**Chapter-1**

**INTRODUCTION**

Cattle population of Bangladesh is about 23.78 million (DLS, 2016). The cattle of Bangladesh are mainly an indigenous, Zebu type (*Bos indicus*) and their daily average milk production is 0.5 to 2.5 liters (Khan *et al*., 2005 and Khan 2009). Whereas, crossbred cattle namely cross of Holstein Friesian, Jersey, Sahiwal and Red-sindhi with indigenous cattle produces 5 to 10 liters milk per day (Hossain *et al*., 2002; and Khan *et al*., 2012). Crossbred cows usually exceed the average performance level of pure-breeds due to heterosis and thus plays an important role in livestock improvement. They have enough economic importance in terms of total production potentialities. A number of studies involving comparisons of productive and reproductive performances have been conducted (Das et al, 2009, Khan *et al*., 2005 and Hossain *et al.,* 2002), but in these studies were concentrated on specific objectives. However, dairy framings depend on many factors like breed and breeding, feeds and feeding, management etc.

In Bangladesh, the commercial dairying becomes popular and the main breed under this farming is Holstein and their crosses with local improved variety and non-descriptive deshi. Commercial farms possess mainly Holstein and Holstein crosses (F1 and F2).

There is a great shortage of milk and meat production in Bangladesh. The yearly milk and meat production in Bangladesh is 2.89 and 1.17 million tonnes but the national demand is about 1.04 and 6.4 million tonnes respectively (DLS 2013). This deficit could be overcome through proper and efficient planning of the whole industry and requires consistent and objective breeding decision.

For profitable dairy farming requires good productive and reproductive performance of the animals/cow. The productive performance parameters are daily and annual milk yield, live weight and the reproductive parameters are considered as, age at the first calving, gestation period, days open, service per conception and calving intervals (Fadlelmoula *et al*., 2007). The farm starting with lactating cows have better productive performance with good feedback (Hassan, 1995). A farm with 13 to 15 month of calving interval, 24 months of age of puberty 1.33 services per conception and 5 kg milk per day per cow could be economically profitable (Azizunessa, *et al.,* 2008). In addition, the productivity of dairy cows depends on proper management. Management leads about 10 to 15 percent milk yield. In Bangladesh very scantly work has been reported so far on factors influencing the productive and reproductive performance in crossbred dairy cows under commercial farming. Therefore, this study was an attempt to know the following objectives.

The specific objectives of my study are –

1. To know the management condition of commercial farms.
2. To study the productive and reproductive performance of Holstein crosses under farm condition in different lactations.
3. To fit the regression line for estimation of fitness of milk yield of Holstein crossbred.

**Chapter-2**

**Materials and Methods**

The study was conducted in three Metro Upazila (administrative sub-unit) namely Bakolia, Patenga and Panchlaish of Chittagong district from July to September 2017. The productive and reproductive performance of Holstein crossbred cows were studied from the organised dairy farms, namely Molla, Super-Dairy and Azizia. The farmers of these farms keep individual cow’s performance record in an organised way and this data were used for this study. A total of 143 crossbred of Holstein cow’s record were used in this study.

**Farm Management**

The farm management and feeding were also observed. These farms are well organised and the owner maintain the farm properly. They done cleaning washing and used disinfectant as a regular basis. They vaccinated the cows of their farm with foot and mouth disease vaccine, anthrax and haemorrhagic septicaemia as routinely. They also used deworms to prevent and control different external and internal parasite. They feed balance diet at regular basis at the proper ratio and amount to fulfil the nutritional requirement of dairy cows. Dietary feed consists of roughage and concentrate feed ingredients.

**Productive and reproductive performance of crossbred dairy cows**

The cows of these farms were various ages and lactations. Lactation ranges was from 1 to 5 and cow’s age was 3 to 10 years. Data of farm structure of the studied dairy farm was also collected. A questionnaire was designed in order to collect data on productive (dairy milk yield (kg), lactation yield (kg) and lactation length (days)) and reproductive traits (service per conception (no), calving interval (days)) of individual cows. Data were collected from their records and direct interview with the owner and/or cowboy by the researcher.

**Fitting with Linear Regression**

The daily milk yield of Holstein cows of three different farms were fitted with the linear regression (Yij=µ+Li+eij, where Yij is the milk yield; μ is the overall mean; Li is the effect of lactation and eij is the residual value distributed a N (0, σ2) to know the fitness of milk yield.

**Statistical Analysis**

The collected data was edited by Microsoft Excel 2007. Means with standard error of different traits of Holstein cross cows of three farms were analysed by using Proc GLM of SAS (SAS *et al*., 2008) following the statistical model as:

Yijk = µ+Fi+Lj+eijk

Where Yijk is the trait value

µ is the overall mean

Fi is the effect of ith farm

Lj is the effect of jth lactation and

eijk is the residual error, normally distributed as N (0, σ2 ).

The mean differences were done by using least significant different test at 5% level of significance (Steel *et al*., 2007).

**Chapter-3**

**RESULTS AND DISCUSSIONS**

The farm structure of studied farm is given in Table 1. From the table 1, it can be seen that under Molla dairy farm the milking cow number was highest than other farm. However the cow’s age was ranges from 2 to 7 years in the three studied farm. In consideration of the cows age it was found that the number of cows were higher in year 4 and than other ages.

**Table 1. Farm Structure of the studied farm**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SL No.** | **Breed** | **Female calf**  **(< 1 year)** | **Male Calf (< 1 year)** | **Heife-r** | **Cows Age in Year** | | | | | | **Bull** | **Dry Cow** | **Total** |
| **2** | **3** | **4** | **5** | **6** | **7** |
| Molla dairy farm | **Holstein × Local** | 9 | 3 | 7 | 9 | 8 | 10 | 12 | 6 | 8 | 2 | 11 | 74 |
| Super Dairy | 3 | 2 | 4 | 4 | 3 | 5 | 7 | 2 | 3 | 1 | 3 | 33 |
| Azizia | 7 | 2 | 5 | 4 | 3 | 5 | 3 | 2 | 4 | 1 | 4 | 36 |
| Total | | 19 | 7 | 16 | 17 | 14 | 20 | 22 | 10 | 15 | 4 | 18 | 143 |

The production performance traits of Holstein cows under three different farms in consideration of lactation numbers are presented in Table 2. Table 2 showed that the daily milk yield was differed significantly (P<0.05) with farms and lactations. However, lowest mean value for all three traits (milk yield, lactation production and lactation length) were observed in Aziza dairy farm compared to other two farms. This change occurs due to poor floor type, poor hygienic condition was seen in Aziza dairy farm. Production performance depends on blood percentage of high yielding variety, environment, body size and dietary factor, similar factors was reported by Khan *et al*., (2005). The milk production of crossbreds cows ranging from 16 to 23 litter per day and lactation yield was 1850 to 2280 litres. Lower milk yield was reported by Reaves *et al*. (2011) and Mondal *et al*., (2008); they reported milk production of crossbred cows may 7 to 12 litre and 12 to 15 litre per day with good management and nutrition, concentrate feeding.

The reproductive performance of Holstein crossbreds are presented in table 3. The service per conception and calving interval among three farms were almost same and no significant differences were observed. The similar service per conception occurs might be due to the use of same bull and quality semen. Hirooka *et al.,*(2004) found that average service per conception for local, local × Holstein and Sahiwal × Holstein cows were 1.700.91, 1.720.88 and 2.011.03, respectively. Oyedipe *et al*., (2003) showed that the average lowest number of Service required for conception (1.590.6) was in L×F cross-bred and highest (1.740.66) in L×F×S×SL. Majid *et al*., (2006) found that Services per conception of (F1, F2,) belonging to Holstein-Friesian, Sahiwal heifer and Sahiwal as 1.60.6, 2.21.3, 2.21.0, 2.51.2 and 1.51.0.

Table 2: Production traits of Holstein cows under three different farms in consideration of lactation numbers

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Mollah Dairy Farm | | | | Mean±SE | Super Dairy Farm | | | | Mean±SE | Azizia Dairy Farm | | | | Mean±SE |
| Lac1 | Lac 2 | Lac 3 | Lac 4 | Lac1 | Lac 2 | Lac 3 | Lac 4 | Lac1 | Lac 2 | Lac 3 | Lac 4 |
| MY (lit/day) | 21.8  ±0.72 | 22.78  ±0.69 | 23.36  ±0.63 | 19.42  ±1.25 | 21.84b  ±0.822 | 21.23a  ±0.71 | 16.63a  ±0.66 | 23b  ±0.57 | 21.3b  ±1.46 | 20.54b  ±0.85 | 16a  ±1.23 | 19.71b  ±0.84 | 15.66a  ±0.83 | 16a  ±0 | 16.84a  ±0.73 |
| Lactation production (litters) | 2139a | 2139a  ±5.09 | 2355.4b  ±3.52 | 2110a  ±7.38 | 2185.86  ±3.99 | - | 2235  ±4.52 | 2260.6  ±6.47 | 2266  .67  ±6.93 | 2254.11  ±5.97 | - | 2235.7b  ±4.53 | 1850a  ±9.39 | 2375b  ±4.20 | 2153.5  ±6.04 |
| Lactation length (days) | - | 201.71b  ±0.94 | 207.36c  ±10.01 | 192.4a  ±1.39 | 200.49  ±4.11 | - | 204.75  ±1.12 | 235.66  ±4.76 | 206.33  ±1.99 | 215.58  ±2.62 | - | 203.71b  ±1.46 | 187.3a  ±1.39 | 207b  ±3.03 | 199.34  ±1.96 |

Means with different superscript differed significantly with 5% level of significance

Table 3. Reproduction traits of Holstein cows under three different farms in consideration of cows lactation number

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Mollah Dairy Farm | | | | Mean±SE | Super Dairy Farm | | | | Mean±SE | Azizia Dairy Farm | | | | Mean±SE |
|  | Lac1 | Lac 2 | Lac 3 | Lac 4 | Lac1 | Lac 2 | Lac 3 | Lac 4 | Lac1 | Lac 2 | Lac 3 | Lac 4 |
| Calving interval (months) | - | 13.92  ±0.33 | 14.62  ±0.32 | 14.2  ±0.65 | 14.25  ±0.43 | - | 14.12  ±0.50 | 14.66  ±0.43 | 14.33  ±0.43 | 14.37  ±0.45 | - | 13.85  ±0.39 | 16.66  ±0.71 | 13.5  ±0.59 | 14.62  ±0.56 |
| Service per conception (Times) | 1.63  ±0.21 | 1.28  ±0.18 | 1.54  ±0.21 | 1.6  ±0.33 | 1.51  ±0.23 | 1±0 | 1.5  ±0.25 | 1.33  ±0.43 | 2±0 | 1.45  ±0.17 | 1.6  ±0.33 | 1.28  ±0.26 | 1.66  ±0.43 | 1.5  ±0.59 | 1.51  ±0.40 |

The days in milk and daily milk yield was plotted and fit the linear regression on Holstein crossbreds under three farms (Figure 1 to 3). The intercept, regression coefficient and co-efficient of determination are shown in table 4.

Table 4: Production and Reproduction traits of Holstein cows under three different farms in consideration of cow’s lactation number

|  |  |  |  |
| --- | --- | --- | --- |
| **Traits** | **Intercept** | **Slope** | **R2** |
| **Molla dairy farm** | 21.89 | 0.008 | 0.001 |
| **super dairy farm** | 22.15 | 0.061 | 0.154 |
| **Azizia dairy farm** | 17.67 | 0.003 | 0.000 |

The above table show that intercept value among farm has significant effect on farm 3(17.67) comparison to other two farm (21.89). On the other hand slope value among farm has less significant difference. But the co-efficient of determination (R2) value on farm 2 was higher (0.154) in comparison with other two farms (0.001).

**LIMITATION**

The study period was limited and study area was restricted to a particular district, for this reason the finding may not reflect the whole country. There were limited recording systems as a result it was difficult to select valid data.

**CONCLUSION**

It can be concluded that with the increases herd size the milking cows’ number also increases. The daily milk yield, lactation yield and lactation lengths differed significantly with farms and lactation numbers. However, the reproductive traits did not vary. This study suggests that in future larger data sets would beneficial for increases the accuracy of the study. Finally, it can be concluded that satisfactory management and appropriate genetic improvement strategies would result in improving performance. More research is needed for making final conclusion.

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**BIOGRAPHY**

I am Md. Azmol Hossain. I born in Feni which is located in the south part of Bangladesh. Now I am an intern student of Chittagong Veterinary and Animal Sciences University, Chittagong. I belong to a small family. We are six members. My father name is Md. Jamal Uddin and my mother name is Manoara Begum. I have a plan to involve myself into innovative research project in future and want to admit myself into brainstorming and fruitful works regarding society’s development.