Study on the current status of small scale dairy farms and trait values of both cross-breed cows and indigenous cows

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Biography of Author

I am **Md. Ariful Islam,** The Son of **Md. Shajahan** and **Jesmin Akter**. I passed Secondary School Certificate Examination from St. Placid's High School & College, Chattogram in 2014 (G.P.A-5) followed by Higher Secondary Certificate Examination from Govt. Hazi Mohammad Mohsin College, Chattogram in 2016 (G.P.A-5). Now I am an intern veterinarian under the Faculty of Veterinary Medicine and Animal Sciences University, Bangladesh.

The Author

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List of Abbreviations

• Daily Milk Yield	DMY
• Live Body Weight	L.wt
• Fiscal Year	FY

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Abstract

Background: In the island region of Bangladesh the people rear both indigenous and crossbred cattles. The growing of cross-bred cows is outpacing the rearing of native breeds of cows here day by day. Therefore, a study was conducted in Bhola, Bangladesh to determine the current status of small dairy farms' breeding, feeding, management practices and traits value of cattle.

Method : A study was conducted for a period of 10 days (From 29th July to 6th Aug,2023) at 4 unions (West & East Ilsha,Pangasha,Belumia) Bhola, Bangladesh. A random sample of 47 dairy cows was chosen, of which 34 were crossbred and the remaining 13 were indigenous dairy cows from 8 small dairy farms. For the study, a total of 47 dairy cattle were divided up into several groups based on factors like parity, age, genotype, and live body weight of cattle.

Result: The productive performance (milk yield & body weight) of crossbred cows were

Significantly ($p< 0.05$) higher than the indigenous dairy cows. The percentage of parity of crossbred cows were satisfied level than the indigenous cows. In the total examination, crossbred cows performed noticeably better than indigenous cows. Rearing crossbred cows provided a better level of economic satisfaction than rearing indigenous cows.

Key words: Day milk yield, Parity, Genotype, Live body weight

Chapter: 1
Introduction

In underdeveloped nations like Bangladesh, dairy farmers raise cows of native, cross-bred, foreign breed and the development varieties. Red Chittagong cattle, Pabna cattle, and Munshigonj cattle are native breeds to Bangladesh. Since genotype significantly influences the biological features of dairy cows, the reproductive and productive abilities differ from breed to breed (Khaton 2015). According to the Veterinary Digital Magazine 2022, Bangladesh is presently ranked among the top 25 milk-producing nations in the world.In Bangladesh, reducing poverty is one of the biggest issues facing the country in the twenty-first century. The primary means of eradicating poverty in the nation is through the development of agriculture.

There are currently expected to be 25.7 million cattles, 0.83 million buffaloes, 14.8 million goats, 1.9 million sheep, 118.7 million chickens, and 34.1 million ducks among Bangladesh's livestock population (https://en.banglapedia.org/index.php/Livestock). Animal genetic potential is the primary factor in livestock development (Islam et al.2022). The full development of this genetic potential is possible with optimal diet, disease prevention, and management techniques (Ansell 1985).

In Bangladesh, dairy farming is primarily combined with crop farming, with an average of 1-2 cows and 0.20 hectares of land per farmer. There are also some medium-sized and large commercial farms (5-100 cows) in the surrounding areas of bigger cities like Dhaka, Chittagong, Rangpur, Khulna, and Sylhet that primarily raise Holstein-Friesian (H) and H crossbred cows that produce milk for the farmer's family consumption as well as any extra milk that is sold Khan *et al* (2009).

Dairy in Bangladesh has been evolving from a livelihood-oriented industry to one that is enterprise-driven, despite the fact that it continues to be a major source of income and livelihood for millions of people (Uddin *et al*. 2020). The two main crossbreds utilized in commercial dairying in Bangladesh are Holstein crosses (Holstein × local zebu) and Sahiwal crosses (Sahiwal × local zebu), although the Holstein crossings predominate (Haque et al. 2011). Over the years, HF-L crossbred cows' milk production performance in Bangladesh gradually improved (Bhuiyan, 2015). Comparing local crossbred cows to Holstein-Friesian (HF) and HF crosses, it was found that the latter had later sexual maturity, poorer milk production, and longer calving intervals. However,

temperate breeds, like as the Ayrshire, have a poor survival percentage in tropical surroundings with relation to hybrids of tropical breeds like the Sahiwal with indigenous cattle, and Red-Sindhi (Table 3.2; McDowell, 1985; Cunningham and Kahi *et al*., 2000; Rege *et al*., 1998; and Syrstad, 1987).

The milk production performance of the crossbred was higher in F-1 cows practically everywhere the same, but it was questionable for crossing with the Friesian one or two times or more, according to Khan *et al.* (2014).

The most valuable characteristics of milk-producing animals include average body weight, milk yield, calving frequency, conception rate, calves' birth weights, gestation length, etc. Our genetic resource is the indigenous cow (Bos indicus), but their reproductive and productive abilities fall short of expectations (Rahman *et al*., 1998). Each lactation cycle of a local cow, which lasts 180 to 240 days, produces between 300 and 400 litres. Contrarily, crossbred cows have lactations that last 210–240 days and produce 600–800 litres of milk (Islam, 1999). Local cattle, however, cannot be disregarded because of the special qualities they have, such as a higher capacity for disease resistance, the ability to produce even with low-quality feed, and a good tolerance for hot and muggy weather.

The large cattle population of Bangladesh, milk production fall down day by day. Environmental factors such as poor nutrition, season and tempature have also significant impacts on productive and reproductive performance (Islam *et a*l 2022). For this reason,to fulfill the demand of the people,the number of cross breed cattle is increasing day by day with the spread of practice of artificial insemination throughout the country. Local cows typically produce only 300 to 400 litres of milk during each lactation phase, which lasts 180 to 240 days. An key barrier to the future development of the cattle industry is the native cows' low productivity (A.B.M.K.I.Khan 2010).

The concentrate is derived from a variety of sources in the livestock industry, including maize, rice polish, corn, vegetable oil, cotton seed, wheat, wheat bran, fish meal and bone meal. The pasture along the river is where the most native cows are grazing. Cattle from mixed breeds have less ability to prevent disease than cattle from the local breed.

Research on crossbreeding dairy cattle in the tropics has thus far mainly focused on: performance (e.g. Tadesse and Dessie, 2003), reproduction (e.g. Ibrahim *et al*., 2011), appropriate crossbreed levels (e.g. Kahi, 2002), adaptive potential (e.g. Wilson, 2009), and economic impacts (e.g. McDowell *et al*., 1996). There is no empirical data available about the growth of dairy cattle crossbreeding on farms, but impacts at the farm level have been explored to a much smaller extent (Patil and Udo, 1997; Samdup *et al.*, 2010).

Dairy farms of all sizes are expanding daily in the Bhola district area. Particularly low income groups have adopted farming as a lucrative endeavor. For the small-scale dairy producers in Bhola, Bangladesh, a study is needed to determine the relationship between farm category and production and reproduction performance of cross-breed and native cows. Knowing specifics about the management techniques and capabilities of various dairy breeds is crucial for developing a future plan for dairy growth in this area. Consequently, the study was started with the following goals:

1. To observe the current status of small dairy farms' breeding, feeding, management practices and traits value.
2. To compare cross-breed cows and indigenous cows reared in small-scale dairy farms.

Chapter: 2
Materials and Methods

2.1. Study area and duration:

The study on 47 dairy cows was conducted from July 29 to August 6, 2023 in 4 unions (West Ilsha, Pangsha, East Ilsha, and Belumia) of the Bhola district. The places were picked because they have a lot of cattle dairy farms with cross-breds and local breds.

Fig 3: Geographical location in Bhola district

2.2. Study population:

Eight small-scale dairy farms provided the cows that were used in this investigation. According to genotype, the 47 cows were divided into 2 groups: Indigenous and Cross (Indigenous-13, Cross-34). The lactation number, parity, day milk yield, and age of cows were considered in this study. Both naturally occurring services and artificial insemination (AI) were used for the service of the cows.

2.3 Data Collection:

According to the study's goals, a questionnaire was used which was supplied by ACDI-VOCA. Using the designed questionnaire, data were gathered from the farmers in the chosen areas. Each farmer received the complete questionnaire, which was then rigorously and frequently monitored via visits. The following information was included in the questionnaire. General identification and information of the selected dairy farms. The farmer's demographic and the productive and reproductive parameters of the cows was collected.

2.4. Statistical Analysis:

Microsoft Excel was used to modify the collected data, and **SAS (2008)** was used to analyse the descriptive statistics. To estimate the mean and standard errors of each productive & reproductive parameter under following statistical mode was used.

$$\mathbf{Yijk = \mu + Fi + Bj + eijk}$$

Where,

Yijk = Parameter's value.

μ = Overall mean.

Fi = Effect of farm type.

Bj = Effect of breed groups/ Crosses.

eijk = Random error distributed as N (0, σ2).

Chapter: 3
Result

3.1. Farm base animal distribution:

Eight small scale dairy farms provided the cows that were used in this investigation. According to Genotype, the 47th cows are divided into 2 groups. One is Indigenous another one is Cross (L× F) (35% × 65%)

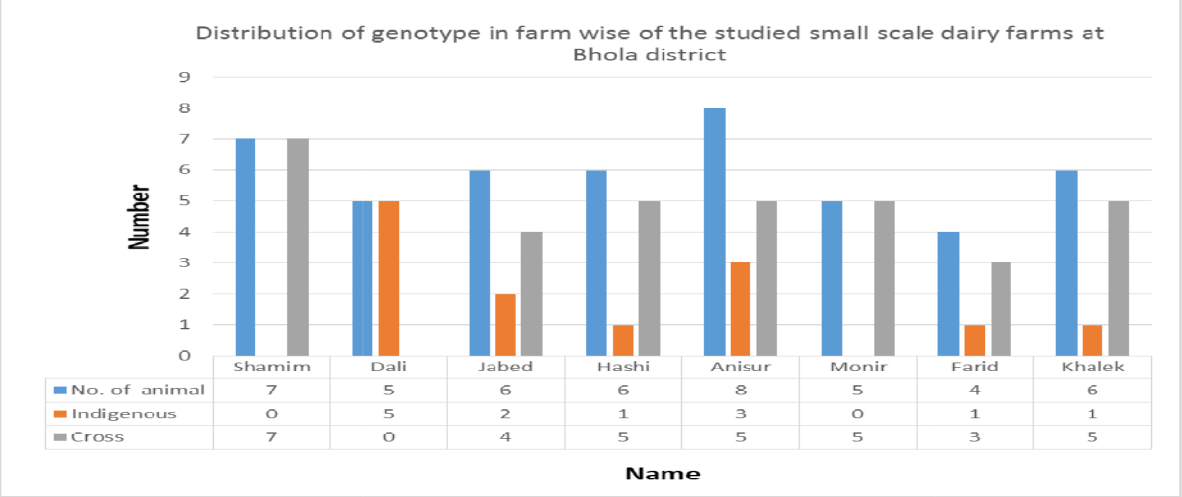

Figure 1

3.2. Age base distribution :

Table 1 indicated the average age of Eight dairy farms, with Shamim Dairy Farm showing a mean age of 3.90 ± 0.629, Dali Dairy Farm showing a mean age of 4.10 ± 0.235, Jabed Dairy Farm showing a mean age of 3.51 ± 0.52, Hashi Dairy Farm showing a mean age of 3.33 ± 0.418, Anisur Dairy Farm showing a mean age of 3.48 ± 0.468, Monir Dairy Farm showing a mean age of 3.32 ± 0.581,Farid Dairy Farm showing a mean age of 3.45 ± 0.904, Khalek Dairy Farm showing a mean age of 2.90 ± 0.597. Maximum age : Dali's Dairy Farm and minimum age : Khalek's Dairy Farm

Table 1 : Distribution of age of cattles in the studied small scale dairy farms in Bhola district

Farmer's Name	**Age (year)** **Mean ± St.dv**
Shamim	3.90 ± 0.629
Dali	4.10 ± 0.235
Jabed	3.51 ± 0.527
Hashi	3.33 ± 0.418
Anisur	3.48 ± 0.468
Monir	3.32 ± 0.581
Farid	3.45 ± 0.904
Khalek	2.90 ± 0.597

3.3. Feeding Practice :

The standard ratio of roughage to concentrate should be 2:1. A diet that meets the nutrient requirements for high milk production is necessary for dairy cows with high milk production (Peter S. Erickson 2020). The ratio of roughage to concentrate was shown in Figure-2 to be 2.25:1 in Shamim Dairy Farm, 4:1 in Dali Dairy Farm, 3:1 in Jabed Dairy Farm, 2:1 in Hashi Dairy Farm, 2.50:1 in Anisur Dairy Farm,2.6:1 in Monir Dairy Farm,2:1 in Farid Dairy Farm & 1.75:1 in Khalek Dairy Farm .

The Hashi Dairy Farm & Farid Dairy Farm displayed a healthy ratio of concentrate to roughage.

The Dali Dairy Farm displayed a poor healthy ratio of concentrate to roughage.

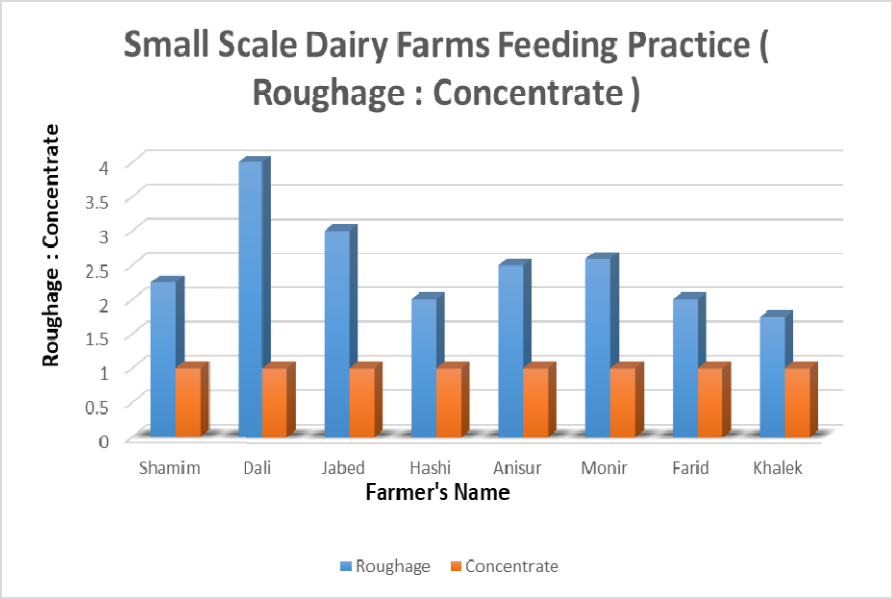

Figure 2

3.3. Live Body Weight base Distribution :

Despite its accuracy, weighing scales are less preferred by dairy farmers since they are labor-intensive, expensive to implement (Heinrichs *et al*. Citation1992), and distressing to the herd (Brandl & Jrgensen Citation1996). Rapid techniques based on linear body measurements are therefore frequently used. Small ruminant live body weights have been accurately predicted by studies using linear body measurements (Mohammad *et al*. Citation2012; Eyduran *et al*. Citation2013; Ali *et al.* Citation2015).

Schaeffer's formula: The equation used for calculating live weight was **W = (L × G2)/300**, where W is body weight in lbs, L is length of the animal from point of shoulder to pin bone in inches, and G is the chest girth of the animal in inches. The final weight was converted into kg.

Table 2 analysis, Cross groups live body weight was satisfied than indigenous groups

Table 2: Studied the body weight of different genotypes of cattles in farm wise of the small scale dairy farms in Bhola district.

Farmer's Name	**Genotype**	**Live Body Weight (kg) Mean ± St.dv**
Shamim	Cross	313.33 ± 61.101
	Indigenous	-
Dali	Cross	-
	Indigenous	350 ± 27.386
Jabed	Cross	345 ± 33.162
	Indigenous	334 ± 45.301
Hashi	Cross	424 ± 18.165
	Indigenous	315 ± 34.107
Anisur	Cross	450 ± 77.136
	Indigenous	345 ± 43.202
Monir	Cross	300 ± 23.875
	Indigenous	-
Farid	Cross	400 ± 55.602
	Indigenous	327 ± 23.310
Khalek	Cross	376.67 ± 11.491
	Indigenous	31023.324

3.4. Parity & Genotype wise traits value & feed value

Table 3 presented the fixed factor and traits value of different parity and genotype.The fixed factor of 1st parity indigenous group was 3.76 ± ±0.611 (age) & 1 ± 0 (lac no).The fixed factor of 1st parity cross group was 2.9 ± 0 .420 (age) & 1 ± 0 (lac no). The traits value of 1st parity indigenous group was 4.167 ± 0.288 (MY) & 336.66 ± 55.075 (L.wt). The traits value of 1st parity cross group was 5.92 ± 1.057 (MY) & 386.15 ± 55.075 (L.wt).The fixed factor of 2nd parity indigenous group was 4.73 ± 0.193 (age) & 2 ± 0 (lac no). The fixed factor of 2nd parity cross group was 3.62 ± .485 (age) & 2 ± 0 (lac no). The traits value of 2nd parity indigenous group was 3.72 ± .207 (MY) & 329 ± 11.780 (L.wt).

As result, 1st parity of traits value was more than 2nd parity in both group.

Table 3: Traits value of cattle according to parity and genotype.

Parity	**Breed**	**Fixed Factor**		**Traits Value**	
		Age (year)	**Lac No**	**MY (L/day)**	**L.wt (kg)**
1	Indigenous	3.76^{b} ± 0.611	1 ± 0	4.167 ± 0.288	336.66 ± 55.075
	Cross	2.9^{a} ± 0 .420	1 ± 0	5.92 ± 1.057	386.15 ± 55.075
2	Indigenous	4.73 ± 0.193	2 ± 0	3.72^{a} ± 0.207	329^{a} ± 11.780
	Cross	3.62 ± 0.485	2 ± 0	5.7^{b} ± 1.03	403^{b} ± 4.571

Legends: Lac no= Lactation number, MY= Milk yield, L.wt= Live weight
Different letters in superscripts indicated significant differences at 5% level of significant

Following a feeding value study, we discovered that in both groups, the second parity of the feed ratio was higher than the first parity. The cross-group feed balance ratio, on the other hand, was larger than the native group.

Table 3.1: Feeds Value of cattle according to parity and genotype.

Parity	Genotype	Feed (kg)	
		Roughage	Concentrate
1	Indigenous	4.0 ± 0.0	2.66 ± 1.154
	Cross	4.46 ± 0.518	3.00 ± 0.816
2	Indigenous	3.70 ± 0.152	2.20 ± 0.020
	Cross	4.55 ± 0.598	2.80 ± 1.032

3.5. Age wise traits value & feed value

Table 4 shows that cow age increased, the number of parities and lactations increased, and the characteristics value declined.

Table 4: Traits value of cattle according to age

Age (year)	Fixed Factor		Traits Value	
	Parity	Lac	MY (L / kg)	L.wt (kg)
2.1 - 3	1.23 ± 0.438	1.23 ± 0.438	5.84 ± 1.028	384 ± 47.721
3.1 - 4	1.64 ± 0.497	1.64 ±0.497	5.39 ± 1.243	386.42±50.323
4.1 - 5	1.84 ± 0,447	1.84 ± 0.447	3.74 ± 0.622	342 ± 34.205
5 <	2.00 ± 0.00	2.00 ± 0.00	3.90 ± 0.821	322 ± 51.185

Table 4.1: Feeds value of cattle according to age

Age (year)	Roughage	Concentrate
2.1 – 3	4.57	2.84
3.1 – 4	4.28	2.85
4.1 – 5	3.80	2.00
5 <	3.70	2.44

3.7. Total Genotype wise traits value & feed value

Table 5 presented genotype wise traits value of cattle.In contrast to indigenous tribes, we have seen that cross-group features are higher.

MY rate: Cross group (5.82 ± 1.029) > Indigenous group (3.82 ± 0.611)

L.wt rate: Cross group (393.47 ± 45.687) > Indigenous group (30.76 ± 39.467)

The overall performance rate of Cross- group is adequate.

Table 5: Traits value of cattle according to genotype

Genotype	Fixed Factor			Traits Value	
	Age (year)	Parity no	Lac no	MY	L.wt
Indigenous	4.50 ± 0.721	1.76 ± 0.438	1.76 ± 0.438	3.82 ± 0.611	330.76 ± 39.467
Cross	3.21 ± 0.570	1.43 ± 0.506	1.43 ± 0.506	5.82 ± 1.029	393.47 ± 45.687

The standard ratio of roughage to concentrate should be 2:1.Table indicate genotype wise feeding value. That's are 2 group which is Indigenous & Cross. We observe that the amount of roughage and concentrate is 3.76 & 2.30 kg in Indigenous group. In Cross group, the amount of roughage and concentrate is 4.50 & 2.91 kg

Table 5.1: Feeds value of cattle according to genotype

Genotype	**Roughage**	**Concentrate**
Indigenous	3.76 ± 0.438	2.30 ± 0.757
Cross	4.50 ± 0.543	2.91 ± 0.900

Chapter 4

Discussion

The total of 47 cows employed in this experiment came from eight small dairy farms. The cattle are separated into two groups based on genotype. One is Native group, while the other is Cross (L × F) (35% × 65%).

In the Bhola district, the prevalence of indigenous and cross group dairy farms is shown in **Figure -1**. 34 out of the 47 cows that were raised by the farmers were cross-group cows..

Eight dairy farms were listed in **Table 1**, with Shamim Dairy Farm showing a mean age of 3.90 0.629, Dali Dairy Farm showing a mean age of 4.10 0.235, Jabed Dairy Farm showing a mean age of 3.51 0.52, Hashi Dairy Farm showing a mean age of 3.33 0.418, Anisur Dairy Farm showing a mean age of 3.48 0.468, Monir & Dali Dairy Farm has a maximum age. .Age restriction: Khalek Dairy Farm. There were no significant difference ($P < 0.05$)

The standard ratio of roughage to concentrate should be 2:1. A diet that meets the nutrient requirements for high milk production is necessary for dairy cows with high milk production (Peter S. Erickson 2020). The ratio of roughage to concentrate was shown in **Figure-2** to be 2.25:1 in Shamim Dairy Farm, 4:1 in Dali Dairy Farm, 3:1 in Jabed Dairy Farm, 2:1 in Hashi Dairy Farm, 2.50:1 in Anisur Dairy Farm,2.6:1 in Monir Dairy Farm,2:1 in Farid Dairy Farm & 1.75:1 in Khalek Dairy Farm . The Hashi Dairy Farm & Farid Dairy Farm displayed a healthy ratio of concentrate to roughage. The Dali Dairy Farm displayed a poor healthy ratio of concentrate to roughag.

I used Schaeffer's technique to measure the live body weight and **Table 2** presented that studied live body weight of different genotype. After analysing the data, I discovered that cross group weight was more satisfactory than others. The median live body weight of cross group was (345 ± 33.162). There were no significant difference ($P < 0.05$) in table 2

The fixed factor and trait values for various parities and genotypes were shown in **Table3**. First parity indigenous group's fixed factors were 3.76 ± 0.611 (age) and 1± 0 (lac no).First parity cross group's age and lac no fixed factors were 2.9 ± 0.420 and 1 ± 0 respectively. First parity indigenous group's characteristics value was 4.167 ± 0.288 (MY) & 336.66 ± 55.075 (L.wt). First parity cross group characteristics values were 5.92 ± 1.057 (MY) & 386.15 ± 55.075

(L.wt).The age and lac no fixed factors for the second parity indigenous group were 4.73± 0.193 and 2 0 respectively. The age and lac no fixed factors for the second parity cross group were 3.62 ± .485 and 2 ± 0 respectively. The characteristics value of the indigenous group with the second parity was 3.72 ± 207 (MY) and 329 ± 11.780 (L.wt). There were no significant difference ($P < 0.05$) in table3.

In **Table 3.1** showed, after conducting a feeding value study, we found that the second parity of the feed ratio was larger than the first parity in both groups. On the other hand, the cross-group feed balance ratio was higher than the native group.

Table 4 demonstrates that the features value decreased, the number of parities and lactations increased, and the age of the cow grew. I found that the body weight acquired at the age (2-4), the weight level was 385 ± 1.414 and the milking output was 5.62 ± 0.318, which was a reasonable level. When the age (4) was raised, the weight level dropped below 332 ± 14.142 and the production level fell below 3.82 ± 0.113. There were no significant difference ($P < 0.05$) in **table 4.**

Cow characteristic values were shown in **Table 5** by genotype.We have observed that cross-group traits are higher compared to indigenous tribes. MY rate: Indigenous group (3.82 ± 0.611) < Cross group (5.82 ± 1.029). L.wt rate: Indigenous group (330.76 ± 39.467) > Cross group (393.47 ± 45.687) .The Cross-group's overall performance rate is acceptable. There were no significant difference ($P < 0.05$) in **table 5.** Compared to native cows, crossbred cows' average milk output was considerably higher ($p < 0.01$).My finding was in agreement to Ali *et al*.(2000).

Chapter: 5

Conclusion

The study has established that farm categories had a major impact on the fixed factor and trait value of the cross and indigenous groups. Parity, body weight, and day milk yield in the various crosses and native cows. This study reveals that cross-breed cow rearing is more advantageous and cost-effective than native cow rearing. Overall, the fixed features and value performance of cross-breed cows are great and noteworthy. This study will aid in identifying the crucial areas of dairying for researchers and students. In this research, I have worked with small-scale cow farms. In the future, I will work with the cow farm on a large scale, and I will achieve development for the country and the nation.

Data collection from indigenous farm

Data collection from cross breed farm

The objective of this questionnaire is to measure the per liter milk cost from the Micro (0-5 cattle), Small (5-15 cattle) and medium farm (15 to 20+) form the existing practice and identify profit from milk sale in various geographic area of the activity area.

A. General Information of the Farming household:

1. Farmer's Name:
2. Contact Number:
3. Farm Location (District/Area):
4. Livestock Type (e.g., Cattle, Goats, etc.):
5. Size of Livestock Farm (Small/Medium/Large-scale):
6. Do you get any training on livestock rearing and healthcare management: Yes/No
7. If yes, from where you have received the training (Government organization/NGO):
8. Name of the organization:
9. Duration of the training:

B. General information of the Farm:

a. Total number of cattle:
b. Number of dairy cows that produces milk:
c. Last day milk production:
d. Cost of 1 liter milk production:
   i. Feed cost (Concentrate feed, Roughage feed, Supplement feed)/Total milk production per day
   ii. Labor cost (No. of labor * monthly wage) /Total milk production per day
   iii. Medicine cost/Total milk production per day
   iv. Vet. Service cost/Total milk production per day
   v. Electricity cost /Total milk production per month

g. Impact of improved farm management practices and access:
   i. Access to affordable livestock care (Cost of advice, Cost of service)
      1. Get primary healthcare from LSPs
      2. Cost of service is less than before
      3. Cost of service is more than before
      4. Absence of Primary health care provider
      5. Inadequate manpower at regional Upazila station.
   ii. Access to artificial insemination services
      1. Get AI from activity trained LSPs easily
      2. Cost is standard
      3. Cost is higher
      4. Timely service
      5. Increased rate of conception
   iii. Access to fodder cultivation (new variety introduction)
      1. Learned about new variety of fodder
      2. Learned about cultivation technique
      3. Know nothing about fodder cultivation
      4. Used fodder chopper machine to chop green fodder
   iv. Increased knowledge of alternative feeding
      1. Have knowledge on Silage feeding
      2. Have knowledge on hay feeding
      3. Have knowledge on UMS feeding
      4. Know nothing about all of the above
   v. Increased knowledge in feeding management (water provided separately)
      1. Provide feed mixed with water.
      2. Provide feed without mixing with water
      3. Allow 24 hour to clean water

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   vi. Access to vaccines
      1. Get vaccines regularly from LSPs.
      2. Get vaccines irregularly from LSPs
      3. Get vaccines from Government regularly.
      4. Get vaccines from Government irregularly
      5. Need to purchase vaccines by ourselves
      6. Vaccines are not found always
   vii. Increase household consumption of dairy products and its benefits (Set aside of milk % increase/decrease)
      1. Set aside milk (250 ml/adult) regularly
      2. Market additional milk regularly.
      3. Market milk occasionally
      4. Gift milk often

Additional Note:

h. Challenge documentation
   i. Access to market
   ii. Storage facilities
   iii. Theft/robbery
   iv. Balanced feeding knowledge
   v. Climate change risk (increased salinity in the field, Increased heat stress, Increased flood)
   vi. Availability of Vet service
   vii. Farm management knowledge gap
   viii. Lack of artificial insemination practices
   ix. Any other

i. Any additional support needed.
   i. Training on what issues
   ii. Sourcing of dairy cattle
   iii. Any other

Additional note:

Questionnaire provided by ACDI/VOCA

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