PERFORMANCE OF DIFFERENT CROSSBRED CATTLE IN DHAKA DISTRICT

MOST. SADIA AFRIN

DEPARTMENT OF ANIMAL NUTRITION, GENETICS AND BREEDING
SHER-E-BANGLA AGRICULTURAL UNIVERSITY

DHAKA-1207

June, 2022

PERFORMANCE OF DIFFERENT CROSSBRED CATTLE IN DHAKA DISTRICT

BY

MOST. SADIA AFRIN

REGISTRATION NO: 20-11101

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 BREEDING AND GENETICS

SEMESTER: January-June/2020

Approved by:

Dr. Lam Yea Asad
Professor & Supervisor
Department of Animal Nutrition, Genetics and Breeding
Sher-e- Bangla Agricultural University
Dhaka-1207

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

Department of Animal Nutrition, Genetics and Breeding
Sher-e- Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

*This is to certify that the thesis entitled on "**Performance of Different Crossbred Cattle in Dhaka District**" Submitted to the Department of Animal Nutrition, Genetics and Breeding, Faculty of Animal science and veterinary medicine, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in Animal Breeding and Genetics** embodies the result of a piece of bona fide research work carried out by **Most. Sadia Afrin, Registration No. 20-11101,** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.*

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

Dated:
Dhaka, Bangladesh

Dr. Lam Yea Asad
Professor & Supervisor
Department of Animal Nutrition, Genetics and Breeding
Sher-e Bangla Agricultural University
Dhaka-1207

DEDICATED

TO

My beloved Parents

And

Professor Dr.Lam Yea Asad

Acknowledgement

For the very first of all, the author expresses her gratitude to the almighty Allah, the most gracious and supreme authority of the Universe for kind blessings to fortunate the author to accomplish this research work and complete this thesis successfully. Words actually will never be enough to express how grateful the author is nevertheless will try her level best to express her gratitude towards some respected persons for their advice, suggestions, direction and cooperation in completing the research work and thesis.

The author would like to express heartfelt gratitude to her honorable Supervisor Professor. Dr. Lam Yea Asad Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University, Dhaka, for her cordial supervision, innovative suggestions, scholastic guidance, helpful comment, inspiration and timely instructions throughout the entire period of the research.

The author expresses her deep indebtedness to her Co-Supervisor Associate Professor, Dr. Al-Nur Md. Iftekhar Rahman Department of Animal Nutrition, Genetics and Breeding for his scholastic guidance, constructive criticism, untiring assistance and advice throughout the research work and in writing the thesis.

The author would like to express her deepest respect and boundless gratitude to all the respected teachers of the Department of Animal Nutrition, Genetics and Breeding for their valuable teaching, sympathetic co-operation, and inspirations throughout the course of this study and research work.

The author wishes to extend her special thanks to Md. Shakerul islam, Md.himel for their keen help as well as heartiest co-operation and encouragement. Special thanks to all other friends for their support and encouragement to complete this study.

The author is deeply indebted and grateful to hes parents, sister and other relatives for their moral support, encouragement and love with cordial understanding.

Finally, the author appreciates the assistance rendered by the staff of the Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University , Dhaka, who have helped her during the period of study.

The author

Mobile number:01319879148, Mail id: sadiasmrity007@gmail.com

PERFORMANCE OF DIFFERENT CROSSBRED CATTLE IN DHAKA DISTRICT

ABSTRACT

The study was conducted to see the performance of different crossbred cattle likely Sahiwal and local crossbred (SL×L), Holstein and Sahiwal crossbred (HF×SL), and Holstein crossbred (HF×HF). A total 120 crossbred cows were selected from different area of Dhaka district. It was observed that birth weight of calf SL×L, HF× SL, HF×HF was 20.92±1.83 kg, 26.55±2.43 kg, and 37.35±3.79 kg respectively. Mean milk yield per day for SL×L, HF×SL, HF×HF crossbred cattle were 4.45±0.79, 15.73±1.72, 25.6±3.16 liters respectively. Lactation yield was higher 6944.05±970.41 liters in HF×HF crossbred cattle. Age of puberty was shorter 18.12±1.18 months in HF×HF cross and longer 27.47±1,43 months in SL×L crossbred cattle. The reproductive performance of HF×SL crossbred needs minimum service per conception (1.27±0.55) and SL×L crossbred need maximum service per conception (1.37±0.74). Calving interval was higher 15.87±1.09 months in HF×HF crossbred cattle. Dry period was lower 79.5±13.24 days in HF×HF crossbred cattle. From the above perspective it could be concluded that HF×HF crossbred cows may be suitable for profitable farming in Bangladesh but herd life and life time productivity is one of the most influential factor for profitable dairy farming. However, further study with larger sample sizes covering more different management systems would be required to describe a better inference in this consideration.

LIST OF CONTENTS

LIST OF CONTENTS (Cont'd)

LIST OF CONTENTS (Cont'd)

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND SYMBOLS

%	=	Percentage
>	=	Greater than
<	=	Less than
±	=	Plus minus
AI	=	Artificial Insemination
ANOVA	=	Analysis of Variance
BAU	=	Bangladesh Agricultural University
B.C.	=	Before Christ
BLRI	=	Bangladesh Livestock Research Institute
BW	=	Birth Weight
DF	=	Degree of Freedom
Do	=	Days open
DLS	=	Department of Livestock Services
et al.	=	Associate
FAO	=	Food and Agricultural Organization
GDP	=	Gross Domestic Product
Gm	=	Gram
MS	=	Mean Square

LIST OF ABBREVIATIONS AND SYMBOLS (cont'd)

Li	=	Liter
KG	=	Kilogram
NS	=	Non significant
MYPD	=	milk yield per day
NO.	=	Number
AFS	=	Age at first service
SAS	=	Statistical analytical system
SAU	=	Sher-e-Bangla Agricultural University
SAURES	=	Sher-e-Bangla Agricultural University Research System
SE	=	Standard Error
SS	=	Sum of squares
VIZ.	=	Namely

CHAPTER 1

INTRODUCTION

Livestock plays an important role in the development of the traditional economy of Bangladesh. The contribution of livestock in the Gross domestic product (GDP) of Bangladesh in 1.90% with GDP growth rate of livestock at 3.10% in the years of (2021 - 2022) . About two third of the total population in Bangladesh suffer from malnutrition. The magnitude of malnutrition can be substantially reduced by consumption of milk or dairy product. Livestock sector plays an important role for solving the problems of malnutrition, unemployment, empowerment of women, growth of fertility of agricultural land, making talented nation and earning foreign exchange. Approximately, 20% people in the country are directly engaged with the livestock sector.

Bangladesh has a high density of cattle population. The total livestock population of Bangladesh is 4329.79 lakh among them cattle are 247.00 lakh in 2021-2022 year (DLS, 2020). There are over 2.3 million crossbreds available throughout the country (Halder and Hossain, 2014). The dynamic effects of introducing crossbreds are reflected in the milk yield of the country which increased from 23.7 to 106.8 lakh metric ton in the last decade (DLS ,2020). To improve the performance of crossbred dairy cattle, along with production, some other related factors including reproduction, scientific management and disease control procedures needed to be focused Barua *et al.* (2018). Although the cattle population in Bangladesh is considerably high but the productivity is not satisfactory. Meat, milk plays a vital role in meeting the demands food of animal origin in our everyday life. There is a great shortage of milk and meat production in Bangladesh is 7.27 and 6.15 million tons, but the national demand is about 14.69 and 7.05 million tons, respectively (BBS, 2017). Both productive and reproductive performances are influenced by the cow level and farm level determinants (Sarder and Hossain, 2001). Bangladesh has been facing demand and supply mismatches of beef due to insufficient production and supply. Low carcass yield of native cattle and recent no cattle export policy of a long bordered neighboring country, According to last Agricultural census 2008, Bangladesh had very high density of cattle population which was about 188 head per kilometer square (Huque and Khan, 2017). Records of the productive ability and reproductive characteristics of different crossbred cows are essential for future improvement program. We know that the productive and reproductive performance of cows mostly depends on genetic merits of cows. But the productive and reproductive

Performance of dairy cattle also depends on feed, genetics, disease control and management of the environment factors (Sarder and Hossain, 2001; Thornton, 2010; Rahman *et al*. 2014, Hamid *et al*. 2017). The cattle resources of Bangladesh are mostly indigenous type (Bos indicus) with a substantial number of, Sahiwal and Holstein Friesian crossbreds. Indigenous cattle, although well adapted in the harsh environment and more resistant to the common disease, have poor milk yield, short lactation length, long calving interval and late sexual maturity Majid *et al. (*1995). The crossbred cattle performed better than that of exotic and local cattle in terms of adaptability and production.

The economic condition of a dairy farm depends on to a greater extent on the productive and reproductive performance of the animal. The poor reproductive performance of high yielding cows may affect the overall economic performance of the herd especially under high ambient temperature (Jainudeen and Hafez, 2000). The productive performance is considered as average milk yield per lactation per cow, average lactation length of different genotypes. The reproductive performance is considered as age at first hit, age at first calving, service per conception, gestation length, calving interval, days open. Prolong days open and low conception rate is the major constraints limiting the dairy farming in Bangladesh (Rokonuzzaman *et al.* 2009; Alam and Ghos, 1994; Shamsuddin *et al*. 2001). A farm with 13-15 months calving interval, 24 months for age at puberty, 1.33 services per conception and 5kg milk per day per cow could be economically profitable (Azizunnesa, 2010). Cattle any large, even-toed hoofed, ruminant mammals of the genus Bos, family Bovidae. Domestic cattle mostly descended from the wild aurochs (European Ox, now extinct). Domestication of cattle and their propagation at the world level started in the Neolithic agesin about 2000 BC. Bos indicus and Bos taurus are the two distinct species of cattle. *B. indicus*, the Indian Zebu (humped) is available in the Indian subcontinent, characterized in general by lower growth rate, very smaller size, late sexual maturity, poor production, and prone to parasitic attack but resistant to some infectious diseases. On the other hand *B. taurus* (temperate cattle) is characterized by medium to heavy size, early sexual maturity, and has high production potentialities in terms of meat and milk. Cattle has multipurpose functions, it is used for traction of land and cartage and produces milk and meat. Cow dung is used as manure and as fuel, and a substrate for methane production. Cattle hides and skin are used forclothing, bags, shoes etc. In Bangladesh the total cattle population is about 23.4 million of which 11.91 million are males and 11.49 million are females. Included among the cattle population are about there are 3.53 million milking cows, 2.61 million dry cows (those cow without milk),

2.13 million draught cattle, and 4.20 million improved cattle. Since the 1960s, the people of Bangladesh have been rearing three categories of cattle viz pure breed, crossbreed, and local. The pure breed and the crossbreed cattle have high nutritional requirement, less adaptability, and are susceptible to parasitic infestation and diseases compared to the local variety. On the other hand, the local variety is less prone to diseases and is heat tolerant. In Bangladesh the best local cattle are available in some selected areas viz Pabna, Sirajganj, Chittagong, and Munshiganj areas. In Pabna and Sirajganj area medium type cattle are seen, known as Pabna cattle. A Pabna cow can produce 3-5 liter of milk per day. In Chittagong a beautiful red cattle with some distinct characteristics are seen; it is known as Red Chittagong Cattle and may produce about 2 litre milk. In Munshiganj area a type known as White Munshiganj Cattle has also some distinct phenotypic characteristics.

Bangladesh has little opportunity to increase cattle population instead of increase productivity. Thus Bangladesh has taken an opportunity for boosting its bovine industry through ongoing program like cattle fattening and crossbreeding for dairy and beef cattle production. Our native bread grow at a slower rate than most of the temperate fast growing breed. A long term genetic improvement program will be necessary to select the high performing indigenous cattle (Edwards and Shamsuddoha, 2000). Another effective way of improving the performance that has been followed over the last few decades is by replacing the indigenous cattle with high yielding crossbreds. In order to support the increasing demand of meat and milk we need to produce fast growing cattle bread with in a economic FCR. Considering these facts, the present study is designed to understand the productive and reproductive performance of different crossbred cattle of Dhaka district and to recommend farmers the best crossbred cattle which are to be more economic and suitable in existing ecological and sociological condition of Dhaka district.

Thus, there are some necessities to study on this topic further to update the research findings. From that stand point the present research work has been under taken with following objectives:

(1) To observe the productive performance of different crossbred cattle in Dhaka district.

(2) To observe the reproductive performance of different crossbred cattle in Dhaka district.

CHAPTER 2

REVIEW LITERATURE

Many researchers and scientist in different countries of the world have been carried out substantial research works related to the performance of different crossbred cattle. In different areas of our country this type of work also has been done but limited. Besides Dhaka district there is no research work done about this. For this reason, I have selected this area for my study. This chapter includes high lightening of research work which is done by previous researcher and scientist related to the study.

2.1 Cattle bred in Bangladesh

Cattle breed relatively homogeneous variety or group of dairy cattle within a species having similar appearance and usually developed by deliberate selection. No specific cattle breed has yet been established in Bangladesh. But with the long natural selection some improved indigenous varieties of cattle exist in the country. This results from the centenary selection of better animals for increasing milk production. These improved varieties are Pabna Cattle, Red Chittagong, Munshiganj Cattle, and North Bengal Grey Cattle. Their production potentiality is higher as compared to average overall performance of the common local cattle in Bangladesh. Of about 23.4 million cattle heads in Bangladesh, most are non-descriptive indigenous Zebu (humped) type multipurpose animals. The average milk yield being about 206 kg/lactation/cow. Cattle are almost evenly distributed with a little higher concentration in northern part of the country. They are the good source of milk, meat, and draught power; cow dung is used as manure and fuel. The local variety has some good criteria, viz resistant to diseases and parasites, efficient to utilize low quality roughages, and well-adapted to harsh environmental conditions.

2.2 Crossbred cattle in Bangladesh

To improve the production potentialities of the local cattle, efforts were made to cross breed with different exotic breeds several times in the past. The introduced breeds are Holstein-Friesian, Jersey, Sahiwal, Hariana, Sindhi, Australian-Friesian, Sahiwal-Friesian, Holstein etc. A number of exotic pure breeds, their crossbreeds, and up-graded cattle are found in the government dairy farms, commercial dairy farm, milk pocket area, and in urban and semi-urban areas of Bangladesh. Crossbred cow obtained from a cross between individuals of two genetically different breeds. Crossbred cows usually exceed the average performance levels of potential purebreds and thus play an important role in improvement of the livestock.

They have enough economic importance in terms of total production potentialities. Crossbred cattle exhibit greater reproductive fitness than their parents.

A successful crossbred may show 14 to 24 percent more total lactation than pure breeds. It has also been recorded that crossbred have greater livability in comparison to pure breeds (losses from birth to calving were 17.4 percent for pure breeds, and 8.2 percent for crossbreds). For these advantages, Bangladesh undertook innumerable attempts to improve the milk production capacity of zebu cattle through crossbreeding with Bos taurus breeds. Crossbreds of Bangladesh include Sahiwal Pabna cross, Friesian Pabna cross, Sahiwal Local cross, and Friesian cross, and their milk production are 1240, 1460, 728 and 1800 liters per lactation, respectively. But the major problem with crossbreeding is recording of crosses of the individual animals. This means that record keeping is important for maintaining the percentage of crosses as well as performance. The breeding merit of crossbred animals may be slightly reduced because of the heterozygous nature of their genetic composition, and the fact that all animals transmit only a sample half of their own parental traits to their off springs. In Bangladesh, crossbred cattle cannot achieve their production potentialities properly due to harsh environmental conditions, non-availability of green fodder and forage, unskilled management, and lack of knowledge about health care. In fact, crossbred cattle has a higher nutritional requirement and better adaptability than pure breeds.

2.3 Birth weight

kabir and islam (2009) who found that the average birth weight of Friesian cross was 24.1±1.73 kg and for Sahiwal cross was 23.16 ± 2.13 kg. According to Hasan (1995) the average birth weight of SL × Pabna was 21.26 ± 2.89 kg. Islam *et al*. (2009) reported that the birth weight of Local, Local x Friesian were 17.0±0.4 and 22.5±0.3 Kg.

2.4 Milk yield per day

Miazi *et al*. (2007) found that the average milk yield of Sahiwal× Local, Friesian × Local were 4.9±0.95 and 6.0± 1.06 L/day, respectively. Islam *et al*. (1999) also observed that the average milk yield of the Sahiwal × Local, Friesian × Local cows were 2.1±0.69, 4.7±1.01 and 6.2±3.16 liter/day, respectively. The significant effect of genetic group on dairy milk yield is also found by Khan and Khatun (1998) and Nahar *et al*. (1992). Sarder *et al*.(1997) observed that the average milk yield (L/day) for Holstein Friesian cross, Sahiwal cross, Sindhi cross,

Jersey cross and Local cross were 7.2 ± 2.6, 5.8 ± 2.2, 6.4 ± 2.76, 6.9± 2.7 and 4 ± 1.5 liter, respectively.

It was observed that the exotic blood level significantly influenced both productive and reproductive performances. The majority of the crossbred cows have 50% to 75% exotic blood. Higher productive performance of crossbred cattle especially Holstein Friesian (HF) fluctuates due to the use of exotic blood (50%, 75%, 87.5% or 93.8% of HF) with the local zebu or Sahiwal breed. Galukande *et al*. (2013) reported that the exotic inheritance of 75% Bos Taurus genes had 2.7 times higher milk yield than the local cows. Cunningham and Syrstad (1987) concluded that the consistent improvements in most of the performance traits were achieved in upgrading cattle to as much as 50% with the temperate dairy breeds in the tropics and up to 50% genes from temperate breeds can be recommended for the genetic improvement. Crosses with less than 50% Bos tauras genes are poor dairy animals for milk production (Syrstad, 1989) . Nahar *et al*. (2007) found that green grass increases milk yield in lactating crossbred cows. Similarly, Reddy (1998) stated that supplement of green forage with rice straw increased milk production. Macleod *et al*. (1983) also reported an increase in milk production by 0.06 kg per percentage unit increase of concentrates. Similar observations were also found in other studies (Sanh *et al.* 2002; Kuoppala *et al.* 2004). On the other hand, Beyero *et al*. (2015) revealed that increasing green roughage and concentrate ratio in dairy ration reduced milk production. The result may be due to the variation in dry matter intake as well as the change in ruminal fermentation pattern (Beyero *et al*. 2015; Shan-shan *et al*. 2016). Feeding right before milking showed significant ($p<0.05$) effect on milk yield. A study by Johansson *et al*. (1999) revealed that feeding during milking increased milk production compared to feeding 1.5 hour before and after milking. The average daily milk yield, milk yield per lactation or milk yield per calving interval increases with the advancement in parity. Mohamed (2004**)** and Qureshi *et al*. (2020**)** who reported that milk yield increased with advanced lactation up to fourth parity. Molee *et al.* (2011) in Thailand reported a daily milk yield of 11.84 kg in <80% HF crossbred cows. Mohamed-Khair *et al.* (2007) reported daily milk yield of 50%, and 75% HF crossbred cows were 9.77±0.30 and 10.17±0.49 liters.

2.5 Lactation yield

Nahar *et al.* (1992) reported lactation yield of 1702.8±10 kg in friesian crossbreds. Lactation yield mainly depend on lactation length and milk production per day.

2.6 Lactation length

Hasan (1995) found that average lactation lengths of Local × Sahiwal, Friesian× Local dairy cows were 256.3±24.37 and 263.0±30.68 days, respectively. Mainly Disease occurrence, management system, feeding, housing and nutritional supplements has great influence upon lactation length. Lactation length in genetic group from 50% to 70% exotic inheritance is not much different. Hasan (1995) reported that the average lactation period of Jersey, Holstein, Sahiwal and Sindhi crosses were 286, 272, 262 and 255 days, respectively. Uddin *et al.* (2008) observed that the mean lactation length of indigenous, Friesian cross, Sahiwal cross and Sindhi cross were 218.22±28.35, 284.69±1.64, 251.77±3.66 and 259.77±4.9 days respectively. Sultana (1995) reported longest lactation period in SL cows (293 days) over eight genetic groups. Abdel and Alemam (2008) in Holstein-Friesian in Sudan, Sandhu *et al.* (2011) in Holstein-Friesian cattle in Pakistan, Utrera *et al.* (2013) in Holstein cows in México,Niraj *et al.* (2014) in HF crossbred in Ethiopia and M'hamdi *et al.* (2010) in Holstein cows in Tunisian observed an average lactation length of 322, 314, 358, 325 and 309 days.

2.7 Age at puberty

Morrow (1986) and Meyer *et al*. (2004**)** who found that the age at puberty for the crossbred cattle should be approximately between the 1.4 to over 2 years in their native conditions. In previous studies, it has been demonstrated that the well-nourished temperate heifer has the potential to reach the specific weight at 10-12 months, and conceive at 14-15 months of age (Hafez and Hafez, 2013). It was further suggested that the high plan of nutrition could accelerate puberty by increasing the growth rate of heifers. Majid *et al.* (1993) reported the age of puberty of SL×F cattle ranging from 606.4 days (20.2m) to 770.31 days (25.68m). In the present study, the progeny of L×SL×F cows reached early age at puberty than other genetic groups of dam. Environmental condition, nutrition, care and management may affect this trait. Finally, genetic makeup is the main factor, which remarkably influences the age of puberty. Kabir *et al*. (2009) found the age at puberty of Local, Shahiwal × Local and Holstein × Local are 25.92±1.08, 18.0±1.00 and 21.6 ± 2.40 months.

2.8 Age at first service

Majid *et al.* (1995) observed that the age of first fertile service of 50% L × 50% F and 50% SL ×50% L are 26.3±2.5 and 28.6±3.9 months. Factor which results in delayed initiation

puberty include inadequate management and health care (Oyedipe *et al.* 1982; Alam and Ghosh, 1988), state of nutrition (Dobson and Alam, 1987).

2.9 Age at first calving

Asaduzzaman and Miah (2004) found that the age at first calving of Friesian ×Local and Sahiwal × Local were 36.3±3.08 and 37.3±3.01 months. Majid *et al.* (1993) also obtained age at first calving was 42.3 months. Earlier reports showed that under improved management, health care and optimum nutritional status; seasonal stress can be minimized to obtain first calving at about 3.5 years (Oyedipe *et al*. 1982). AFC of 36.37 months reported by Tassew and Seifu (2009) and higher than that of Kiwuwa *et al*. (1983) and Mekonnen (1983) who reported 497 and 420 days, respectively for crossbred cows.

The age at first calving was 32 to 40 months in Friesian crosses demonstrated by Lahousse (1960) and 40.2 months in crossbreds of Boran with Friesian and Jersey (Demeke *et al.* 2004). Sadek *et al.* (1994) depicted that a reduction in AFC will minimize the raising costs and shorten the generation interval and subsequently maximize the number of lactations per head. In general, earlier first calving increases the lifetime productivity of cows. It was also observed that intensive management practices reduced the age at first calving (Sarder and Hossain, 2001). Crossbred cows born in spring, has lower age at first calving (1189±6.6 days) while higher in cows born in Autumn (1557±6.9 days) (Hassan and Khan, 2013). Mureda and Zeleke (2007) mentioned that the different factors are responsible for the advance or delay AFC such as environmental factors, especially nutrition, determine pre-pubertal growth rates, reproductive organ development, and the onset of puberty and subsequent fertility. Substantial evidence exists dietary supplementation of heifers during their growth will reduce the interval from birth to first calving, probably because heifers that grow faster cycle earlier express overt estrus. There was the difference between the age at puberty and AFC of two Friesian crosses. And this is also outlined by Abera (2016) that the variation in age at first service (AFS) and AFC between different exotic blood levels production systems probably due to the difference in genetic potential among different exotic blood levels and difference in management and feeding systems among production systems. Siddiquee *et al.* (2014) who reported that overall age at first calving was 40.00±0.17 months in HF crossbred cows but in 50% and 75% HF crossbred cows were 37.30±0.30 and 44.99±0.32 months, respectively.

2.10 Service per conception

Mondal *et al*. (2005) found that average service per conceptions is 1.63±0.64, 1.60±0.65 and 1.60±0.59 for Sahiwal cross, Sindhi cross and Friesian cross, respectively. The number of services per conception depends upon the stillness of the inseminator, semen quality, sperm motility and physical condition of the sire. Physically strong and disease-free sires have lower service per conception than the others. Artificial insemination has great influence upon the service per conception of crossbred animals.

Service per conception 2.30 for Holstein-Friesian in Sudan reported by Abdel and Alemam (2008), 2.05±1.47 reported by Alewya (2014) in Holstein Friesian dairy cows in Ethiopia, 2.55±1.7 reported by M'Hamdi *et al.* (2010) in Tunisian Holstein cows, and 2.1 reported by Hammoud *et al.* (2010) in Friesian cows in Egypt. Ngodigna *et al.* (2009) found 2.0±1.0 in Holstein Friesian x Bunaji crossbreed cows in Nigeria. Service per conception is influenced by breed, body weight, nutrition, semen quality, time of insemination, skill of the AI worker, and finally health status of the animal. It may be due to the difference in quality and quantity of the semen used during artificial insemination, lack of proper heat detection and time of insemination of the cows as well as lower husbandry practices. An experiment was conducted by Sultana (1995) on the performance of exotic cattle breeds and their crosses in Bangladesh and observed that genetic and non-genetic factors had no significant effect on service per conception. Many other factors like as the quality and quantity of semen used in artificial insemination, improper detection of heat, failure to inseminate at appropriate time and skill of the Majid *et al.* (1995) who observed almost similar service per conception for different genotypes where the value of service per conception of Sahiwal (SL), Friesian (F), Local (L), ½ L-½ F (F_1), ½ SL- ½ F (F_1), ¼ L- ¾F (F_2), ½ L- ½ F (F_2), 1/4 L- ¼ SL- ½ F (F_2), ¼ L- ¼ F- ½ SL and L- ½ F- SL (F_3) were 1.90±0.12, 1.27±0.19, 1.76±0.08, 2.20±0.49,2.21±0.23,2.00±0.37,1.73±0.18,2.00±0.39,1.53±0.19 and 1.25±0.25, respectively.

2.11 Calving interval

Mondal *et al.* (2005) found that the calving intervals were 445±94.9, 451±89.3 and 414±51.4 days for Sahiwal cross, Sindhi cross, Friesian cross. Majid *et al.* (1993) reported the average calving interval range from 434±20 to 454±20 days. Calving interval is the best economic index of any dairy enterprises and it is expected not more than 13 months for cattle.

2.12 Dry period

Nahar *et al.* (1987) found that the average dry period of Sindhi cross and sahiwal were 145.9 and 127.2 days. Gajbhiye and Dhanda (1987) also found the length of dry period is ranging from 131±11 to 162±7.9 days for cattle. The dry period increases with calving age, as a result of the increase of milk yield with the age of the herd. It can be speculated that if milk yield increases with calving age, the dry period would decrease. Dairy cows are usually dried-off for two months prior to the next calving. This rest period is necessary to maximize milk production in subsequent lactations. It was reported that the dry period is required for the renewal of the udder glandular tissue (Capuco *et al;* 1997, Annen *et al;* 2004). Nevertheless, the optimal dry period was established as 60 days. A significant increase in milk yield of the dairy cows exhibited new attention in creating the optimum dry period. A research done in Poland by Borkowska *et al.* (2006) and Winnicki *et al.* (2008) indicated that the extended or excessively shortened dry period leads to a reduction in milk production as compared to the recommended optimum. Long dry periods decrease the average annual production of the cow by extending the calving interval beyond the normal 13 to14 month's interval and causing a decrease in the lifetime production of the dairy cow.

2.13 Days open

This may be due to breed, sire, dam, nutrition, semen type, lactation length and frequency, poor heat detection and extension of postpartum waiting period etc. Khan and Majumder (2011) reported that calving to conception interval in Friesian cross, Sahiwal cross and local cows were 148 ± 8, 139 ± 8 and 116 ± 10 days, respectively. Sarder *et al*. (1997) reported that calving to conception interval in Friesian cross for 148±8 days, SL cross for 139±8 days and Local for 116±10 days. Days open is different may be due to breed, sire, dam, nutrition, semen type, lactationlength and frequency, poor heat detection and extension of postpartum weaning period.

CHAPTER 3

MATERIALS AND METHOD

The present study was done under the Department of Animal nutrition, Genetics and Breeding, Sher-e Bangla Agricultural University (SAU), Dhaka-1207, with the financial support of the sher-e Bangla Agricultural University Research system (SAURES).

3.1 Study area

This study was conducted at different places of Dhaka district and these were Uttara,Tongi ,Nogorbare, Abdullapur, Mohammadpur, Bosila, Mirpur and Keraniganj. The location of the study was illustrated in Figure-1 and Figure-2 respectively.

In this study two approaches were adopted viz.

1. Initial in depth monitoring of the activities of the farm before collection of data.

2. Recording productive and reproductive performance directly from the farms.

3. There is limited data on the productive and reproductive performance of the indigenous cattle. To know the productive and reproductive feature of crossbred cattle in Dhaka district this place was selected.

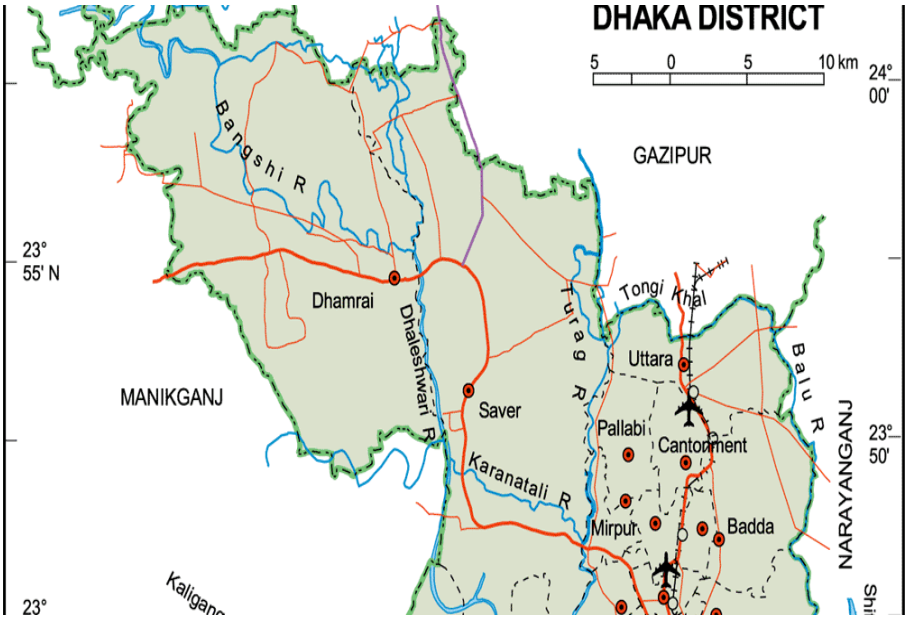

Figure 1 Map of Dhaka district

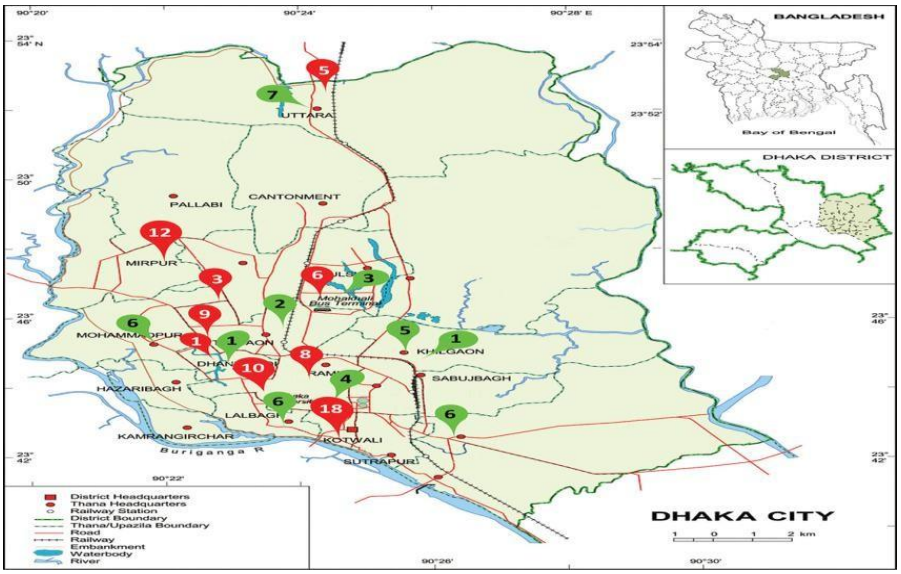

Figure 2 Map showing the study

3.2 Population and sampling of the study

At first, survey was done randomly in different area of Dhaka district to find out distribution pattern i.e. the cattle number per farm, cattle population dynamics and their utility. 120 cows of different crossbred such as SL×L (40 cows), HF×SL (40 cows), HF×HF (40cows) selected for this study. The data were collected from different farms under the District of Dhaka. To obtain reliable information data were collected by myself in January 2022 to December 2022.

3.3 Study period & Data collection

Data for the experiment were conducted through farm to farm visiting during Jan/2022 to Dec/2022. Data were collected by myself through previously prepared interview schedule. Questionnaire includes both open and closed question to collect data with view to objectives of this study. In order to make the data collection program successful, researcher myself visited every farm of selected area during the study period. Direct interview method was used for collection of information.

3.4 Parameters of the study

3.4.1 Birth weight (BW)

Weight at first calving means the body weight of calf when gives birth first. The body weight of calf were recorded in data sheet for analysis.

3.4.2 Weaning period (WP)

Age at which a calf leaves its mother or when a calf starts to take green grass or straw rather than suckling is called age of weaning.

3.4.3 Milk yield per day (MYPD)

Milk yield means milk production expressed in kg per animal and day. The milk yield of crossbred cattle were recorded in data sheet and analyzed.

3.4.4 Lactation length (LL)

Lactation length means the period when a cow gives milk. The total period when cow gives milk were recorded in data sheet and analyzed.

3.4.5 Lactation yield(LY)

An effective lactation yield was computed, defined as the daily yield from 60d before there is calvingto 60 d before the next calving, to account for additional milk yield before calving and for differences in calving interval.

3.4.6 Age at puberty (AP)

Age at puberty is the time between birth and first estrus. When a cow show the sign of first sign that age counted as age of puberty. By observing the wagging tail, swelling, watery discharge from vulva, jumping tendency to other ,mucous paint around peritoneum detect the age of puberty of cattle.

3.4.7 Age at first service (AFS)

Age at first fertile service is defined as the age when a heifer first conceive followed by heat.

3.4.8 Age at first calving (AFC)

Age at first calving indicate that time when cattle give first birth a calf. That is recorded in data sheet for analysis .The clinical bottom line was an optimum range of age at first calving or AFC on dairy farms appears to be 22 to 25 months inclusive. Lower or higher than this figure can bring lower first lactation 305 days in lifetime milk yields, lower fertility, and lower chances of surviving to a second lactation.

3.4.9 Service per conception (SPC)

This is defined as the average number of service or insemination required per conception and is a simple method of assessing fertility (payne, 1970). Experimental animals were serviced by using artificial insemination (A.I) technique.

3.4.10 Calving interval (CI)

The calving intervals were recorded on the basis of interval between the dates of one calving to the date of next calving. The calving intervals were recorded in days. Data were recorded in data sheet for analysis.

3.4.11 Dry period (DP)

The mammary gland of the dairy cow require a non-lactating (dry) period to an impending parturition to optimize milk production in the subsequent lactation. This period is called the dry period.

3.4.12 Days open (DO)

The calving to conception interval (days open), the period between parturition and the following conception of a dairy cow is the major parameter used to determine the reproductive performance and to make an economic decision in dairy herd.

Statistical Analysis

The collected data of the experiment were compiled and included to the Excel spread sheet for statistical analysis. The values of productive and reproductive performances were analyzed by using Statistical Analysis Software (SAS, 1998).

Plate 1 : Visiting farm area & collect data from farm

Plate 2 : Data collection from farm owner

Plate 3 : Data collection from a farm

Plate 4 : Interview taken from a farm manager

CHAPTER 4

RESULTS AND DISCISSION

The study was conducted to see the productive and reproductive performance of Sahiwal (SL) × Local (L), Holstein Friesian (HF) × Sahiwal (SL) and Holstein Friesian (HF) ×Holstein Friesian cows of different areas in Dhaka district. Results on productive and reproductive performances of crossbred cows were summarized in Table 1 and Table 2.

Table 1. Productive performance of different crossbred cattle in Dhaka district.

Breed / Parameter	SL×L (Mean±SD) n=40	HF×SL (Mean±SD) n=40	HF×HF (Mean±SD) n=40	Level of Significant
Birth weight(Kg)	20.92^{c}±1.83	26.55^{b}±2.43	37.35^{a}±3.79	*
Weaning period(m)	7.93^{a}±0.52	4.23^{b}±0.55	2.92^{c}±0.64	*
Milk yield per day(Kg)	4.45^{c}±0.79	15.73^{b}±1.72	25.6^{a}±3.16	*
Lactation yield (Liter)	1114.25^{c}±165.48	3567.42^{b}±274.67	6944.05^{a}±970.41	*

Mean with different superscripts within each column and traits differed significantly
*, ($p<0.05$) ; SD=Standard deviation

4.1 Birth weight (Kg) : The birth weights of calf SL×L,HF×SL,HF×HF crossbred cattle were 20.92±1.83, 26.55±2.43 and 37.35±3.79 kg respectively (Table 1). There is significant difference among three crossbred. The higher birth weight of calf was observed 37.35±3.79 kg for HF×HF crossbred cattle. The lower birth weight of calf was observed in 20.92±1.83 kg for SL×L crossbred cattle. kabir and islam (2009) who found that the average birth weight of Friesian cross was 24.1±1.73 kg and for Sahiwal cross was 23.16±2.13 kg and these results are slightly lower than the present study.

4.2 Weaning period (m) : The weaning period of SL×L, HF×SL, HF×HF crossbred cattle were 7.93±0.52, 4.23±0.55 and 2.92±0.64 months, respectively (Table 1). There is significant difference among three crossbred. The highest age at weaning was 7.93±0.52 months for SL×L crossbred cattle. The lowest age at weaning was 2.92±0.64 months for HF×HF crossbred cattle. Management is the main factor which influences this trait remarkably.

4.3 Milk yield per day (Liters) : The Milk yield per day of SL×L, HF×SL, HF×HF

crossbred cattle were 4.45±0.79, 15.73±1.72 and 25.6±3.16 liters respectively (Table 1). There is significant difference among three crossbred. The highest milk yield was 25.6±3.16 liters for HF×HF crossbred cattle. The lowest milk yield was 4.45±0.79 liters for SL×L crossbred cattle. The result of Milk yield per day 4.45±0.79 liters for SL×L crossbred is closer to the result of Miazi *et al.* (2007) found that the average milk yield of Sahiwal × Local, Friesian × Local were 4.9±0.95 and 6.0±1.06 L/day, respectively. Daily milk yield is also found by Khan and Khatun (1998) and Nahar *et al.* (1992). Sarder *et al.* (1997) observed that the average milk yield (L/day) for Holstein Friesian cross, Sahiwal cross, Sindhi cross, Jersey cross and Local cows were 7.2±2.6, 5.8±2.2, 6.4±2.76, 6.9±2.7 and 4±1.5 liter, respectively these are higher than the present study. The daily milk yield variation possibly occurred due to genetic, biological phenomenon, hormonal influences, feeding system, quality of feed, care taker and severe intensive sun light.

4.4 Lactation yield (liter): The lactation yield of SL×L, HF× SL, HF×HF crossbred cattle were 1114.25±165.48, 3567.42±274.67 and6944.05±970.41 liters respectively in (Table 1). There is significant difference among three crossbred. The highest lactation yield was 6944.05±970.41 liters for HF×HF crossbred cattle. The lowest lactation yield was 1114.25±165.48 liters for SL×L crossbred cattle. Nahar *et al.* (1992) reported that the lactation yield of 1702.8±10 kg in friesian crossbreds. In this present study HF cross bred Lactation yield is higher than theses result. Lactation yield mainly depend on lactation length and milk production per day.

Table 2. Reproductive performance of different crossbred cattle in Dhaka district.

Parameter \ Breed	SL×L (Mean±SD) n=40	HF×SL (Mean±SD) n=40	HF×HF (Mean±SD) n=40	Level of Significant
Lactation length (d)	258.75^{c}±12.12	292^{b}±13.61	326.25^{a}±15.84	*
Age at puberty (m)	27.47^{a}±1.43	20.67^{b}±2.14	18.12^{c}±1.18	*
Age at first service (m)	28.38^{a}±1.22	21.57^{b}±2.0	19.92^{c}±0.94	*
Age at first calving (m)	38.32^{a}±1.22	31.57^{b}±2.0	30.07^{b}±0.97	*
Service per conception(no)	1.37±0.74	1.27±0.54	1.3±0.60	NS
Calving interval (m)	14.58±0.62	14.47±0.90	15.87±1.09	NS
Dry period (d)	139.32^{a}±17.15	109.87^{b}±14.95	79.5^{c}±13.24	*
Days open (d)	171.37^{a}±17.28	158.25^{b}±14.39	158.25^{b}±14.39	*

Mean with different superscripts within each column and traits differed significantly
*, ($p<0.05$) ; SD=Standard deviation, NS : Non- significant

4.5 Lactation length (d) : The Lactation length of SL×L, HF×SL, HF×HF crossbred cattle were 258.75±12.12, 292±13.61 and 326.25±15.84 days respectively in (Table 2). There is significant difference among three crossbred. The highest lactation length was 326.25±15.84 days for HF×HF crossbred cattle. The lowest lactation length was 258.75±12.12 days for SL×L crossbred cattle. Abdel and Alemam (2008) in Holstein-Friesian in Sudan, Sandhu *et al.* (2011) in Holstein- Friesian cattle in Pakistan, Utrera *et al*. (2013) in Holstein cows in México, Niraj *et al*. (2014) in HF crossbred in Ethiopia and M'hamdi *et al*. (2010) in Holstein cows in Tunisian observed an average lactation length of 322, 314, 358, 325 and 309 days. This result is closerto the present study for HF crossbred cattle. Hasan (1995) found that average lactation lengths of Local × Sahiwal, Friesian× Local dairy cows were 256.3±24.37 and 263.0±30.68 days, respectively. This result is closer to the present study for SL× L crossbred.

4.6 Age at puberty (m) : The age at puberty of SL×L, HF×SL, HF×HF crossbred cattle were 27.47±1.43, 20.67±2.14 and 18.12±1.18 months respectively (Table 2). There is significant difference among three crossbred. The highest age was27.47±1.43 months for SL×L crossbred. The lowest age was, 18.12±1.18 months for HF×HF crossbred cattle. This result support the previous result Morrow (1986) and Meyer *et al*. (2004**)** who found that the age atpuberty for the

crossbred cattle should be approximately between the 1.4 to over 2 years in their native conditions.

4.7 Age at first service (m) : The age at first service of SL×L, HF×SL, HF×HF crossbred cattle were 28.38±1.22, 21.57±2.0 and 19.92±0.94 months respectively (Table 2). The highest age at first service was 28.38±1.22 months for SL×L crossbred cattle. The lowest age at first service was 19.92±0. 94 months for HF×HF crossbred cattle. Majid *et al*. (1995) observed thatthe age of first fertile service of 50% L × 50% F and 50% SL × 50% L are 26.3±2.5 and 28.6±3.9 months. This result is similar with present study for L×SL crossbred cattle. Factor which results in delayed initiation of puberty include inadequate management and health care (Oyedipe *et al*. 1982; Alam and Ghosh, 1988), state of nutrition (Dobson and Alam, 1987). Friesian cross progenies showed early age at first service than other genetic groups of dam whereas Rahman *et al*. (1993) reported that average age at first service 47.3±0.5 months. Which is higher than the results obtained in present study for HF×HF crossbred cattle.

4.8 Age at first calving (m) : The age at first calving of SL×L, HF×SL, HF×HF crossbred cattle were 38.32±1.22, 31.57±2.07 and 30.07±0.97 months respectively (Table 2). There is significant difference among three crossbred. The highest age at first calving was 38.32±1.22 months for SL×L crossbred cattle. The lowest age at first calving was, 30.07±0.97 months for HF×HF crossbred cattle. Siddiquee *et al*. (2014) who reported that overall age at first calving was 40.00±0.17 months in HF crossbred cows but in 50% and 75% HF crossbred cows were 37.30±0.30 and 44.99±0.32 months, respectively. This result are higher than present study. Asaduzzaman and Miah (2004) found that the age atfirst calving of Friesian × Local and Sahiwal × Local were 36.3±3.08 and 37.3±3.01 months. These result is closer with present study for L×SL crossbred. The age at first calving was 32to 40 months in Friesian crosses demonstrated by Lahousse (1960) and 40.2 months in crossbreds of Boran with Friesian and Jersey (Demeke *et al*; 2004). This result are higher than present study.

4.9 Service per conception (no) : The service per conception is 1.37±0.74, 1.27±0.55 and 1.3±0.60 for SL×L, HF×SL and HF×HF crossbred cattle were respectively (Table 2). There is no significant difference among three crossbred. The highest service per conception was 1.37±0.74 for SL×L crossbred cattle. The lowest service per conception was, 1.27±0.55 for HF×SL crossbred cattle. Mondal *et al*. (2005) found that average service per conceptions is 1.63±0.64, 1.60±0.65 and 1.60±0.59 for Sahiwal cross, Sindhi cross and Friesian cross, respectively this result is slightly higher than present study.

4.10 Calving interval (m) : The calving interval of SL×L, HF×SL, HF×HF crossbred cattle were 14.58±0.62, 14.47±0.90 and 15.87±1.09 months respectively (Table 2). There is no significant difference among three crossbred. The highest calving interval was 15.87±1.09 months for HF×HF crossbred cattle. The lowest calving interval was 14.47±0.90 months for SL×L crossbred cattle. Calving interval may vary due to the effect of genetic, nutritional, environmental and managemental are condition. Mondal *et al*. (2005) found that the calving intervals were 445±94.9, 451±89.3 and 414±51.4 days for Sahiwal cross, Sindhi cross, Friesian cross. These result was almost similar with the present study.

4.11 Dry period (d) : Dry period of SL×L, HF×SL, HF×HF crossbred cattle were 139.25±17.15, 109.87±14.95 and 79.5±13.24 days respectively (Table 2). There is significant difference among three crossbred. The highest dry period was 139.25±17.15 days for SL×L crossbred cattle. The lowest dry period was 79.5±13.24 days for HF×HF crossbred cattle. Nahar *et al*. (1987) found that the average dry period of Sindhi cross and sahiwal were 145.9 and 127.2 days respectively and this result was closer to the present study for SL crossbred. Gajbhiye and Dhanda (1987) also found the length of dry period ranging from 131±11 to 162±7.9 days for cattle. This result was higher from the present study.

4.12 Days open (d) : Days open of SL×L, HF×SL, HF×HF crossbred cattle were 171.37±17.28, 126.5±11.94 and 158.25±14.39 days respectively (Table 2). There is significant difference among three crossbred. The highest days open was 171.37±17.28 days for SL×L crossbred cattle. The lowest calving days open was 126.5±11.94 days for HF×SL crossbred cattle. Sarder *et al*. (1997) reported that calving to conception interval in Friesian cross for 148±8 days, SL cross for 139±8 days and Local for 116±10 days. These result was close to the present study.

CHAPTER 5

SUMMARY AND CONCLUSION

The study was conducted in Dhaka District, in different farm named Rimi, Hamid, Sarkar, Aftab,Sadek,Islam etc Dairy Farm from Jan/2022 to Dec/2022. The present experiment was conducted under the Department of Animal Nutrition, Genetics and Breeding in Sher-e Bangla Agricultural University (SAU), Dhaka, with the financial support of the Sher-e Bangla Agricultural University Research System (SAURES). This study involves only field work foraccumulation of data. The total 120 data were taken from the area respectively. The main objectives of this study is the evaluation of productive and reproductive performance of crossbred cattle based on different factors. HF×HF is not pure bred. This is crossbred.

The higher birth weight of calf was observed 37.35±3.79 kg for HF×HF crossbred cattle. The lower birth weight of calf was observed in 20.92 ± 1.83 kg for SL×L crossbred cattle. The highest age at weaning was 7.93±0.52 months for SL×L crossbred cattle. The lowest age at weaning was 2.92±0.64 months for HF×HF crossbred cattle. The highest milk yield was 25.6±3.16 liter for HF×HF crossbred cattle. The lowest milk yield was 4.45±0.79 liter for SL×L crossbred cattle. The highest lactation yield was 6944.05±970.41 liter for HF×HF crossbred cattle. The lowest lactation yield was 1114.25±165.48 liter for SL× L crossbred cattle. The highest lactation length was 326.25±15.84 days. The lowest lactation length was 258.75±12.12 days. The highest age at puberty was 27.47±1.43 months for SL×L crossbred. The lowest age at puberty was, 18.12±1.18 months. The highest age at first service was 28.38±1.22 months for SL×L crossbred cattle. The lowest age at first service was 19.92±0.94 months for HF×HF crossbred cattle. The highest age at first calving was 38.32±1.22 months for SL×L crossbred cattle. The lowest age at first calving was, 30.07±0.97 months for HF×HF crossbred cattle. The highest service per conception was 1.37±0.74 for SL×L crossbred cattle. The lowest service per conception was, 1.27±0.55 for HF×SL crossbred cattle. The highest calving interval was for 15.87±1.09 months for HF×HF crossbred cattle. The lowest calving interval was 14.47±0.90 months for SL ×L crossbred cattle. The highest dry period was 139.25±17.15 days for SL×L crossbred cattle. The lowest dry period was 79.5±13.24 days for HF×HF crossbred cattle. The highest days open was 171.37±17.28 days for SL×L crossbred cattle. The lowest calving days open was 126.5±11.94 days for HF×SL crossbred cattle. Judging from the overall analysis of the results, it may be concluded that productive and reproductive performance of Holstein crossbred is superior to other dairy

crossbreds. This result show HF×HF crossbred performance best. HF×SL ranked second in performances While other crossbred performance is relatively lowerperformance.

Recommendation

Based on the findings and conclusions of the study, the following recommendations were made:

The present study was conducted on different farm in Dhaka district. Farm namely Sorkar, Rimi, Sikdar, Hamid, Kabir, Sajjat, Hoque, H.R Agro etc. dairy farm. Findings of the study need further verification through similar research in other parts of the country. This study investigated on twelve productive and reproductive parameters on the basis of farms information. Therefore, it is recommended that further studies should be conducted involving other variables in these regards. It is also recommended that proper care and management also helps for better productive and reproductive performance of crossbred cattle in Dhaka district.

REFERENCES

Abdel, R.I.M.K. and Alemam, T.A. (2008). Reproductive and productive performance of Holstein-Friesian cattle under tropical conditions with special reference to Sudan - a review.Agric. Rev; 29: 68-73.

Abera, M. (2016). Reproductive and Productive Performances of Crossbred and Indigenous Dairy Cattle under Rural , peri-urban and Urban Dairy Farming Systems in West Shoa Zone, Oromia, Ethiopia. Doctoral dissertation , Jimma University, Jimma, Ethiopia.

Alam, M. G. S. and Ghosh, V. (1988). Reproductive performance of cows: Its relation to parity and season. Bangladesh Vet. J. 22:51- 61.

Alam, M.G.S. and Ghosh, A. (1994). Plasma and milk progesterone concentration in early pregnancy diagnosis in Zebu cows . Asian-Australasian J. Anim. Sci. 78, 131-136

Alewya, H. (2014). Comparative study of reproductive and productive performance of Holstein Friesian dairy cows at Holeta Bull Dam Station and Genesis Farms. MSc Thesis , Department of Animal Production Studies, Addis Ababa University.

Annen, E. L., Collier, R. J., Mcguire, M. A. and Vicini , J. L. (2004). Effects of Dry Period . Length on Milk Yield and Mammary Epithelial Cells . Journal of Dairy Science, 87: E66 E76.

Azizunnesa, Sutradhar, BC., Hasanuzzaman, M., Aktaruzzaman, M., and Faruk, MO. (2010). Study on the productive and reproductive performances of Red Chittagong cows at rural areas in Chittagong. Univ. J. Zoo. Raj, 28: 27-31.

Barua, S., Alam, M. J., Rahman, M. M., Farid, M. S. and Koiry, S. (2018). Selected Factors Associated with Dairy Farms Profitability of Chittagong District in Bangladesh. Asian Research Journal of Arts & Social Sciences, 7: 1–12.

BBS, (2017). Statistical Year book of Bangladesh. Bangladesh Bureau of Statistics Government of Bangladesh .

BBS, (2018). Report on Agriculture and Rural Statistics. Government of the People's Republic of Bangladesh.

Beyero, N., Kapoor, V. and Tewatia, B. S. (2015). Effect of different roughage: Concentrate ratio on milk yield and its fatty acid profile in dairy cows. Journal of Biology, Agriculture and Healthcare, 5: 176-185.

Borkowska, D., Janus, E. and Malinowska, K. (2006). Zaleznosc pomiedzy dlugoscia okresu zasuszenia krow a ich produkcyjnoscia w nastepnej laktacji. Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego, 2: 27–32.s

Capuco, A. V., Akers, R. M. and Smith, J. J. (1997). Mammary Growth in Holstein Cows During the Dry Period: Quantification of Nucleic Acids and Histology. Journal of Dairy Science, 80: 477–487.

Cunningham, E. P. and Syrstad, O. (1987). Crossbreeding Bos indicus and Bos taurus for milkproduction in the tropics. FAO Animal Production and Health Paper (No. FAO APHP- 68).

Demeke, S., Neser, F. W. C. and Schoeman, S. J. (2004). Estimates of genetic parameters for Boran, Friesian and crosses of Friesian and Jersey with the Boran cattle in the tropical Highlands of Ethiopia: reproduction traits. Journal of Animal Breeding and Genetics, 121: 57–65.

DLS, (2020). Livestock econoour at a glance, Ministry of Fisheries and Livestock, Governmentof the People's Republic of Bangladesh.

DLS, (2021- 2022). Livestock Economy at a Glance. Department of Livestock Services , Bangladesh.(http://www.dls.gov.bd/site/page/22b1143b - 9323 - 44f8 - bfd8647087828c9b/Livestock - Economy)

Dobson, and Alam ,M.G.S. (1987). Preliminary investigation into endocrine system of sub fertile Cattle: Location of common lesion (rate limiting step). J. Endocrinol. 113:167171.

Edwards, G. and Shamsuddoha, A. (2000). Dairy Industry in Bangladesh of : Problems and Prospects. Proc. of the Australian Agricultural and Resource Economics Society 2000 Conference (44th), 23-25 January 2000, Sydney, Australia (No. 123730).

Gajbhiye, P.U. and Dhanda, O.P. (1987). Sire evaluation and production performance of Gir cattle. Indian Vet. J. 64:1043-1048.

Galukande, E., Mulindwa, H., Wurzinger, M., Roschinsky, R., Mwai, A. O. and Sölkner, J. (2013). Cross-breeding cattle for milk production in the tropics: achievements, challenges and opportunities.Animal Genetic Resources/Ressources génétiques animales/Recursos genéticos animales, 52: 111–125.

Hafez, E. S. E. and Hafez, B. (2013). Reproduction in farm animals. John Wiley & Sons.

Halder, S. R. and Barua, P. (2003). Dairy production, consumption and marketing in Bangladesh. Research & Evaluation Division, BRAC, 13.

Hamid, M. A. and Hossain, K. M. (2014). Role of psrivate sector in the development of dairyindustry in Bangladesh. Livestock Research for Rural Development, 26: 22–25.

Hammoud, MH., El-Zarkouny, S.Z. and Oudah E.Z.M, (2010). Effect of sire, age at first calving, season and year of calving and parity on reproductive performance of Friesian cows under semi-arid conditions in Egypt. Arch. Zoo. Tech., 13: 60-82.

Hasan, M.M. (1995). Distribution pattern and some economic dairy characters of locals and crossbred cows in Mymensingh Sadar, M.S. thesis, Department of Dairy Science Agricultural University, Mymensingh.

Hassan, F. and Khan, M. S. (2013). Performance of crossbred dairy cattle at military dairy farms in Pakistan. Journal of Animal and Plant Sciences, 23: 705–714.

Huque, K.S. and Khan, M.Y.A. (2017). Socio-geo graphic distribution of livestock and poultry in Bangladesh a review.

Islam, S.S. and Bhuiyan, A.K.F.H. (1997). Performance of crossbred Sahiwal at the Pabna milk shed area in Bangladesh. Asian Australas. J. Anim. Sci. 10(6): 581-586.S

Islam, S.S., Sultana, Rokonuzzaman, M. and Hassan, M.R. (2009). Productive and reproductive performance of crossbred and indigenous dairy cows under smallholder farming system. J. Bang. Agri. Univ., 7: 69–72.

Islam, A., Wadud, A., Rabbani, M.G. and Hossain, B., (1999). Rearing practices and milk production ofdairycattleinThakurgaondistrict.Bangladesh J. Anim. Sci., 27: 172-176.

Jainudeen, M.R. and Hafez, E.S. (2000). Reproduction in farm animals, reproductive failure infemales, reproductive failure, 8(4): 294-322.

Johansson, B., Uvnäs-Moberg, K., Knight, C. H. and Svennersten-Sjaunja, K. (1999). Effect of feeding before, during and after milking on milk production and the hormones oxytocin, prolactin, gastrin and somatostatin.The Journal of Dairy Research, 66(2): 151-163.

Karim, Z., Huque, K. S., Hussain, G., Ali, Z. and Hossain, M. (2010). Growth and Development Potential of Livestock and Fisheries in Bangladesh. Bangladesh Food Security Investment Forum; May 26–27, 2010; Dhaka, Bangladesh.

Khan, M.K.I and Khatun, MJ. (1998). Performances of F_1 cross breed cows at Baghabarighat Milk shed area. Bangladesh J. Anim. Sci. 27:183-186.

Khan, M.k.I. and Mazumder, J. (2011). Economic selection index using different milk Production traits of Holstein and its crossbreds. Turk. J. Vet.

Kiwuwa, G. H., Trail, J. C. M., Kurtu, M. Y., Worku, G., Anderson, F. M. and Durkin, J. (1983). Crossbred dairy cattle productivity in Arsi Region, Ethiopia. International Livestock Centre for Africa (ILCA), Research Report, No. 11. 1-29.

Kuoppala, K., Yrjänen, S., Jaakkola, S., Kangasniemi, R., Sariola, J. and Khalili, H. (2004). Effects of increasing concentrate energy supply on the performance of loose-housed dairy cows fed grass silage-based diets. Livestock production science, 85(1): 15-26.

Lahousse, A. (1960). The effect of age at first calving on milk production. In Annales de Gembloux, 66: 212-217.

M.Y. and Hossain, M.M. (2005). Comparative study on the productive and reproductive Performance of different dairy genotypes reared in Bangladesh Agricultural University Dairy Farm. Pak. J. Nutr., 4(4): 222-225. https://doi. org/10.3923/pjn.2005.222.225

M'hamdi, N., Bouallegue, M., Frouja, S., Ressaissi, Y., Brar, S.K. and Hamouda, MB. (2010). Effects of environmental factors on milk yield, lactation length and dry period in Tunisian Holstein Cows. pp. 153-164.

Macleod, G. K., Grieve, D. G. and Millan, I. (1983). Performance of first lactation dairy cows fed complete rations of several ratios of forage to concentrate. Journal of Dairy Science, 66(8): 1668-1674.

Majid, M.M., Nahar, T.N., Talukder, A.I. and Rahman, M.A. (1993). Reproductive performance of pure breed F_1, F_2 and F_3 cows raised in Savar Dairy Farm. Bangladesh J. Livestock Res. 11:53-62.

Majid, M.A., Nahar, T.N., Talukder, A.I. and Rahman, M.A. (1995). Factors affecting the reproductive efficiency of crossbred cows. Bang. J. Anim. Sci., 2: 18-22.

Majid, M. A., Nahar, T. N., Talukder, A. I. and Rahman, M. A. (1995). Reproductive the

Performance of pure breed F_1, F_2 and F_3 cows raised in Savar dairy farm. Bangladesh Journal of Livestock Research, 2: 53–6.

Mekonnen, G. (1983). Preliminary Evaluation of Holistein Breed and their Half-Breeds for Milk Production. Ethiopian Journal of Agricultural Sciences, 1 (1): 43-49.

Meyer, M. J., Everett, R. W. and Amburgh, M.E. Van. (2004). Reduced age at first calving: effects on lifetime production, longevity, and profitability. Proc. of the Arizona Dairy Production Conference, Tempe, Arizona, 42–52 pp.

Miazi, O.F., Hossain, M.E. and Hassan, M.M.. (2007). Productive and reproductive performance indigenous Dairy cows under rural conditions in Comilla. Bangladesh. Univ. J. Zool. Rajshahi Univ., 26: 67-70. https://doi. org/10.3329/ujzru.v26i0.702

Mohamed, M. A. E. R. (2004). Studies on some performance traits of butana cattle in atbara livestock. Doctoral Thesis, University of Khartoum, Sudan.

Mohamed-Khair, A.A., Ahmed, T.B., Musa, L.A. and Peters, KJ. (2007). Milk production and reproduction traits of different grades of Zebu x Friesian crossbreds under semi-arid conditions. Arch. FuerTierz. Dumm., 50: 240- 249.

Molee, A.B., Bundasak, P., Kuadsantiat. and Mernkrathoke, P. (2011). Suitable percentage of Holstein in crossbred dairy cattle in climate change situation. J. Anim. Vet. Adv., 10: 828-831.

Mondal, S.C., Alam, M.M., Rashid, M.M., Ali, and Morrow, A. (1986). Current therapy in theriogenology. 2nd ed. W.B. Saunders Company., The Curtis Center, Independence Square, West Philadelphia, PA 19106.

Mureda, E. and Zeleke, Z. M. (2007). Reproductive performance of crossbred dairy cows in eastern lowlands of Ethiopia. Livestock Research for Rural Development, 19 (11). Article No. 161.

Nahar, A., Al-Amin, M., Wadud, A., Monir, M. M. and Khan, M. A. S. (2007). Effect of partial green grass over dry feeding on the productive performance of early lactating crossbred cows in Bangladesh. International Journal of Dairy Science, 2(1): 73-78.

Nahar, N., Mostafa, K.G. and Amin, M.R. (1987). Comparative study on the performance of F. cross-bred cows. Bangladesh J. Anim. Sci., 18(1-2): 55-62.

Nahar, T.N., Islam, M. and Hasnath, M.A. (1992). A comparative study on the performance HF. Crossbred cows under rural conditions in and around the BAU campus.

Ngodigha, EM., Etokeren, E. and Mgbere, O. (2009). Evaluation of age at first calving and number of service per conception traits on milk yield potentials of Holstein Frisian x Bunaji crossbred cows. Res. J. Anim. Sci., 3: 6-9.

Niraj, K,E., Alemayehu, Abreha, T. and Hailelule, A.Y. (2014). Productive performance of indigenous and Holstein- Friesian crossbred dairy cows in Gondar, Ethiopia. Vet. World, 7**:** 177-181.

Oyedipe, E.O., Osori, D.I.K., Akerejola, O. and Saror, D. (1982). Effect of level of nutrition on the onset of Puberty and conception rate of Zebu heifers. Theriogenology. 18:525- 539.

Qureshi, M. S., Akhtar, S., and Suhail, S. M. (2020). Seasonal stress affects reproductive and lactation traits in dairy cattle with various levels of exotic blood and parities under subtropical condition. Pakistan Journal of Zoology, 52: 147–155.

Rahman, M F., Islam, N., Hossain, M.A., Prodhan, M.U.M. and Rahman, A. (1993). Reproductive patterns of different breeds of cows in Bangladesh. Bangladesh J. Livestock Res. 1:19-24.

Rahman, M.M., Islam, M.N. and Dev, A., Reddy, D.V. (1998). The effect of supplementation of green forages (Cenchrus ciliaris/ Stylosanthes hamata/ subabul) on utilization of rice straw- poultry droppings rice bran fish meal diet in cows. Journal of Dairy Science, 14: 31-44.

Rokonuzzaman, M., Hassan, M.R., Islam, S. and Sultana, S. (2009).Productive and reproductive performance of crossbred and in- digenous dairy cows under smallholder farming system. J. Bangladesh Agric. Univ. **7,** 69-72.

Sadek, R. R., Helali, E. A., Safwat, M. A., Ibrahim, S. A. M. and Abd El-fatah, A. (1994). Evaluation of Friesian cattle performance in commercial farms in Egypt.

Sandhu, Z.S., Tariq, M.S., Balochand, M.H., Qaimkhani, M.A. (2011). Performance analysis of Holstein-Friesian cattle in intensive managementat Dairy Farm Quetta, Balochistan,Pakistan. Pak. J. Soc. Sci., 9: 128-13.

Sanh, M. V., Wiktorsson, H. and Ly, L. V. (2002). Effects of natural grass forage to concentrate ratios and feeding principles on milk production and performance of crossbred lactating cows. Asian-Australian Journal of Animal Sciences, 15(5): 650-657.

Sarder, M.J.U., Shamsuddin, M., Bhuiyan, M.M.U. and Rahman, M.A. (1997). Individual cows determinant of the fertility and productivity in mini dairy farm. Bangladesh Vet. J. 31:91-98.

Sarder, M. J. U. and Hossain, M. A. (2001). Reproductive and productive performance of indigenous cows. The Bangladesh Veterinarian, 18: 123–129.

Sarder, M.J.U., Shamsuddin, M., Bhuiyan, M.M.U. and Rahman, M.A. (1997). Individual cows' determinant of the fertility and productivity in mini dairy farm. Bangladesh Vet. J., 31: 91-98.

Shamsuddin, M., Bhuiyan, M.M.U., Sikder, T.K., Sugulle, A.H., Alam, M.G.S. and Galloway, D. (2001). Constraints limiting the efficiency of artificial insemination of cattle in Bangla- desh. Pp. 9-27 in Proc. Final Res. Co-ordination Meet. Radio-immun. Rel. Techniq. Imp. Artificial Insem. Prog. Cattle Rear. Trop. Sub-trop. Condit. Uppsala, Sweden.

Shan-shan, S., Na, Z. and Qing-zhang, L. (2016). Effect of different roughages on milk protein and milk fat synthesis in dairy cows. Journal of Northeast Agricultural University (English Edition), 23(4): 40-46.

Siddiquee, N.U., Wadud, M.A., Bhuiyan, M.S.A., Rahman, A.K.M.A., Amin, M.R. and Bhuiyan, A.K.F.H (2014). Suitability of temperate and tropical crossbred dairy cattle under peri-urban production system in Bangladesh. Pak Pub. Gro., 1: 26-36.

Singh, A. S. and Mishra, M. (1980). Physiological responses and economic traits of Holstein, Jersey, crossbred and Hariana cows in hot and humid environment. Indian Journalof Dairy Science, 33: 174–181.

Sultana , R. (1995). Quantitative analysis of reproductive perform- ance of purebred and their crosses in the Savar Dairy Farm. MS Thesis. Bangladesh Agricultural University Mymensingh, Bangladesh.

Syrstad, O. (1989). Dairy cattle cross-breeding in the tropics: Performance of secondary cross-bred populations. Livestock Production Science, 23: 97–106.

Tassew, A. and Seifu, E. (2009). Smallholder dairy production system and emergence of dairy cooperatives in Bahir Dar Zuria and Mecha Woredas, Northwestern Ethiopia. World Journal of Dairy & Food Sciences, 4: 185–192

Thornton, P. K. (2010). Livestock production: recent trends, future prospects. Philosophical Transactions of the Royal Society B: Biological Sciences, 365: 2853–2867.

Uddin, M.K, Wadud, A., Begum, D., Siddiki, M.S.R. and Rashid, M.H. (2008). Productive and Reproductive performance of indigenous and crossbred cattle in Comilla District. Bangladesh J. Anim. Sci. 37(1):39-43.

Utrera, ÁR., Robles, R.C.C. and Rodríguez, J.R.G. (2013). Effects of breed, calving season and parity on milk yield, body weight and efficiency of dairy cows under subtropical conditions. Int. J. Anim. Vet. Adv., 5: 226-232.

Winnicki, A., Glowicka-Woloszyn, R., Helak, B., Dolska, M. and Jugowar, J. L. (2008). Wplyw dlugosci okresu zasuszenia krow na wydajnosc i jakosc mleka w nastepnej laktacji (Effect of a dry period length on milk production and quality in next lactation). Prace i materiały Zootechniczne. 65, 17.

APPENDICES

Appendix 1: Questionnaire the study

Questionnaire on Performance of Different Crossbred Cattle in Dhaka District Date: Serial :

Number:

Name of the farm	
Name of the Owner	
Name of the farm area	
Types of Breed	
Number of cows	

Parameters

Birth weight	
Weaning period	
Milk yield per day	
Lactation length	
Lactation yield	
Age at puberty	
Age at first service	
Age at first calving	
Age at first service	
Calving interval	
Dry period	
Days open	

Collected data by: Sign:

Appendix-2

(List of the sampled farmers)

Name of the Respondent	Farm Name	Mobile No.	Area
1. Md. Shahin	Sarkar Dairy Farm	01819297468	Helal market, uttarkhan, Dhaka
2. Md. hamid	Hamid Dairy Farm	01914950466	Daskhin khan, Uttara, Dhaka
3. Md. Moynal	Rimi Dairy Farm	01723671593	Majar road, Uttarkhan, Dhaka
4. Abdul Khan	Major Agro Farm	01822333827	Namapara, Daskhin Khan, Uttara, Dhaka
5. Abul kalam	sompa Dairy Farm	01965393005	kotbari, Abdullahpur, Dhaka
6. Md.Nuru	Nuru Dairy Farm	01712000269	kotbare, Abdullahpur, Dhaka
7. Jaman Reja	H.R. Agro	01678113848	Teromuk, Uttarkhan
8. Md. Hasan	Uttara Agro	01822089326	Sector 10, Uttara
9. Al-Amin	Al-Amin Dairy	01990146262	Ashulia,Dhaka
10. Md. Nasir	Sadek Agro	01744591992	Mohammadpur beribadh, Dhaka
11. Ali Shahin	Meghdubi Agro	01715786158	Bosila, Dhaka
12. Md. Kalam	Sara Agro	01913510880	Bosila, Dhaka
13. Md. Naim	Wealth Agro	01732294285	Mohammadpur beribadh,
14. Shoriful Islam	Islam Agro	01893460281	Bosila, Dhaka
15. Md. Anoar	Jakir Dairy Farm	01715082799	Mohammadpur,Dhaka

Name of the Respondent	Farm Name	Mobile No.	Area
16. Md. Iftekhar	Domestic Agro	01997207591	Bosila, Dhaka
17. Ashraful	Dairy Farm	01881678723	Keranigonj, Dhaka
18. Roni	Songita Dairy Farm	01826661884	Keranigonj, Dhaka
19. Hazi Emdad	Anik Dairy Farm	01864507374	Keranigonj, Dhaka
20. Horilal Sarker	Dairy Farm	01731959728	Keranigonj, Dhaka
21. Md. Nahid	Al-Madina Farm	01323268392	Mohammadpur beribadh, Dhaka
22. Md. Hanif	Jamal Dairy Farm	01972521031	Mohammadpur beribadh, Dhaka
23. Md. Sirajul	Siraj Dairy Farm	01945587039	Bosila, Dhaka
24. Md. Rajab	Dairy Farm	01924046664	Bosila, Dhaka
25. Md.Mostafa	Sun-Agro	01716118351	Uttara, Dhaka
26. Jaman Sarker	Shuddho Dairy	01713468561	Uttara, Dhaka