
Evaluate the Productive and Reproductive Performance Considering Genotypes of Dairy Cows

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Abstract: Progress of production in dairy cattle is frequently considered possible by either improving the genetic merit and/or by husbandry practices. The aim of the research is to evaluation of productive and reproductive performance of dairy cows considering genotype was undertaken in greater Rajshahi from July, 2007 to June, 2009. A total 335 farmers data and 671 numbers of cows were considered for assessed in the local (L), Local x Friesian (LF), Local x Sahiwal (LS), Local x Friesian x Sahiwal (LFS) and Local x Jersey (LJ) dairy cows raised in randomly selected smallholder dairy farms and Duncan multiple range test for statistical significance. The overall mean values of age at puberty (month), age at first service, age at first calving (month), service per conception (s/c), post-partum heat period (days), days open (days), wastage days (days), gestation length (days), milk yield per day (liter), lactation length (days), milk yield per lactation (liter), weaning period (days), dry period (days), calving interval (days) and birth weight of calves (kg) were 26.37±.22, 26.56±0.23, 37.84±0.25, 1.43±.36, 85.83±1.57, 117.85±2.35, 13.33±1.02, 279.90±.33, 5.35±.12, 277.00±1.73, 1390.45±33.50, 213.21±2.35, 91.34±1.47, 398.81±2.34 and 22.51±.21, respectively in different genotypes of cows. Considering the overall performance it could be concluded that Local x Sahiwal x Friesian (LSF) crossbred cows are more suitable for sustainable and profitable dairy farming in greater Rajshahi region.

Keywords: Dairy Cows, Genotype, Rajshahi Region, Crossbred

1. Introduction

Farm animals are an integral component of the livestock rearing system in Bangladesh as it not only a source of meat protein but also a major source of farm power services as well as employment. This sub-sector provides full time employment for 20% of the total population and part-time employment for another 50% (Rahman *et al.*, 2014). The poultry meat alone contributes a substantial 37% of the total meat production in Bangladesh (Begum *et al* 2011). Moreover, livestock products, namely, leather and leather products, hides and skins are important exportable items contributing about 13% to total foreign exchange earnings during the 1970s and 1980s (Rahman and Bhuiyan 1991). Most of the cattle population in Bangladesh is non-descriptive types, which do not belong to any specific breed

and termed as indigenous cattle. They are small in size and their milk production capacity is much lower than that of exotic breeds. The average milk production of local cow is very low and it arises between 300 to 400 liters per lactation period of 180 to 240 days. Generally crossbred cows yield from 600 to 800 litres per lactation of 210 to 240 days (Islam, 1992). Different types of dairy cattle such as Sahiwal cross; Sindhi cross Holstein cross and Jersey cross are available in this farm. We don't have enough information about productive and reproductive performances of these breeds under farm management condition. Hence the present comparative study was undertaken for the evaluation of productive and reproductive performance of different dairy breeds and crossbreds.

2. Methodology

The present study was conducted in greater Rajshahi covering four districts including Rajshahi, Chapainawabjong, Naogaon and Natore as well as the farm of the Department of

Animal Husbandry and Veterinary Science, University of Rajshahi from July, 2007 to June, 2009. Data were collected from 335 farmers of 4 districts under greater Rajshahi and total number of cows was 671. The data collected with their genetic variability was in table 1.

Table 1. Districts wise number of farmers, genotypes and number of cows.

Name of Districts	No. of Farmers	Genotypes					Total
		Local	Local × Friesian	Local × Sahiwal	Local × Friesian × Sahiwal	Local × Jersey	
Rajshahi	90	48	62	50	32	06	188
Chapai Nawabgonj	82	38	50	32	22	18	160
Natore	78	42	45	32	18	08	145
Naogaon	85	49	55	42	18	14	178
Total	335	177	207	156	90	51	671

Several productive and reproductive parameters of dairy cows were studied according to Dairy herd fertility, Ministry of food and agriculture, U. K. (Department for Environment, Food & Rural Affairs, 2012).

Age at puberty: The age at which a heifer first shows estrus sign and behavior may be defined as age at puberty. It was measured in month. **Age at first service:** It is defined as the age when a heifer is first inseminated followed by heat. It was measured in month. **Age at first calving:** It is defined as the age when a heifer gives a calf. It was measured in month. **Number of service per conception (S/C):** In this study the average number of services or inseminations required for each successful conception. **Calving to 1st service interval/Post-partum heat period:** It is considered as the interval between date of calving and the date of first heat shows. It was calculated in days. **Days open:** In this study days open was measured in days. Days open is referred as interval from parturition to conception of cows. **Wastage days:** It is considered as the mean first service to conception interval and it was measured in term of days. **Gestation length:** It was calculated as interval from conceived to parturition. The duration of gestation was expressed in term of days. **Milk yield per day:** It is the total milk yield in lactation divided by total number of days in that lactation and was measured in liters. **Lactation length:** In this study the lactation length was measured in days. The number of days from first milking to the end of milking of cows is called lactation length. **Milk yield per lactation:** The total quantity (liters) of milk produced throughout the lactation is considered as milk yield per lactation. **Weaning period:** Age at which a calf leaves their mother or when a calf starts to take green or straw rather than suckling is called age at weaning. It was recorded in months. **Dry period:** In this study the dry period was measured in days. The number of days from end of milking to next parturition of cows is called dry period. **Calving interval:** The number of days between two successive calving of the same cows or the period from one calving to the next is termed as calving interval. In this study calving interval was measured in days. **Birth weight of calf:** The weight of calf just after parturition. It was recorded in kg.

Statistical analysis: General Linear Model analysis were done to measure the association and strength of association between the potential influencing factors genotypes, age,

parity, body condition, body weight, housing, ventilation, feeds and feeding etc. Duncan Multiple Range Test (DMRT) was used for test of significance of means with unequal subclass number (Steel and Torrie, 1980).

3. Results and Discussion

Effect of genotypes on productive & reproductive performance of dairy cows in greater Rajshahi has been shown in Table-2 and in Table-3. The average age at puberty in LO, LO×FN, LO×SL, LO×SL×FN and LO×JR genotypes were 28.94±.48, 24.64±.33, 26.31±.42, 26.72±.78 and 29.78±.46 months, respectively. The average age at first service for the same genotypes were 29.48±.51, 24.64±.33, 26.31±.42, 26.72±.78 and 29.78±.46 months, respectively. The average service per conception were 1.50±8.08, 1.54±5.48, 1.31±6.07, 1.23±6.78 and 1.15±9.66, respectively. The average age at first calving were 38.84±.60, 36.96±.46, 38.32±.44, 37.87±.88 and 39.70±.72 months, respectively. The average post-partum heat periods were 98.59±4.41, 84.09±2.54, 80.66±1.75, 81.71±4.05 and 73.26±3.8 days, respectively. The average days open were 120.48±5.82, 121.3±3.87, 115.90±4.16, 106.37±5.85 and 105.38±5 days, respectively. The average wastage days were 11.27±2.11, 17.08±1.70, 10.06±4.16, 11.89±3.66 and 4.37±2.18 days, respectively. The average gestation lengths were 279.38±.47, 279.68±.72, 279.71±.25, 282.17±.74 and 279.37±.4 days, respectively. The average milk yields per day were 1.64±7.55, 6.65±.19, 5.92±.18, 7.02±.46 and 5.54±.30 liter, respectively. The average milk yields per lactation were 499.07±20.4, 1636.81±.4, 1538.46±.63, 1833.58±112 and 1595.65±114.18 liter, respectively. The average lactation lengths were 274.00±3.78, 274.80±2.79, 279.61±3.37, 281.98±5.33 and 292.08±7 days, respectively. The average weaning periods were 221.41±4.61, 206.62±4.0, 222.62±4.10, 231.86±7.24, 202.68±10 and 213.21±2.35 days, respectively. The average dry periods were 87.40±2.45, 88.33±2.61, 90.61±3.88, 89.58±4.3 and 91.34±1.47 days, respectively. The average calving interval were 404.46±5.61, 395.77±3.1, 398.88±5.92, 400.16±6.75 and 399.65±7 days, respectively. The average birth weight of calves were 17.65±.38, 23.16±.32, 24.44±.32, 2432±.48 and 22.38±.59 kg, respectively. Genotypes had significant (P<0.05) effect

on age at puberty, age at first service, age at first calving, service per conception, post-partum heat period, wastage

days, milk yield per day, milk yield per lactation, weaning period, dry period and birth weight of calf.

Table 2. Effect of genotypes on productive and reproductive parameters of dairy cows.

Productive and reproductive Parameters	Genotypes					Overall
	LO	LO×FN	LO×SL	LO×SL×FN	LO×JR	
Age at Puberty (month)	28.94±.48 ^a n=142	24.64±.33 ^c n=273	25.66±.51 ^b n=136	26.72±.78 ^b n=72	29.78±.46 ^a n=51	26.37±.22 n=665
Age at first service (month)	29.48±.51 ^a n=126	25.58±.34 ^b n=270	26.31±.42 ^{bc} n=143	27.08±.65 ^b n=72	29.86±.64 ^a n=51	26.56±0.23 n=671
Age at first calving (month)	38.84±.60 n=123	36.96±.40 n=251	38.32±.44 n=142	37.87±.88 n=72	39.17±.72 n=51	37.84±0.25 n=639
Service per conception (S/C)	1.50±8.08 ^a n=132	1.54±5.48 ^a n=263	1.31±6.07 ^{ab} n=143	1.23±6.78 ^{ab} n=72	1.15±9.66 ^b n=51	1.43±.36 n=661
Post partum heat period (days)	98.59±4.41 ^a n=130	84.09±2.54 ^b n=260	80.66±1.75 ^b n=139	81.71±4.05 ^b n=72	73.26±3.83 ^b n=51	85.83±1.57 n=652
Days open (days)	120.48±5.82 n=122	121.3±3.87 n=261	115.90±4.16 n=136	106.37±5.85 n=72	105.38±5.64 n=52	117.85±2.35 n=644
Wastage days (days)	11.27±2.11 ^{ab} n=130	17.08±1.70 ^a n=272	10.06±1.87 ^{ab} n=142	11.89±3.66 ^{ab} n=72	4.37±2.18 ^b n=52	13.33±1.02 n=668
Gestation length (days)	279.83±.47 n=128	279.68±.72 n=252	279.71±.25 n=139	282.17±.74 n=72	279.37±.46 n=52	279.90±.33 n=645
Milk yield per day (liter)	1.64±7.55 ^c n=129	6.65±.19 ^a n=243	5.92±.18 ^b n=141	7.02±.46 ^a n=72	5.54±.30 ^b n=51	5.35±.12 n=636
Lactation length (days)	274.00±3.78 ^b n=134	274.80±2.79 ^b n=260	279.61±3.37 ^{ab} n=134	281.98±5.33 ^{ab} n=73	292.08±7.88 ^a n=52	277.00±1.73 n=653
Milk yield per lactation (liter)	499.07±20.49 ^c n=126	1636.81±47.3 ^{8b} n=265	1538.46±63.08 ^b n=132	1833.58±112.87 ^a n=72	1595.65±114.18 ^b n=52	1390.45±33.50 n=647
Weaning period (days)	221.41±4.61 ^{ab} n=134	206.62±4.06 ^b n=263	222.62±4.10 ^{ab} n=141	231.86±7.24 ^a n=72	202.68±10.31 ^b n=51	213.21±2.35 n=661
Dry period (days)	102.45±3.34 ^a n=132	87.40±2.45 ^b n=255	88.33±2.61 ^{ab} n=128	90.61±3.88 ^{ab} n=72	89.85±4.35 ^b n=52	91.34±1.47 n=639
Calving interval (days)	404.40±5.61 n=128	395.77±3.16 n=266	398.88±5.92 n=133	400.16±6.75 n=72	399.65±7.65 n=52	398.81±2.34 n=651
Birth weight of calf (kg)	17.65±.38 ^c n=122	23.16±.32 ^b n=262	24.44±.32 ^{ab} n=135	24.32±.48 ^{ab} n=72	22.38±.59 ^b n=52	22.51±.21 n=643

Figure indicate Mean ± SE Value, n = Number of observation, LO = Local, FN= Friesian, SL = Sahiwal, JR = Jersey, ^{abc} values having different superscripts differed significantly.

Many researchers studied the effect of genetic group on productive and reproductive performance, some of those were similar with the present study. Rokonzaman (2006) found the average milk yield of Holstein Friesian cross, Sahiwal cross, Sindhi cross and Indigenous dairy cows were 8.39±2.01, 4.63±0.96, 4.35±1.12 and 2.38±0.73 liters, respectively. The average age at first calving were 34.12±3.78, 35.48±3.64 and 40.48±4.54 months, respectively. The average lactation length were 262±24.15, 250.4±28.06, 258.8±34.32 and 227.8±32.50 days, respectively. The average dry period were 134.8±30.02, 134±27.25, 163±32.37 and 197.4±52.28 days, respectively. The average post-partum heat period were 86.48±23.66, 93.92±38.06, 127.08±43.47 and 121.2±52.90 days, respectively. The average services per conception were 1.84±0.80, 1.32±0.48, 1.48±0.59 and 1.92±0.91, respectively. The average calving to first service were 98.28±26.29, 96.48±36.43, 131.24±41.14 and 124.4±55.42 days, respectively. The average calving intervals were 396±29.68, 385.2±39.66, 422.0±42.03 and 425.2±64.83 days, respectively. Sarder *et al.* (1997) reported that the average

milk yield (liter/day) for Holstein-Friesian cross, Sahiwal cross and Local cows were 7.2±2.6, 5.8±2.2 and 4.0±1.5 respectively. Shamsuddin *et al.* (2001) found a shorter calving interval in Sahiwal crossbred cows than that of crossbred of Friesian and Local cows.

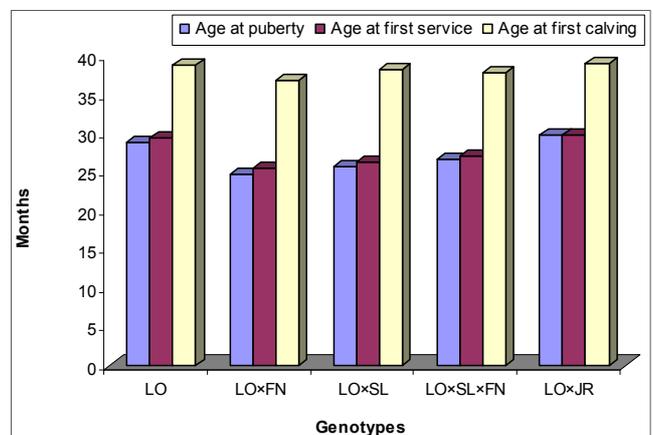


Figure 1. Graphical representation of mean value of age at puberty, age at first service and age at first calving in different genotypes.

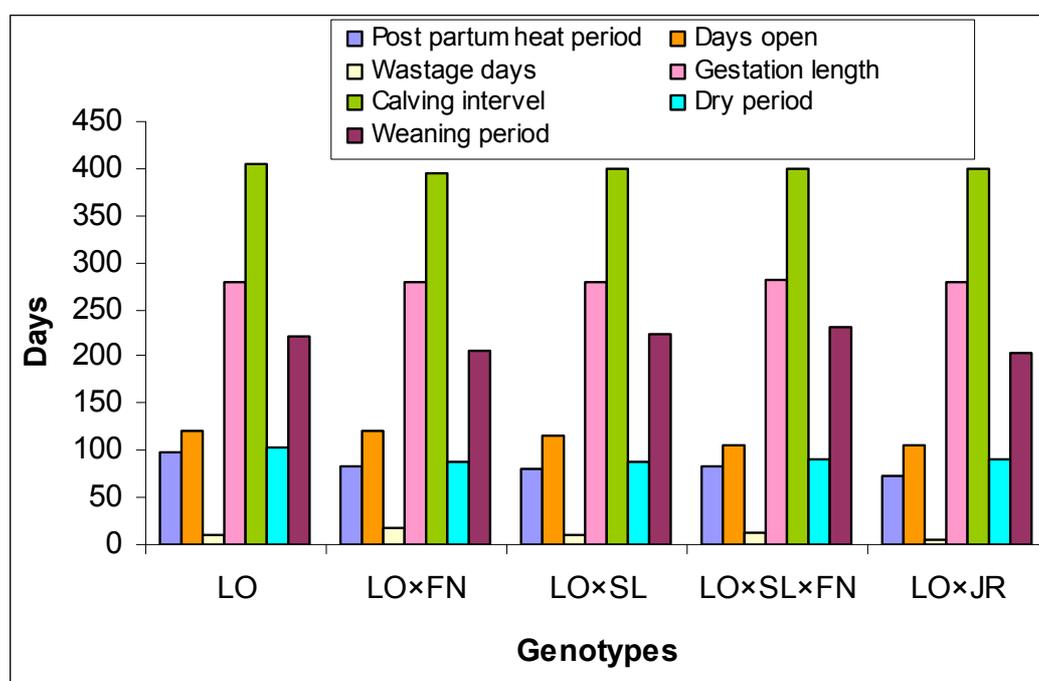
Table 3. Analysis of variance for genotypes on productive and reproductive parameters of dairy cows.

Productive and reproductive parameters	Source of variation	Sum of squares	DF	Mean square	F-value	Significant level
Age at puberty (month)	Between genotype groups	2315.706	4	578.927	20.531	***
	Within genotype groups	17116.346	607	28.198		
Age at first service (month)	Between genotype groups	1439.520	4	359.880	11.625	**
	Within genotype groups	18976.125	613	30.956		
Age at first calving (month)	Between genotype groups	386.407	4	96.602	2.647	*
	Within genotype groups	2120.771	581	36.499		
Service per conception (S/C)	Between genotype groups	9.053	4	2.263	3.338	*
	Within genotype groups	408.892	603	.678		
Post-partum heat period (days)	Between genotype groups	30120.697	4	7530.174	5.196	*
	Within genotype groups	862312.64	595	1449.265		
Days open (days)	Between genotype groups	14938.183	4	3734.546	1.136	NS
	Within genotype groups	1943701.4	591	3288.835		
Wastage days (days)	Between genotype groups	7916.501	4	1979.125	3.091	*
	Within genotype groups	391224.61	611	640.302		
Gestation length (days)	Between genotype groups	271.046	4	67.761	1.028	NS
	Within genotype groups	38614.020	586	65.894		
Milk yield per day (liters)	Between genotype groups	2368.938	4	592.235	102.961	***
	Within genotype groups	3330.433	579	5.752		
Lactation length (days)	Between genotype groups	10320.987	4	2580.247	1.420	NS
	Within genotype groups	1084444.0	5978	1816.489		
Milk yield per lactation (liters)	Between genotype groups	1.30E+08	4	32500562.970	70.938	***
	Within genotype groups	2.72E+08	594	458152.536		
Weaning period (days)	Between genotype groups	44130.611	4	11032.653	3.289	*
	Within genotype groups	2036330.9	607	3354.746		
Dry period (days)	Between genotype groups	21503.890	4	5375.973	4.254	*
	Within genotype groups	740563.38	586	1263.760		
Calving interval (days)	Between genotype groups	65741.025	4	1642.756	.496	NS
	Within genotype groups	1981492.9	598	3313.533		
Birth weight (kg)	Between genotype groups	3868.106	4	967.027	47.307	***
	Within genotype groups	12060.492	590	20.442		

NS = Non significant * = Significant at 5% levels

** = Significant at 1% levels *** = Significant at 0.1% levels

DF = Degree of freedom

**Figure 2.** Graphical representation of mean value of post-partum heat period, wastage days, calving interval, weaning period, days open, gestation length and dry period in different genotypes.

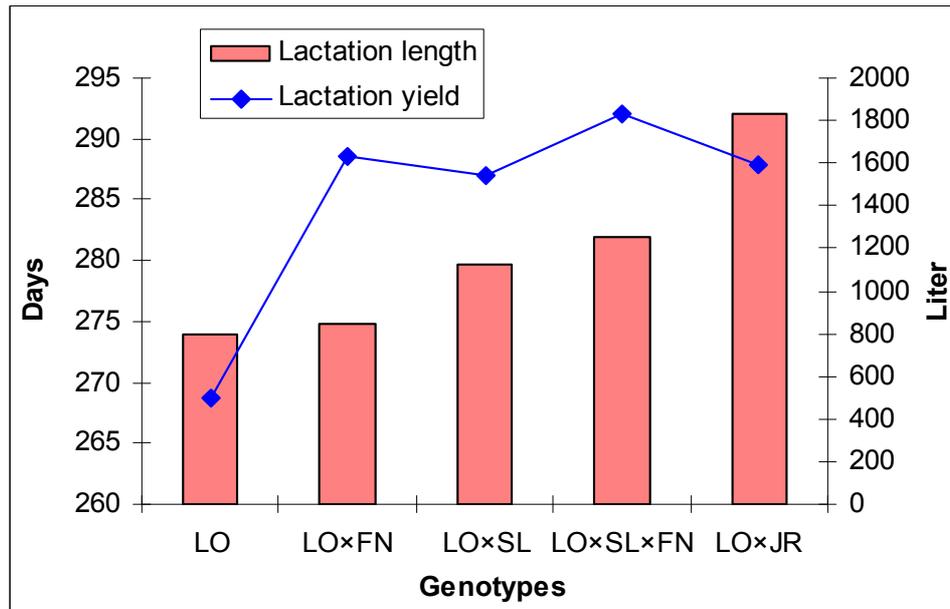


Figure 3. Graphical representation of mean value of lactation length and lactation yield in different genotypes.

Majid *et al.* (1995) found that performance of Friesian breed and its crosses with local cows were better among all genetic groups. Performance of Sahiwal and its cross-bred were observed to be poor. They showed that average age at first calving in pure breed Friesian was lowest of 939.97 ± 45.66 day; in SL it was the highest of 1678.95 ± 154.28 days, whereas in local it was 1269.29 ± 42.01 days. Ahmed and Islam (1987) reported that body weight at birth 23 kg; age at puberty 18-24 months; age at first calving 45 months; average milk production per day 6.64 kg; average lactation length 341 days, calving interval period 425 days. Corresponding value in Sahiwal/Sahiwal crossbred cattle were 20kg, 18-22 months, 51 months, 3.5 kg, 312 days and 493 days. Sarder (2001) found the average length of age at first service and age at first calving were 30.0 ± 7.0 and

39.7 ± 7.0 months respectively. Khan *et al.* (1991) found the significant ($P < 0.05$) effect of genetic groups on lactation period, gestation length and age at first calving. Kumar *et al.* (1997) that different traits like age at first calving, service period, calving interval, milk production had the best performance in two-breed crosses whereas 3-breed inter crosses had the worst ($P < 0.01$). Syed *et al.* (1998) mentioned that breed type had significant effect on lactation length and average daily milk yield; Sahiwal cows had the lowest ($P < 0.05$) average daily yield (5 kg) among crossbreds, average daily milk yield range from 6.4 to 7.5 kg.

In the present finding more or less similar to the above authors. Some parameters were not similar result due to sample size of dairy cows, data collection error, management of cows as well as selection of cows etc.

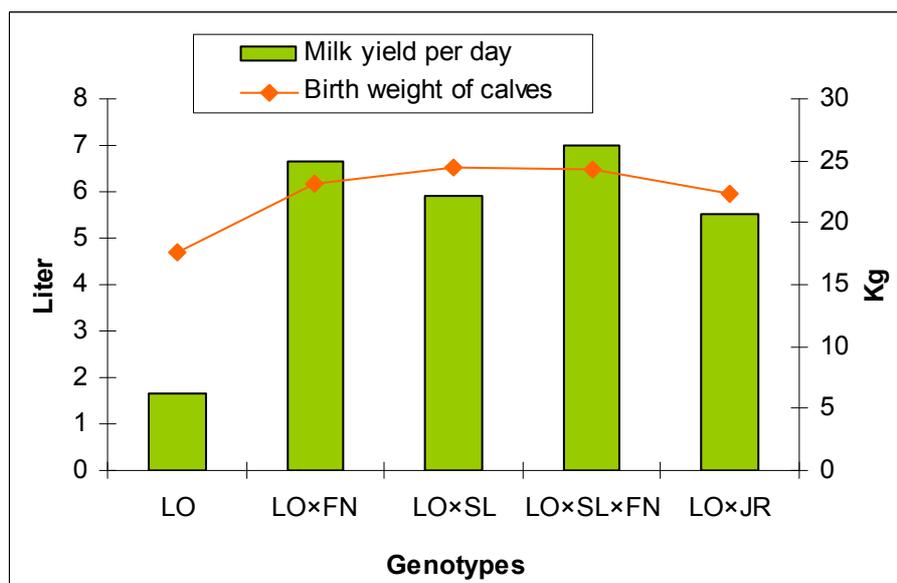


Figure 4. Graphical representation of mean value of milk yield per day and birth weight of calf in different genotypes.

4. Conclusion

Local×Sahiwal×Friesian genotypes had excellent performances considering all the productive and reproductive parameters in greater Rajshahi where, Local (indigenous) cows showed the worst result.

References

- [1] Ahmed Z and Islam TS 1987. Cattle breeding programme through artificial insemination in Bangladesh. A. I. Extension project Report CCBS, Dhaka.
- [2] Begum I A, Alam M J, Buysse J, Frija A and Van Huylenbroeck G 2011 A comparative efficiency analysis of poultry farming systems in Bangladesh: A Data Envelopment Analysis approach. *Applied Economics*, 44:3737-3747.
- [3] Department for Environment, Food & Rural Affairs (2012). Beef cattle and dairy cows: health regulations. <https://www.gov.uk/guidance/cattle-health>.
- [4] Islam, M. A., 1992. A comparative economic analysis of milch cows and buffaloes in two selected villages of Myensingh district in Bangladesh, M. Sc. Thesis, Department of Agricultural Finance, Bangladesh Agricultural University, Mymensingh.
- [5] Khan MAA, Amin MR, Howlider AR and Hussian SMI 1991. Successive reproductive and milk yield performance of dairy cows. *Bangladesh J. Train. Dev.* 4: 31-38.
- [6] Majid MM, Nahar TN, Talukder AI and Rahman MA 1995. Reproductive performance of pure breed, F₁, F₂ and F₃ cows related at Savar Dairy Farm. *Bangladesh J. Lives. Res.* 2: 53-62.
- [7] Rahman S and Bhuiyan S R 1991 Fisheries planning performance and Fourth Five-Year Plan. *Farm Economy*, 8: 109-121.
- [8] Rahman S, Begum IA and Alam MJ (2014) Livestock in Bangladesh: distribution, growth, performance and potential. *Livestock Research for Rural Development*. Volume 26, Article #173. Retrieved December 20, 2016, from <http://www.lrrd.org/lrrd26/10/rahm26173.html>.
- [9] Rokonuzzaman 2006. Study on the productive and reproductive performances of cross bred and indigenous cows under small holder dairy farming condition at Sarsha thana in Jessore district, M. S. Thesis, Department of Dairy Science, BAU, Mymensingh, Bangladesh.
- [10] Sarder MJU 2001. Reproductive and productive performance of indigenous cows. *The Bangladesh Vet.* 18: 123-129.
- [11] Sarder MJU, Shamsuddin M, Bhuiyan MMU and Rahman MA 1997. Individual Cow as determinant of the fertility and productivity in mini dairy farms. *Bangladesh Vet. J.* 31: 91-98.
- [12] Shamsuddin M, Bhuiyan MMU, Sikder TK, Sugulle AH, Chanda PK, Alam MGS and Galloway D 2001. Constraints limiting the efficiency of artificial insemination of cattle in Bangladesh. Radioimmunoassay and related techniques to improve artificial insemination programs for cattle reared under tropical and sub-tropical conditions. Proceedings of a final research coordination meeting organized by the joint FAO/IAEA division of nuclear techniques in food and agriculture and held in Uppsala, Sweden, 10-14 May, 1999. pp. 9-28.
- [13] Syed M, Rehman A, Farooq M and Ali M 1998. Production performance of Sahiwal and various grades of cross bred cattle. *Anim. Breed. Abstr.* 66: 209.