc). Among the feed items, cost item followed by wheat bran, lentil bran, broken rice was 41.60Tk, 32.64 Tk. and 31.82 Tk. per kg respectively. This data was similar to present data shown Table 9 showed Wheat bran average price was small, medium and large scale farm is 50.5 Tk./kg, 46.29 Tk./kg and 44.75 Tk./kg . Lentil bran average price small scale farm was 28.67 Tk./kg where the medium and large scale farm average price was 27.62 Tk./kg and 26.55 Tk./kg. Average price was large scale farm was lower than medium and small scale farm because large farm collect feed direct feed mill or company ,discount level was higher, they purchased a large amount of feed where the small scale farm purchased the feed local market and purchased low amount of feed, no discount level in retailing cost. That's why feed price was varied from large scale farm to small scale farm. Medium scale farm average feed price was lower than small scale farm, they collect the feed from dealer, they purchase the feed minimum amount and discount level was medium where the large farm discount level was high. That's why average feed price was variation from small, medium and large scale farm.

Table 9: Average feed price (Tk./kg) in survey area

Name of feed	Small farm	Medium farm	Large farm
Wheat Bran	50.5	46.29	44.75
Rice Bran	17.15	16.88	16.45
Lentil Bran	28.67	27.62	26.55
Kheshari Bran	*	51.75	50.00
Corn Flour	*	31.15	28.21
Mugbean Bran	*	43.11	41
Blackgram Bran	*	48.32	45
Dabli Bran	50	48.96	48.33
Rice Broken	54	53.4	53
Chickpea Bran	*	*	67.4
Soyameal Bran	*	*	39.33
Soyameal	*	*	63.67
Motorsuti Bran	*	*	54
Soyabean Bran	*	*	56.5
Rice Polish	*	*	24
Soyahal	*	*	62
Cow Mixture Standard	*	38	37
Bipro Cattle Feed	*	48	*
Chickpea Powder	*	*	68

4.8 Amount of green grass & straw provided to cattle

Table 10 showed that amount of green grass provided to cattle per day was average 9.15 kg. Jalil *et al.* (1995) reported that rice straw supplied to red Chittagong cattle

average 4.03 kg where present data showed rice straw provided to cattle average 1.88 kg per day. In Chittagong, farmers cultivated rice, when rice cut, rice straw are found, for this reason maximum farmer fed rice straw for cattle but present data was collected near to Dhaka city and many farmer purchased straw , that's why low amount of straw fed to cattle than Chittagong area.

Sarker *et al.* (2017) reported about river basin area of Bangladesh that rice straw and naturally grown green grasses were the main roughages for cattle. About 95% farmers fed rice straw and about 81% farmers fed cut and carry green grasses to their cattle. There were no seasonal variations on feeding rice straw but variations occurred for supplying cut and carry green. This previous study was not similar to current study. This study showed, most of the farmers fed green grasses as roughage source for cattle and low amount of straw provided to cattle.

Hossain *et al.* (2020) observed, Cattle were daily fed local grass (5 - 6 kg), hybrid Napier (6 -8 kg), ad libitum rice straw and water. All cattle of urban and suburban areas were provided stall feeding of cattle without grazing and free space for exercise, but cattle of rural areas were grazed in pasture or roadside areas. These findings can relate with below the table 10 in small scale farm whereas, cattle were fed green grass 8.33 kg and all cattle of survey area adjacent to Dhaka city were provided stall feeding without grazing and free space for exercise. Jalil *et al.* (1995) reported that rice straw and green grass available per cow per day were 4.03 kg and 11.35 kg respectively. Simul *et al.* (2012) reported that farmers of Chittagong supplied average 4.9 kg rice straw and average 8.35kg green grass per day to each red Chittagong cattle. The amount of green grass supplied to each animal are similar to present study.

Table 10: **Amount of green grass & straw provided to cattle per day**

Farm	Green grass provided (Kg/Cattle)	Straw provided (Kg/Cattle)
Small Farm	8.33	1.94
Medium Farm	9.50	1.72
Large Farm	9.64	1.99

Comments: Only 2 large farms provided silage to their cattle.

4.9 Cultivate green grass

Table 11 showed that most of the farmers cultivated green grass. 70% farm owner cultivated fodder. Hossain *et al.* (2016) who reported most of the farmers (83%) of Sirajganj district used cultivated fodder. This data was similar to current data which showed below table 11.

Table 11: cultivate green grass in survey area

Yes (%)	No (%)
70 % farms	30% farms

4.10 Cultivated green grass

Table 12 showed that most of the farmers cultivated Jumbo grass. The percentage of Jumbo grass was 54% where the Talukder *et al*. (2019) reported 76% farmers used the jumbo grass. Percentage of the Napier grass was 22% where the reported 44% farmers used Napier grass (Talukder *et al*., 2019). Maize, kolmilota percentage only 28%, 26% . Pack-Chung and Khesari grass cultivate only 8%. Motorsuti grass cultivate only 2%. Most of the farmers were cultivated fodder in the study area. Most of the farmers cultivate jumbo grass because for this grass, production cost was low, no need irrigation, low amount of fertilizers were used, during rainy season this grass was not die and this grass cultivate in the lower land where the maize grass cultivation need dry and high land, irrigation was needed and high amount of fertilizers are used

and this grass was not cultivated in rainy season, on the other Napier grass cultivation dry and high land was needed and production cost was high than Jumbo grass. When the other grasses crisis, then Kolmilota was used but a high amount of Kolmilota fed by the dairy cow diarrhea outbreak. Above all for this reasons, most of the farmers cultivated jumbo grass.

Table 12: Percentage of cultivated grasses

Name of Grasses	Percentage (%)of grasses
Jumbo	54 %
Napier	22 %
Maize	28 %
Kolmilota	26 %
Pack-Chung	8 %
Kheshari	8 %
Motorsuti	2 %

4.11 Technology used in the study area

Table 13 showed that most of the farmers used chopper and cleaner machine. The percentage of chopper and cleaner machine was 72%. Rashid *et al*. (2007) observed that 100% farmers milking their cow manually in the study area where the farmers who reared dairy cow milking machine used 26% in the survey area. Silage cutter machine was used only 4%.

Table13: Percentage (%) of technology

Name of technology	Percentage(%) of technology
Chopper	72 %
Cleaner	72 %
Milking Machine	26 %
Silage Cutter Machine	4 %

4.12 Training facility

Table 14 showed that about 92% farmers have no training , only 8% farmers got training facilities. Farmers got training how to treatment of mastitis diseases, Improvement of dairy cow production, feeding and management of calf and fodder cultivation.

Table 14: Training facility in survey area

Yes (%)	No (%)
8 %	92 %

4.13 Crude protein percentage (CP %) in mixed concentrate feed

Table 15 showed that crude protein percentage (CP %) in mixed concentrate feed small, medium and large scale farm was 16.3, 18.2 and 19.6 respectively. Ghorbani *et al.* (2011) reported that increasing dietary CP from 19.5 to 21.4% increased milk production and protein. Leonardi *et al*. (2003) reported no effect of dietary CP content on DMI and milk yield of dairy cows when dietary CP was increased from 16.5 to 18.5% and from 16.1 to 18.9%, respectively. They also found that protein yield was unaffected (1.35 and 1.34 kg/d) and milk protein content actually decreased (3.25 and 3.18%) when dietary CP was increased from 16.1 to 18.9%; however, fat content and yield increased significantly in response to dietary CP.

According to NRC (2001) underfeeding or overfeeding CP to dairy cows had detrimental effects on milk production, efficiency of nutrient utilization, reproduction, the environment and the overall profit of the dairy operation. NRC Dairy Committee resulted in an equation that predicts responses in milk production of 0.75 kg/d when CP increased from 15 to 16% and 0.35 kg/d when CP increased from 19 to 20%. Maximum milk production was achieved at 23% CP in the diet.

Table 15: Average crude protein percentage (CP %) in mixed concentrate feed

Farm	Average CP % in mixed concentrate feed
Small	16.3
Medium	18.2
Large	19.6

4.14 Shortage of green grass

Table 16 showed that farmers faced to shortage of green grass. Percentage of green grass shortage from January to February was 12%, from September to October was 14% and there was no rest of the shortage of the month of the year was 74%. The acute shortage of feed & fodder is one of the most important obstacles to livestock development in Bangladesh (Sarker *et al*. 2017).

Table 16: Percentage (%) of shortage for green grass in survey area

Period for shortage	Percentage (%)of Shortage
January-February	12 %
September-October	14 %
No Shortage	74 %

4.15 Challenges and suggestions regarding cattle feeding

Every farmers claimed that higher price of feed was the key challenges for cattle feeding. The results of this study was similar with Rahman *et al*.(2012) and Ahmed *et al.*(2010) where 93.3% and 95% farmers respectively claimed higher prices of feed as main problems and in both the study 85% farmers reported that lowering feed cost might be a possible solution.

Datta *et al.* (2019) reported that feed cost was the main cost items capturing 61% shares in total variable cost. Islam *et al*. (2010) observed that feed cost for indigenous (96%) and crossbred (95.76%) cows was almost similar.

Other challenges were shortage of cattle feed, scarcity of green grass, diseases (foot and mouth disease, mastitis), selling problem (milk), unavailability of high yielding fodder and no training facilities that were claimed by farmers respectively. Rashid *et al*. (2007) indicated about 82% farmers have the problem of milk marketing.

Farmers suggested that reducing feed cost is the primary solution to overcome the challenges regarding cattle feeding. To increase the feed supply and vaccination to solve the challenges and to create marketing channel for fair price in selling milk. More training could be arranged by DLS about fodder cultivation, modern technology system adopted and modern feeding practices.

CHAPTER V

SUMMARY AND CONCLUSION

The outcome of the conducted survey provided us a detailed information about available feed resources, source of available feed, price of purchased concentrate feed items, feed shortage faced by the farmer, challenges regarding cattle feeding and farmer suggestion to overcome the challenges of selected area. From the study we can summarize that the most of the farm were medium size (27 farms out of 50). Jumbo, Napier, Maize, Kolmilota are the popular types of grasses cultivated by farmers. Most of the farmers cultivate green grasses. Farmers used roughage feed items such as rice straw, cultivate green grass (Jumbo, Napier, Maize, Kolmilota) and they fed their cattle various type of concentrate feed such as wheat bran, rice bran, lentil bran, dabli bran, rice broken, maize broken round the year based on their availability. Farmer obtained the feed by two means such as produced and purchased. Purchased of some produced feed depend on availability of farmer stock. Price of purchased feed also varies throughout the year. Most of the farmers reared cross-breed cattle. Chopper and cleaner were the mostly used technology. Most of the farmers have no training facilities. Feed cost had detected as major problem. Hygienic condition was very poor in case of small and medium scale farms. Small and medium scale farmers have no idea about Pack-Chung grasses. German and Para grass were cultivated in lower land, German grass was good for milk production but most of the farmers have no idea about German grass. From the result of the present study we can conclude that green grass were the main roughage source and wheat bran, rice bran, rice broken, maize broken was the main concentrate source of cattle. Higher feed price was main challenges for cattle feeding and reducing feed cost was the key solution to overcome the challenges. Commercial cattle pellet feed was not popular in the study area. Composition of concentrate feed varied area to area that may affect to proper ration formulation. More research should be conducted so that an economic ration can be formulated with locally available feedstuffs which will be helpful for farmers.

RECOMMENDATION

- It is recommended that fodder conservation and different feed technologies need to practice to supply feed to the cattle for year-round.
- More training could be arranged by DLS about fodder cultivation, modern housing system including hygiene practice, modern technology adopted and feeding practices.
- Indeed, as subsequent further research will be needed to identify the most accurate findings.

CHAPTER VI

REFERENCES

Ahmed, T., Hashem, M.A., Khan, M., Rahman, M.F, and Hossain, M.M. (2010). Factors related to small scale cattle fattening in rural areas of Bangladesh. *Bang. J. Anim. Sci.* **39**: 116-124.

Ali, M.H., Khan, M.A.S., Islam, M.N., Khan, M.K.I., Rashid, M.M. and Khatun, M.J. (2000). Comparative performance study on the crossbreds and indigenous cows under smallholder dairy farming. *Pakistan J. Bio. Sci*. **3**: 795-798.

Amaral, P.M., Filho, S.C.V., Detmann, E., Santos, S.A., Prados, L.F., Mariz, L.D.S., Alves, L.C., Menezes, A.C.B., Villadiego F.A.C., Novaes, M.A.S., and Silva, F.A.S. (2014). Effect of phase- feeding crude protein on performance and carcass characteristics of crossbred beef bulls: an application to reduce nitrogen compounds in beef cattle diets. *Trop. Anim. Health Prod*. **46**(2): 419-426.

BBS (2019). Agriculture Census (6^{th}), Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka. pp. 23- 26.

Bhuiyan, A.K.F.H**.** (2007). Cattle and livelihood in Bangladesh. Proc. Int. Conference and Festival on Indian Breeds of Cattle, April 21-29, Hosanagara, Karnataka**,** India. pp. **1**-12.

Broderick, G. A. (2003). Effects of varying dietary protein and energy levels on the production of lactating dairy cows. *J. Dairy Sci.* **86**: 1370–1381.

Das, P.K., Ali, S.Z., Islam, A.B.M.M and Roy, B.K. (2003). A comparative study of productive and reproductive performance and estimates of heritability for economic traits in different genetic groups of cattle available at Baghabarighat Milk Pocket Area of Bangladesh. *Online J. Bio. Sci*. **3**: 726-740.

Datta A.K., HaiderM.Z. and Ghosh S.K. (2019). Economic analysis of dairy farming in Bangladesh. *Trop. Anim. Health Prod.* **51**(1): 55-64

Didanna, H., Wossen, A., Shano (2019). Future prospects and challenges of intensifying dairy production systems in Ethiopia. *African J. Sci. Technol. Innov. Dev.* **11**: 653-661.

Dipu, S.M.M.A., Begum, and Sultana, S. (2019). Socio-economic, farm and technological characteristics of the peri-urban small and marginal dairy farmers of Chittagong metro area, Bangladesh. *SAARC J. Agric.* **17**(1): 77-91.

DLS (2022). Livestock economy at a glance 2021-22. Department of Livestock Services, Ministry of Fisheries and Livestock (MoFL).

DLS (2020). Livestock economy at a glance 2019-20. Department of Livestock Services, Ministry of Fisheries and Livestock (MoFL).

DLS (2016). Yearly updates on Livestock production. Department of Livestock Services, Ministry of Fisheries and Livestock, Dhaka, Bangladesh.

FAO (2012). Food and Agronomical Organization. Roam, Italy.

FAO (2011). World Livestock 2011 – Livestock in food security. Food and Agriculture Organization of the United Nations (FAO). Rome: FAO. Retrieved from www.fao.org/docrep/014/ i2373e/i2373e.pdf

Ghorbani, B., Ghoorchi, T., Amanlou, H. and Zerehdaran, S. (2011). Effects of using monensin and different levels of crude protein on milk production, blood metabolites and digestion of dairy cows. *Asian Australas J. Anim. Sci.* **24**: 65-72.

Gizaw, S., Abera, M., Muluye, M., Aliy, M., Alemayehu, K. and Tegegne, A. (2017). Validating the Classification of Smallholder Dairy Farming Systems Based on Herd Genetic Structure and Access to Breeding Services. *Agric. Sci.* **8**: 545 – 558.

Hafeez, A.S.M.G., Rahman, M.W. (2014). Economics of Small-Scale Dairy Farming in Urban Areas of Bangladesh - Constraints and Opportunities. *Intl. J. Sci. Res.* **3:** 2296 – 2301.

Hasanuzzaman, M., Akter, N., Begum, M.R., Alam, M., Yeasmin, T. and Sarker, M.S. (2014). Study on effect of rice gruel on growth performance of cattle. *Wayamba J. Anim. Sci*. **7**: 1051-1058

Hossain, M.K., Ahsan1, M.I., Lucky, N.S., Islam2, M.R., Howlader, M.M.R. and Alam , M.G.S. (2020). Investigation of constraints to health and production of cattle in North-East Bangladesh. *Bang. Vet.* **37**(1 – 2): 1 - 13

Hossain, M.D., Hossain, M.M., Hashem, M.A. and Bhuiyan, K.J. (2016). Oragnic beef cattle production pattern at Shahjadpur upazilla of Sirajgonj district in Bangladesh. *Bang. J. Anim. Sci.* **45**: 25-30.

Hossain, Z.M.A., Hossain, S.M.J., Rashid, M.M., Sultana, N. and Ali, M.H. (2004). Study on the present management condition of private dairy farm at Rangpur Sadar Thana in Bangladesh. *J. Bio. Sci.* **4**: 185-188.

Huque, K.S. and Sarker, N.R. (2014). Feeds and feeding of livestock in Bangladesh: performance, constraints and options forward. *Bang. J. of Anim. Sci.* **43**(1): 1-10

ILCA (International Livestock Centre for Africa). ILCA Annual Report 1989: 29-31. ILCA, Addis Ababa, Ethiopia; 1990.

Islam M.M., Topader A.H. and Rob A. (2010). Comparative study on the cost benefit between indigenous and cross bred cows reared in rural area of Dinajpur district. *Bang. J. Anim. Sci.* **39**(1&2): 191-196

Islam, M.R., Hasanuzzaman, M., Jalil, M.A. and Huque, K.S. (2002). Identification, screening and nutritive value of forages available throughout Bangladesh. Research Report, Animal Production Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka 1341, Bangladesh. pp. 1-53.

Jalil, M.A., Sarke, N.R., Paul, D.C. and Khan, A.A. (1995). Status of existing husbandry practices of dairy cattle at Manikgonj, Bangladesh. *Bang. J. Anim. Sci.* **24**: 71-80.

Kamal, M.T., Hashem, M.A., Al-Mamun, M., Hossain, M.M., Razzaque, M.A. (2019). Study of cattle fattening system in selected region of Bangladesh. *SAARC J. Agric*. **17**: 105-118.

Kamal, M.M., Iqbal, D.M.H. and Khaleduzzaman, A.B.M. (2009). Supplementation of maize-based concentrates and milk production in indigenous cows. *Bang. Vet.* **26**: 48-53.

Khan, A.B.M.K.I., Baset, M.A., Fouzder, S.K. (2010). Study on management and production system of small-scale dairy farm in a selective rural area of Bangladesh. *J. Sci. Found.* **8**: 13 – 23.

Khan, M.J., Peters, K.J., Uddin, M.M. (2009). Feeding strategy for improving dairy cattle productivity is smallholder farm in Bangladesh. *Bang. J. Anim. Sci.* **38**: 67-85.

Kumar, J., Kumar, B., Kumar, S. (2011). Constraints perceived by farmers in adopting scientific dairy farming practices in Madhuni district of Bihar. *Res. J. Agric. Sci.* 2 : 142 – 145.

Leonardi, C., Stevenson, M., and Armentano, L.E. (2003). Effect of two levels of crude protein and methionine supplementation on performance of dairy cows. *J. Dairy Sci*. **86**: 4033-4042.

Lwanga, S.K. and Lemeshow, S. (1991). Sample size determination in health studies. A practical manual. Geneva: World Health Organization

Marma, S., Ahmed, S.T., Islam, M.W., Rahman, M., Hasan, M.M., Resmi, S.I. (2019). Problems, Productivity and Profitability of a Small-scale Commercial Dairy Farm in Rangamati Hill Tract. *Intl. J. Innov. Res.* **4** : 13 – 17.

Mutsvangwa, T., Davies, K.L., Mckinnon, J.J. and Christensen, D.A. (2016). Effects of dietary crude protein and rumen-degradable protein concentrations on urea recycling, nitrogen balance, omasal nutrient flow, and milk production in dairy cows. *J. Dairy Sci.* **99**(8): 298-310.

Narayan, L., Meena, G.L., Upadhyay, B. (2014). Constraint's analysis of dairy farming in Banswara District. *The Indian J. Ext. Edu. Rural Dev.* **22**: 81 – 84.

Nor, N.M., Steeneveld, W., Mourits, M.C.M., Hogeveen, H. (2015). The optimal number of heifer calves to be reared as dairy replacements. *J. Dairy Sci.* **98:** 861 – 871.

Nordlund, K.V., Goodger, W.J., Bennett, T.B., Shamsuddin, M., Klos, R.F. (2007). Methods for conducting an economic opportunity survey in smallholder dairy farms. *Trop. Anim. Health Prod.* **39**: 557 – 566.

NRC (2001). Nutrient Requirements of Dairy Cows. National Research Council, 7th revised edition by National Academy of Sciene, Washington, DC.

Onono, J.O. and Ochieng, A. (2018). Review of challenges and opportunities for dairy cattle farming under mixed system of Homa Bay County, Western Kenya. *J. Agric. Ext. and Rural Dev.* **10**: 202-210.

Panchbhai, G.J., Siddiqui, M.F., Sawant, M.N., Verma, A.P., Parmes waranaik, J. (2017). Constraints Faced by Co-Operative Dairy Farmers in Adoption of Recommended Dairy Management Practices. *Intl. J. Curr. Microbiol. Appl. Sci.* **6**: 1962 – 1966.

Paris, T. R. (2002). Crop–animal systems in Asia: Socio-economic benefits and impacts on rural livelihoods. *Agric. Syst.* **71**(1):147–168.

Quddus, M.A. (2012). Adoption of Dairy Farming Technologies by Small Farm Holders: Practices and Constraints. *Bang. J. Anim. Sci.* **41**: 124 – 135.

Rahman, M.M., Hoque, M.A., Saha, N.G., Faruque, M.O. (2013). Studies on management system and identification of the causes of genetic erosion of indigenous cattle in Mymensingh district. *Bang. J. Anim. Sci*. **42**: 23-28.

Rahman, Z., Hossain, M.M., Hashem, M.A., Azad, M.A.K., Khatun, H. (2012). Factors related to small scale beef fattening programs in Dinajpur district of Bangladesh. *Prog. Agric.* **23**: 33-38.

Rahman, M.M., (1996). A study on the present status of private small dairy farms in Dhaka Metropolitan City. M.Sc. Thesis, Department of Dairy Sci, Bangladesh Agricultural University, Mymensingh.

Rajpoot, J.S., Kirad, K.S., Badaya, A.K., Chauhan, S.S. (2018). Constraints Faced by Dairy Farmers while Adopting Animal Management Practices in Dhar District of Madhya Pradesh, India. *Intl. J. Curr. Microbiol. Appl. Sci.* **7:** 3163 – 3166.

Rashid, M.M., Roy, B.C., Asaduzzaman, M., Alam, M.M., (2007). Study of the dairy cattle management systems at farmer's level in Jessore district of Bangladesh. *Pakistan J. Nutri.* **6**: 155-158.

Sarker, N.R., Habib, M.A., Amin, M.R., Yeasmin, S., Tabassum, F. and Yeasmin, D. (2017). Feeds and fodder dynamics in selected river basins of Bangladesh. *Bang. J. Anim. Sci*.**46** (3): 206-214.

Sarker, S., Ahaduzzaman, Ghosh, S.K., Sayeed, M.A.and Bary, M. A. (2016). Cross-sectional survey on prescribing patterns for food animal medications in Bangladesh. *J. Dairy Vet. Anim. Res.* 3(4): 00089.

Seraj, S. (2021). Vertical livestock farm on the outskirts of Dhaka. The Daily Star Friday March 19, 2021.

Shahjahan, M. (2017). High yielding dairy cattle husbandry and their production performance at Baghabari Milk Vita areas of Bangladesh. Asian Australan. *J. Biosci. Biotech.* **2** (1): 60-67.

Shamsuddin, M., Goodger, W.J., Hossein, M.S., Azizunnes, Bennett, T., Nordlund, K. (2006). A survey to identify economic opportunities for smallholder dairy farms in Bangladesh. *Trop. Anim. Health Prod.* **38**: 131 – 140.

Simul, A.I., Bhuiyan, A.K.F.H., Alam, M.K.,. Sarkar, M.M. and Rahman, M.M. (2012). Feeding and management practices of Red Chittagong cattle in two selected upazilas of Chittagong district. *Bang. J. Anim. Sci*. **41** (1): 35-40.

Talukder, M.A.I., Billah, M.M., Miah, M.A.H., Rahman, S.M., Ali, M.Y., Munira, S., Shahjahan, M. (2019). Available dairy cattle feed resources with their nutrient composition existed on milk pocket area of Bangladesh. *Intl. J. Nat. Soc. Sci.* **6**: 44-47.

Uddin, M.M., Sultana, M.N., Bruermer, B., Peters, K.J. (2012). Assessing the Impact of Dairy Policies on Farm-Level Profits in Dairy Farms in Bangladesh: Benchmarking for Rural Livelihoods Improvement Policy. *J. Rev. on Global Econo.* **1:** 124 – 138.

Uddin, M.M., Sultana, M.N., Ndambi, O.A., Alqaisi, O., Hemme, T. and Peters, K.J. (2011). Milk production trends and dairy development in Bangladesh, Outlook on Agriculture Vol 40, No 3, pp 000–000 doi: 10.5367/oa.2011.0056.

Wouters, A.P. van der Lee (2009). Smallholder Dairy Development-Drivers, Trends and Opportunities; WUR: Wageningen, The Netherlands.

Yeasmin, N., Hossain, M.K., Roy, A.C., Islam, M.R., Islam, S., Rahman, M.M., Alam, M.S. (2014). Factors Affecting Calf Mortality in Small Scale Dairy Farms at Biswanath Upazilla of Sylhet**.** *Bang. Livestock J.* 1: 34-38.

Zaedi, M., Demurak, Yamamoto, Y., Masuda, K., Sawauchid and Nakatani, T. (2009). Bangladeshi dairy farmers' conditions under Milk Vita. Review of Agricultural. *Economics, Hokkaido University*, 64: 181-190

CHAPTER VII

Sample no.:

Date :

APPENDICES

Appendix-1(Questionnaire of the survey)

Department of Animal Nutrition, Genetics & Breeding

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka-1207

Cattle Feeding Practices Followed by Farmers Adjacent to Dhaka City: Challenges for Sustainable Cattle Nutrition

Questionnaire

1. General Information of Farmers:

a) Name of the Farmer:

……

b) Name of the farm:

……
…

c) Mobile number:

……

d) Upazilla /Thana:

……

e) District:

……

2. Size of the Farm (According to number of cattle)

Small…… Medium …… Large……

3. Type of Cattle & Number of Cattle Reared in the Farm:

a) Calf…….

b) Milking cow ……

c) Beef cow…….

d) Dry cow……

4. Breed/Variety of Cattle:

a) Cross b) Indigenous c) Bhutani d) Others…….

5. Amount of concentrate feed Provided to Cattle Per Day……kg

6. Feed Price per kg

Name of the feed	Price (Tk./kg)

7. Collect from Cattle Feed:

a) Direct feed mill b) Company c) Dealer d) Supplier

e) Others……

8. Amount of Green Grass Provided to Cattle per Day?

…….kg

9. Amount of Straw Provided to Cattle per day?

……..kg

10. Specially made by fiber feed .Yes/No. If yes then,

a) Urea molasses straw……..kg

b) Urea treated straw……..kg

c) Silage……kg

d) Hay……kg

11. Are you Cultivated Green Grass ? Yes/No. if yes then

Land Area	Name of Grasses	Production of cultivated grasses/Acre

12. Which technology have been used?

a) Chopper b) Cleaner c) Milking machine d) Others……

13. Have you taken any training? Yes/no. if yes then

Sl. no.	Name of Training	Duration of training

14.Time (months) of cattle feed shortage faced by the sampled farmer…….……

15. Challenges faced by the sampled farmer regarding cattle feeding

a) Feed cost
b) Shortage of green grass
c) Diseases
d) Feed shortage
e) Selling problem
f) Others…..

16. Farmers suggestion to overcome the challenges.

a)……

b)…….

c)…….....

Thank you for your kind Information.

Name of the Enumerator : Lovely Akter

Reg. no.: 14- 05974 Mobile no.: 01766759952

Mail id: lovely.dvm74@gmail.com

APPENDIX-2

(List of the sampled farmers)

SL	Name of the Respondent	Farm Name	Mobile No.	Area
1	Kalam Miah	Samia& Sara Agro	01913510880	Bosila, Dhaka
2	Md.Iftekhar Adnan	Domestic Agro	01997207591	Bosila, Dhaka
3	Ali ShahinShammi	Meghdubi Agro	01715786158	Bosila, Dhaka
4	Shariful Islam Amit	Islam Agro	01893466281	Bosila, Dhaka
5	Md. Nasir Uddin	Sadeeq Agro	01744591992	Mohammadpur Beribad, Dhaka
6	Md. Naim Hasan	Wealth Tech Agro	01732294285	Mohammadpur Beribad, Dhaka
7	Md. Anower Hossain	Jaker Dairy Farm	01715082799	Mohammadpur Beribad, Dhaka
8	Md. Ataur Rahman	Green Agro	01727310675	Keranigonj, Dhaka
9	HaziEmdad	Anik Dairy Farm	01864507374	Keranigonj, Dhaka
10	Ashraful	Dairy Farm	01881678723	Keranigonj, Dhaka
11	HorilalSorker	Dairy Farm	01731959728	Keranigonj, Dhaka
12	Roni Baroi	Songita Dairy Farm	01826661884	Keranigonj, Dhaka
13	Sopon Ghosh	Dairy Farm	01727732711	Keranigonj, Dhaka
14	Sagor	Dairy Farm	01864780849	Keranigonj, Dhaka
15	Liton Ghosh	Dairy Farm	01710963453	Keranigonj, Dhaka

SL	Name of the Respondent	Farm Name	Mobile No.	Area
16	Johorlal Ghosh	Dairy Farm	01922531327	Keranigonj, Dhaka
17	Haradon Ghosh	Dairy Farm	01992338898	Keranigonj, Dhaka
18	Ramproshad	Dairy Farm	01858927470	Keranigonj, Dhaka
19	Mukhlesor Rahman	Tasmin Dairy Farm	01776830725	Keranigonj, Dhaka
20	Abul Kalam	Dairy Farm	01893826052	Keranigonj, Dhaka
21	Hasan Pillo	Hamim Agro	01301262671	Keranigonj, Dhaka
22	Md. Alauddin	Alauddin Farm	01872314380	Keranigonj, Dhaka
23	Ratan Ghosh	Joti Dairy Farm	-	Keranigonj, Dhaka
24	Khoka Miah	Dairy Farm	01937593870	Keranigonj, Dhaka
25	Ratan Ghosh	Dairy Farm	01813371485	Keranigonj, Dhaka
26	Md. Sohel Rana	Maisor Dairy Farm	01773774244	Ati, Keranigonj, Dhaka
27	Md.Sadek Miah	Dairy Farm	01871219585	Keranigonj, Dhaka
28	Sohel Miah	Jonayer Dairy Farm	01881291263	Keranigonj, Dhaka
29	Md. Noyon Miah	Dairy Farm	01846919970	Keranigonj, Dhaka
30	Morshed	Ahsanullah Agro	01836239823	Keranigonj, Dhaka
31	Barek	Dairy Farm	01962490794	Keranigonj, Dhaka
32	Sujon	Safayet Dairy Farm	01707065607	Ati, Keranigonj, Dhaka
33	Md.Rejoan	Monohoria Dairy	01322006292	Ati, Keranigonj, Dhaka
34	MrittonjoyBaroi	Dairy Farm	01872395595	Keranigonj, Dhaka
35	Nahid	Almodina Cattle Farm	01323268392	Mohammadpur , Beribad, Dhaka

SL	Name of the Respondent	Farm Name	Mobile No.	Area
36	Sirajul	Dairy Farm	019455870399	Bosila, Dhaka
37	Rojob	Dairy Farm	-	Bosila, Dhaka
38	Hanif	Jamal Dairy Farm	01972521031	MohammadpurBeribad, Dhaka
39	Rento Chakma	Dairy Farm	01888221276	Sher-e-Bangla Nagor
40	Abdur Rashid	Dairy Farm	01712927619	Sher-e-Bangla Nagor
41	Rokibul Islam	N.S.Agro	01877809839	Ati, Keranigonj, Dhaka
42	Milon	Milon Agro	01304064555	Ati, Keranigonj, Dhaka
43	Istiak Ahmed	Jara Agro	01993258188	Ati, Keranigonj, Dhaka
44	Md. Alom	Alom Farm	01716914977	Ati, Keranigonj, Dhaka
45	Mokter Hossain	Mokter Farm	01921562229	Bosila, Dhaka
46	Rakib	Simba Farm	01926156471	Bosila, Dhaka
47	NurAlom	Rahma Cattle Farm	01743665044	Bosila, Dhaka
48	Mujammel	Dairy Farm	01967971475	Sher-e-Bangla Nagor, Dhaka
49	Nijamuddin	Dairy Farm	01915925715	Sher-e-Bangla Nagor, Dhaka
50	MdKabir	S.A.C Agro	01703153230	Ati, Keranigonj, Dhaka