

Acknowledgements

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List of Abbreviation

Abbreviation	Elaboration
HF	Holstein Friesian
LC	Local Breed
SL	Sahiwal

Abstract

The study was conducted to observe the productive and reproductive performances and disorders of dairy cattle in farming condition in rural area. The selected study area was Pekua sadar upazila and survey was performed from 1st February 2021 to 30 April 2021. The data reported that about 36.67% of farmers were landless, 30 %, 13.33 % & 20.00 % were small and medium sized and large farmers respectively. The data showed that most of the cattle farmers were poor, illiterate & had a high number of family members. For obtaining this goal, 100 cross-bred dairy cattle were observed. 75% Holstein Friesian(HF) × 25% Local Breed(LC), 50% Local Breed(LC) × 50% Sahiwal (SL) and 75% Holstein Friesian(HF) × 25% Sahiwal (SL) cows were investigated and evaluated for their productive and reproductive performance. In case of productive performance, the study found that the average milk production in HF×LC, LC× SL and HF×SL cross breeds were 12.28±1.5 liters, 7.6±1.2 and 10.61±1.44 liters respectively. The average lactation length in HF×LC, LC× SL and HF×SL cross breeds were found 265.45±0.87days, 255.50±0.56days and 270.33±0.61days respectively during which the average peak lactation period was found 2.67±0.14, 2.33±0.15 and 2.56±0.08 months respectively. The reproductive performance found in the study showed that in HF× LC, the average age of puberty and age of first calving were 16.25±0.46 and 24.89±0.18 months, in LC×SL were 20.22±0.06 and 28.55±0.35 months and in HF×SL were 19.32±0.08 and 28.08±0.37 respectively. The average gestation period in HF×LC, LC× SL and HF×SL were found 278.38±0.15, 281.28±0.11 and 280±0.17 days in order and average inter-calving period were 18.55±0.04 and 18.45±0.05 and 18.42±0.05 months respectively. The average postpartum heat of the HF×LC, LC× SL and HF×SL was found 56.87±0.77, 85.33±1.24 and 70.53±1.12days in turn and the average service per conception were found 1.86±0.18days, 1.93±0.18 and 1.70±0.22 days respectively. Considering all parameters cross breed cattle can be reared in commercial farm condition in Bangladesh.

Keywords: productive & reproductive performances, Holstein Friesian cattle, Sahiwal cattle
Cross-bred cattle

Chapter 1: Introduction

Production of livestock has been considered as a major economic sector and still to be continued in the future in most part of the world. Dairy sector development in small holder farming system is one of the key strategic important areas for addressing food security and improved livelihood in developing countries like Bangladesh.

Dairy cattle also play a great role in reducing poverty by alleviating economic crisis of the world and generating regular income to the small holder dairy farms.

Bangladesh is a densely populated country having about 164.6 millions of people in its 147570 sq. km of area. (BBS, 2019). Contribution of Livestock in Gross Domestic Product (GDP) is 1.47%. Share of Livestock in Agricultural GDP is 13.46, Employment (Directly) 20 %, Employment (Partly) 50 % (BBS, 2019). Livestock population in Bangladesh is currently estimated to comprise 25.7 million cattle, 0.83 million buffaloes, 14.8 million goats, 1.9

important segment of human resources, who need attention for their development. There is a close relationship between the status of women and the socio-economic development in any country. Most of the small scale dairy farm are belongs to women which contributes in GDP. Dairying is the mixed farming system in Bangladesh and it is the strong tools to develop the micro economy in village (Saadullah, 2008). The Average 500- 600 litre milk may be produced by crossbreed cattle per lactation. (Mondal et al, 2005).

The productive & reproductive performances of most dairy farms are below the optimum level. Therefore the dairy farms are becoming losing industry and the farmers are changing their occupation. Dairy farming is a part and parcel of integrated farming system in Bangladesh (Saadullah et al., 1997).

However, the number of crossbred cattle is increasing day by day with the availability of artificial insemination (AI) practices throughout the country. Reasonable number of landless and marginal farmers have found crossbreed cows as a profitable enterprise under improved nutrition, better disease control and management.

The most economic traits of the milk-producing animals are average body weight, milk yield, calving interval, conception rate, birth weight of calves, gestation length, calving interval etc. Indigenous cows (*Bos indicus*) are our resource. Their milk quality is good but the productive and reproductive performance is not up to mark (Rahman et al., 1998). It varies between 300 to 400 liters per lactation period of 180 to 240 days of local cow. On contrary crossbred cows yield from 600 to 800 liters per lactation of 210 to 240 days (Islam, 1992).

Objectives of the current study are:

- To evaluate the productive and reproductive performance of different crossbred dairy in Pekua upazila, Cox's bazar District.
- To know about prevalence of reproductive disorder of dairy cow at rural area under farm condition
- To recommend farmers about cross breed cattle which are to be suitable in existing ecological and socio-economic condition of Bangladesh

Chapter 2: Materials & Methods

2.1 Survey design and conduct

Survey methods are one of the several methods of data collection. The survey was designed to obtain necessary data of dairy cattle farming. The survey method for the present study involved the steps which are described below.

2.2 Selection of the study area:

The study areas were selected randomly on the basis of availability of dairy cow in a particular region and as an integral part of internship placement. Data were collected from a sample of 100 cows from different large, medium and small scale dairy farm selected randomly during 1st Feb 2021 to 30 April 2021 through a pre-tested interview schedule (attached in Appendix). The main purpose of this study was to assess productive and reproductive performances with common reproductive disorders of different dairy cows in Pekua Sadar, Shilkhali and Barabakia union under Pekua Upazila of Cox's bazar district. The entire rural dairy farmers of those mentioned union constituted the population of the study. Under the study the following consideration was taken as vital point:

- The area is blessed with the better communication facilities
- Availability of dairy farm in that particular area
- Expectation of co-operation from the respondents so that reliable data might be obtained

2.3 Study Population:

About 100 cows of 3 different crossbreeds were selected. They were 75% Holstein Friesian \times 25% Local Breed (FL), 50% Local Breed \times 50% Sahiwal (LSL) and 75% Holstein Friesian \times 25% Sahiwal (HSL)

2.4 Preparation of questionnaire:

The questionnaires were prepared before conducting the field survey. The following points were taken into consideration for making the questionnaire:

- Socioeconomic condition of dairy farmer,
- Biological information about cow such as body weight, birth weight, age at puberty etc.
- Disease and Disorder information such as abortion, stillbirth, retained Placenta, dystocia, uterine Prolapse, vaginal Prolapse, anestrous, repeat Breeder, metritis etc.

2.5 Methods of data collection:

Accurate data with necessary information were collected by the myself, which was a bit troublesome. The farmers are reluctant or sometimes hesitate to give necessary information deliberately without any benefit. Only the large scale dairy farmers have a written documents or record. But I tried my best so far possible to achieve the accurate data from the farmers. Question was asked systematically and explanation was given wherever necessary. What type of data was collected are given below.

Productive parameters are as follows-

- Milk yield (litre/day)
- Length of lactation (days)
- Peak milk production (Months)
- Dry Period (Days)

Reproductive Parameters are as follow-

- Age of puberty
- Age of first calving
- Calving interval
- Gestation period
- Service per conception (Number)
- Calf birth weight

- Post-partum period

Reproductive Disorders are as follows-

- Abortion
- Stillbirth
- Retained Placenta
- Dystocia
- Uterine Prolapse
- Vaginal Prolapse
- Anestrous
- Repeat Breeder Syndrome
- Metritis

2.6: Statistical Analysis of Data:

The collected data was compiled, tabulated and analyzed in accordance with the objectives of the study. The data were subjected to statistical analysis using MS Excel program to compute analysis of variance and means of each variance with standard error (SE) according to Steel and Torrie (1980).

Chapter 3: Results & Discussion

The total recorded data for knowing productive and reproductive performance are shown below.

3.1. Productive Performance:

3.1.1 Milk Yield:

In this study, the average milk production in 75% Holstein Friesian × 25% Local Breed (FL), 50% Local Breed × 50% Sahiwal (LSL) and 75% Holstein Friesian × 25% Sahiwal (HSL) cross breeds found 12.28±1.5 liters, 7.6±1.2 and 10.61±1.44 liters respectively. The Milk yield differ significantly ($P<0.05$) among three different crossbred cattle. Highest milk production was recorded in Local × Friesian and the lowest in Local × Sahiwal cross breed. These results are partially agree with findings of Sultana et al. (2001). She found that Friesian-Local cross, Sahiwal-local cross, Friesian-Shahiwal cross were 7.20± 1.07, 4.86 ±0.85 and 6.70±0.86 .

Table 3.1: Milk production of different cross breeds under farm condition

Breeds	No. of cattle	Mean milk Yield (L/day/cow)	Standard error (S.E)	Maximum milk production(L/day/Cow)	Minimum milk production(L/day/cow)
Friesian × Local	46	12.28	0.11	16	10
Local × Sahiwal	34	7.6	0.19	12	5.5
Friesian × Sahiwal	20	10.61	0.15	13	8.0

The milk yield data revealed that Local x HF has shown the better efficiency in milk production. In this case, the average milk production of Local X Friesian 12.28 liters which more than others Friesian cross (7.73±0.73) liters (Nath et al.,2016). The result of the present study agrees with the work of (Hossain et al.,2016), who observed, daily milk yield in crossbred was 12.90±0.72 liter/cow. Kabir et al., (2009) reported that the average daily milk yield of Local x Friesian graded animals were 12.03 ± 3.73 L/day and Nahar et al., (1992) found 7.5 ± 0.1 L/day. The variation might be due to

geographical location and some other factors. Although milk production of crossbreed cows of our experiment agrees more with the findings of above author.

3.1.2: Lactation period

In this study, the average lactation length of 75% Holstein Friesian × 25% Local Breed (FL), 50% Local Breed × 50% Sahiwal (LSL) and 75% Holstein Friesian × 25% Sahiwal (HSL) cross breeds were found 265.45 ± 0.87 days, 255.50 ± 0.56 days and 270.33 ± 0.61 days respectively. The lowest lactation length was found in Local × Sahiwal and the highest in Local × Friesian cross. There was significance ($P < 0.05$) difference among the lactation length. The result of present study nearly agrees finding of Mondal et al. (2005). He found that lactation length of Friesian × Local and Local × Sahiwal cows 250 ± 38.6 days, 245 ± 10.6 days respectively. Hasan (1995) found that average lactation period of Jersey cross, Holstein cross, Sahiwal cross, Sindhi cross were 286 ± 40.2 , 272 ± 55.3 , 262 ± 51.5 and 255 ± 61.5 days, respectively. The result of present study nearly agrees finding of Hasan (1995).

3.1.3: Peak lactation during lactation period:

In this study, the average peak lactation months of crossbreeds, 75% Holstein Friesian × 25% Local Breed (FL), 50% Local Breed × 50% Sahiwal (LSL) and 75% Holstein Friesian × 25% Sahiwal (HSL) were found 2.67 ± 0.14 , 2.33 ± 0.15 and 2.56 ± 0.08 months respectively during their lactation period.

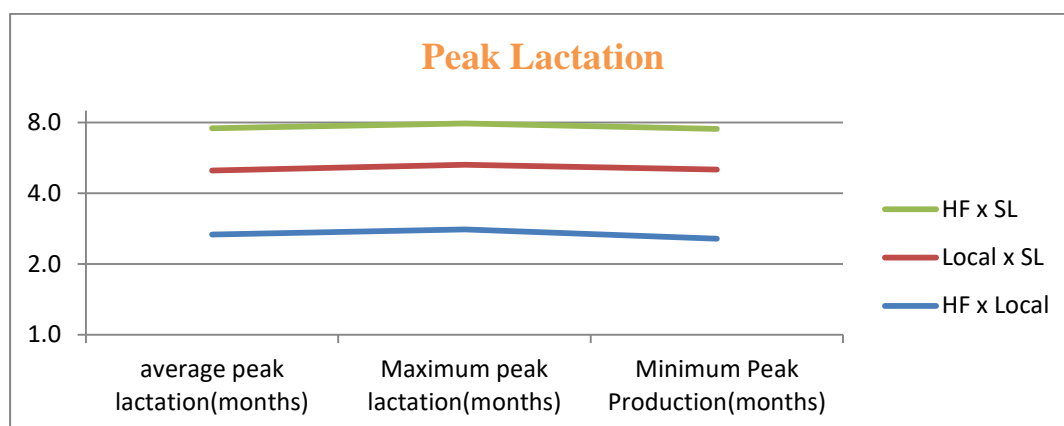


Figure 3.1: Peak Lactation of cross-bred cattle

3.1.4: Feed intake (Roughage and Concentrate):

In this study farmer provide 1.51 ± 0.048 & 1.51 ± 0.084 kg roughage per liter milk production to Holstein Friesian x Local breed and Local bree x Sahiwal crossbreeds respectively under farm condition during their lactation period.

Table 3.2: Amount of roughage per day per liter milk production under farm condition

Breeds	Average milk production per day (L)	Average amount of roughage (kg/day/cow)	Average amount of roughage per liter milk production (kg)	Standard error (S.E)
Local x HF	12.28	20	1.62	0.05
Local x SL	7.6	14	1.84	0.04
HF x SL	10.61	18	1.70	0.05

Table 3.3: Amount of concentrate per day per liter milk production under farm condition

Breeds	Average milk production per day (L)	Average amount of concentrate (kg/day/cow)	Average amount of concentrate per liter milk production (kg)	Standard error (S.E)
Local x HF	12.28	8.61	0.70	0.31
Local x SL	7.60	5.0	0.66	0.52
HF x SL	10.61	7.0	0.66	0.50

3.1.5: Dry Period:

In this study Farmers maintain dry period in Holstein Friesian × Local Breed (FL), Local Breed × Sahiwal (LSL) and Holstein Friesian × Sahiwal (HSL) crossbreeds (70.85 ± 2.37 days, 80.45 ± 4.53 days and 85.34 ± 4.50 respectively. Rokonzaman et al. (2009) reported that the dry periods of cross breeds Local x HF, Sahiwal x Local were 134.8 ± 30.02 , 134.8 ± 27.25 , days respectively.

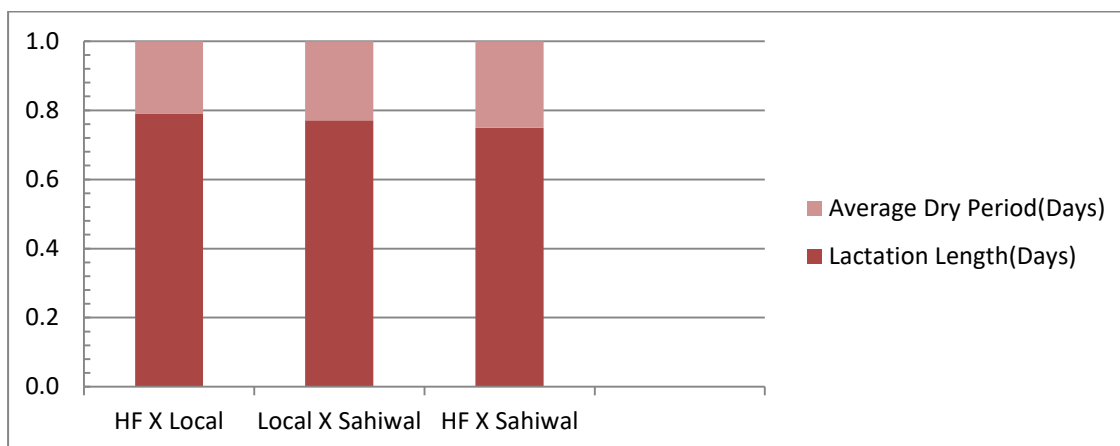


Figure 3.2: Average dry period of cross breeds under farm condition

3.2: Reproductive performance:

Table 3.4: Breed wise productive and reproductive performance of the dairy cows under study

Parameters	75%HF x25% Local (FL) n=46	75%HFx 25% SL (HSL) n=34	50%Localx50%SL (LSL) n=20
Lactation length (day)	265.45 ± 0.87	255.50 ± 0.56	270.33 ± 0.61
Milk yield (lit/day)	12.07 ± 0.19	7.4 ± 0.22	10.50 ± 0.12
Calving interval (month)	12.13 ± 0.14	14.20 ± 0.25	13.76 ± 0.24
Post-partum heat period (days)	56.87 ± 0.77	85.33 ± 1.24	70.53 ± 1.12
Service per conception(n)	1.86 ± 0.18	1.93 ± 0.18	1.70 ± 0.22
Calf birth weight(Kg)	25.20 ± 0.34	15.83 ± 0.56	18.60 ± 0.37
Age of puberty	16.25 ± 0.46	20.22 ± 0.06	19.32 ± 0.08
Age of 1 st calving	24.89 ± 0.18	28.55 ± 0.35	28.08 ± 0.37
Gestation Period	278.38 ± 0.15	281.28 ± 0.11	280 ± 0.17

3.2.1 Gestation period

In this study, the average gestation period in Holstein Friesian × Local Breed, Local Breed × Sahiwal and Holstein Friesian × Sahiwal were 278.38 ± 0.15 days, 281.28 ± 0.11 and 280 ± 0.17 days respectively. The average gestation length of Friesian and Jersey cross were 285.0 ± 4.18 & 282.08 ± 2.42 days respectively (Miazi et al., 2007). Rahman et al., (1998) also observed the average gestation length for Local x Friesian and Local x Sahiwal 289 ± 8.1 and 289 ± 8.1 days respectively. The gestation period was reported 285 days for HF, 285 days for Jersey (Ghose et al. 1995).

3.2.2: Service per conception:

The average lowest number of service per conception Holstein Friesian × Local Breed, Local Breed × Sahiwal and Holstein Friesian × Sahiwal were 1.86 ± 0.18 , 1.93 ± 0.18 and 280 ± 0.17 (Table 4). There was no significant ($P > 0.05$) difference among service per conception. This finding of service per conception the present study was partially in agree with the finding of Mondal et al. (2005). He found that service per conception of Sahiwal × Local, Friesian × Local cows was 1.63 ± 0.64 , 1.6 ± 0.59 , respectively.

3.2.3: Calving Interval:

The average calving interval of Holstein Friesian × Local Breed, Local Breed × Sahiwal and Holstein Friesian × Sahiwal cows were 12.13 ± 0.14 , 14.20 ± 0.25 , and 13.76 ± 0.24 months respectively (Table 4). There was no significant ($P > 0.05$) difference among the calving interval. These results coincides the findings of Mondal (1998) found that the means calving interval of Friesian cross, Sahiwal cross and Friesian-Sahiwal cross were 16.71 ± 1.10 , 14.83 ± 1.19 and 13.81 ± 1.14 days respectively.

3.2.4: Post-partum Heat Period:

The average post-partum heat period of Holstein Friesian × Local Breed, Local Breed × Sahiwal and Holstein Friesian × Sahiwal were 56.87 ± 0.77 , 85.33 ± 1.24 , and $70.53 \pm$

1.12days respectively (Table 4). There was significant ($P<0.05$) difference among the post-partum heat period. These results are partially similar with Miazi et al. (2007). They found that local, Sahiwal \times Local, Friesian \times Local and Jersey \times Local was 102 ± 8.7 , 95.0 ± 25.0 , 90.0 ± 13.42 and 92.92 ± 7.16 days respectively. Mazid et al. (1993) found that average post-partum heat period for local, Friesian \times Local was 120.04 ± 7.84 and 117.24 ± 7.29 days, respectively.

3.2.5: Calves Weight at Birth:

Average birth weight of calves of different crossbred cows was presented in Table 4. It was found that average birth weight of calves of Holstein Friesian \times Local Breed, Local Breed \times Sahiwal and Holstein Friesian \times Sahiwal cows was 25.20 ± 0.34 , 15.83 ± 0.56 and 18.60 ± 0.37 kg, respectively. Statistical analysis showed that there was significant difference ($P<0.05$) within the birth weight of calves of different dairy cows. Among the different types of cows highest birth was recorded in case of Friesian \times Jersey and the lowest was recorded in case of Sahiwal \times Local. Khan (1990) found that average birth weight of calves for Jersey, Sahiwal and Sindhi crossbred calves were 17.1 ± 0.17 , 17.8 ± 0.18 , 17.9 ± 0.17 kg respectively. These results are similar with present study

3.2.6: Age of Puberty

The average age of puberty in Holstein Friesian \times Local Breed, Local Breed \times Sahiwal and Holstein Friesian \times Sahiwal cross breeds observed 16.25 ± 0.46 months, 20.22 ± 0.06 and 19.32 ± 0.08 respectively.

Table 3.5: Age of puberty of crossbreeds under farm condition

Breeds	Minimum age of puberty (months)	Maximum age of puberty (months)	Mean age of puberty (months)	Standard error (S.E)
Local x HF	15.0	18	16.50	0.57
Local x SL	17.0	24	20.50	0.52
HF x SL	17.50	21.5	19.50	0.55

3.2.7: Age at 1st Calving:

The average 1st calving age of in Holstein Friesian × Local Breed, Local Breed × Sahiwal and Holstein Friesian × Sahiwal was 24.89 ± 0.18, 28.55 ± 0.35 and 28.08 ± 0.37 months respectively (Table 4). There was significant (P<0.05) difference among the 1st calving age. This result was supported by Hafez (1987) who found age at first calving ranging from 24 to 36 months. Islam (1999) found that age at first calving of Friesian crossbred, Sahiwal crossbred and local crosses were 36.3 ± 3.48, 37.3 ± 3.01, 40.1 ± 3.54 months, respectively which may differ from present study due to management and environmental factor.

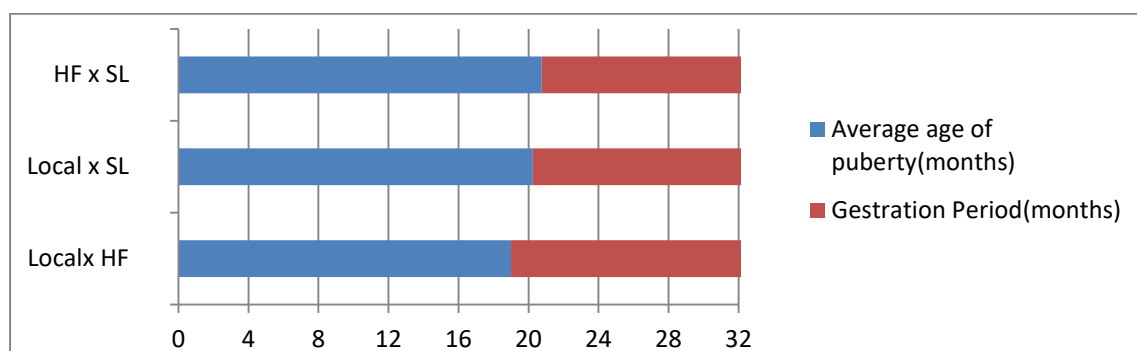


Figure 3.3: Average age of first calving (Months) in cross breed cattle

3.3: Reproductive Disorder:

Overall Prevalence of the reproductive disorder in cross breed cattle was 26% among the cows. Abortion, anestrus and metritis are most common and the result is almost similar to others study.

Table 3.6: Reproductive disorder of the cross breeds dairy cows under study:

Parameters	Prevalence (%)
Abortion	4%
Still birth	2%
Retained Placenta	3%
Dystocia	2%
Uterine Prolapse	3%
Vaginal Prolapse	1%
Anestrus	4%
Repeat breeder syndrome	3%
Metritis	4%

Chapter 4: Limitation

In this study only the productive and reproductive performance and reproductive disorder of breed combination of HF, Sahiwal and local crosses which were available in farm condition. Due to lack of proper record keeping system in some farms, a few data were collected based on the assumption of the respondents. Some irrelevant data were obtained which were corrected by re- interviewing. A short study period has limited the vast study on many other productive and reproductive traits in cross breeds. Also there are other available breeds all over the country whose productive and reproductive traits can also be studied. Some other characteristics important to farming such as longevity, adaptability, disease resistance, productive years etc. was not observed in this study and can be studied future research.

Chapter 5: Conclusion

The study was conducted to find out the comparative productive and reproductive performance with prevalence of reproductive disorder of different cross breed dairy cows at Pekua, Cox's bazar. It is known that genetic merit plays the role in productive and reproductive variation and also in reproductive disorder. This study exhibited that Indigenous × Friesian(50%) cross-bred is a potential animal and its productive and reproductive performances was better for milk production, lactation length, calf birth wt. and age at 1st heat. Although the calving interval and service per conception was better in Indigenous × Shahiwal (50%) and post-partum heat period & age at 1st calving in Friesian(50%) × Sahiwal(50%) but not significant difference. Considering other four traits performance of Holstein Friesian × Local breed is better than any other cross breeds of this study. This crossbred should be reared in commercial dairy farming condition for better return.

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Biography

I am **Fatematuz Zohora**, daughter of **Nurul Ali** and **Maleka Begum**. I have passed the Secondary School Certificate Examinations in 2013 followed by Higher Secondary Certificate Examination in 2015. I enrolled for Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU), in 2015-2016 session. At present, I am an intern veterinarian under the Faculty of Veterinary Medicine in Chattogram Veterinary and Animal Sciences University. I would like to work as a veterinary practitioner and do research on Public Health in Bangladesh.

Appendix

A Questionnaire for Assessment of Productive and Reproductive Performance and Reproductive Disorder of cross breed cattle under farming condition in Pekua, Cox's bazar.

Form No:

Informed Consent

By completing this questionnaire you consent to following the data will be used in a report.

Do you wish to participate?

- Yes
- No

Name and Address of the Owner:

- Name:.....
- Occupation:.....Contact no.:
- Village/Word:.....
- Union:..... Upazila: Pekua

Characteristics of Sample Households:

- a) Sex:-----b) Age:-----c) Education level----- d) Marital status-----
- e) Own Land: Landless/Land Holder f) Experience in dairy keeping-----

Information about Dairy Farm and Cow:

- Category of Farms:** a) Small Scale (3-5) cows, b) Medium Scale (6-10)cows
- c) Large Scale (11 or more) cows.

Housing System: Intensive/Semi-intensive/Tethered/Free-range/Other.....

Feeding Practice: a) Roughage(Y/N).....Kg/day, b) Concentrate(Y/N)-----
Kg/day

Grazing: Tethering/Plain Land/Low Land/High Land/No grazing(Cut & Carry)

Types of Grazing: Community/Individual

Breeding System: Natural/AI/Both

Breed: 75% Holstein Friesian × 25% Local Breed, 50% Local Breed × 50% Sahiwal, 75% Holstein Friesian × 25% Sahiwal.

Body Condition Score(BCS): 1.Cachectic 2.Poor 3.Good 4.Fat 5.Obese

Constraints and Culling reasons of dairy cows in the study area:

Feed shortage/ High feed cost/ Inefficient AI service/ Heat detection/ Disease/Others--

Productive Performance of Dairy Cattle:

1) Milk Yield:(Litre/Day) 2)Length of Lactation:(Days)

3) Peak Milk Production:.....(Months) 4) Dry Period:(Days)

Reproductive Performance of Dairy Cattle:

1) Age at First Service (Age at which heifers attain body condition and sexual maturity for accepting service for the first time)-----

2) Number of Service Per Conception (Number of services (natural or artificial), required for successful conception)-----

3) Age at First Calving (The period between birth and first calving)-----

4) Calving Interval (A time elapsed between two consecutive successive parturitions)-

5) Days Open (The number of days between parturition and subsequent conception)---

6) Calf Birth weight:(Kg) 7) Gestration Period:(Days)

Reproductive Disorders & Their Effect:

6) Abortion (Loss of the fetus between the age of 42 days and approximately 260 days)

a) Number of cow-----b) Regular follow up no:-----

7) Stillbirth (Calf loss or calves born dead from days 260 until the end of normal gestation period or dying within 24 hours of parturition)

- a) Number of cow: -----b) Regular follow up no: -----
- 8) Retained Placenta (A lack of expulsion of the placenta within the first 24 h after calving)
- a) Number of cow: -----b) Regular follow up no: -----
- 9) Dystocia (prolonged or difficult parturition);
- a) Number of cow: -----b) Regular follow up no: -----
- 10) Uterine Prolapse (Immediately after parturition/within several hours/between 48 to 72 hours)
- a) Number of cow: -----b) Regular follow up no: -----
- 11) Vaginal Prolapse (The protrusion of the vagina and sometimes with the cervix through the vulva, most commonly seen in the last 2 to 3 months of gestation)
- a) Number of cow: -----b) Regular follow up no: -----
- 12) Anestrous (Complete sexual inactivity with no manifestation of estrus for more than two months)
- a) Number of cow: -----b) Regular follow up no: -----
- 13) Repeat Breeder (Failed to conceive for three or more consecutive services but animal exhibiting regular estrous cycle)
- a) Number of cow: -----b) Regular follow up no: -----
- 14) Metritis (An inflammation of the uterine wall)
- a) Number of cow: -----b) Regular follow up no: -----