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Original Article

Status of feeding practices, productive and reproductive performances of dairy cows at the Palash Upazila of Narsingdi district in Bangladesh

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Rice straw, indigenous cow, Holstein crossbred, age at puberty, milk yield and calving interval.

A B S T R A C T

This study was carried out at different villages of Palash Upazila under the Narsingdi district in Bangladesh to envisage the storage system of straw, feeding system, genotype distribution, productive and reproductive performances of dairy cows. Hence, a total of 100 small-scale dairy farm owners were randomly selected and interviewed with a pre-tested structured questionnaire. Overall, 40% of farmers were raised indigenous cows in the studied villages, while 60% were reared Holstein crossbred cows. Around 75 and 25% farmers were collected green grass from the arable and non-arable lands, respectively. Results revealed that 11.43% farmers from each village of Balucharpara, Kandapara, Gazaria, Sultanpur, and Malita were stored straw as a stack on the field, and the lowest percentage (4.29%) farmers of Sanerbari village were followed this system of storage. About 14.81% farmers of each Paiksha and Sanerbari villages were stored straw inside their houses. Calving interval (P=0.04) of indigenous cows and milk yield (P=0.05) of Holstein crossbred cows were both differed significantly among the studied villages. Overall, both indigenous and Holstein crossbred cows performances were observed better in Balucharpara village than that of other villages. However, farmers should be motivated and given training on fodder cultivation, feed processing, and preservation to accelerate the sustainable production and reproduction of cows.

Introduction

Dairy animal rearing is an inseparable and integrated part of the subsistence smallholder farming in Bangladesh but faces many challenges (Uddin *et al*., 2010). Rice straw has been widely used as a basal feed for dairy animals in Bangladesh and is characterized by low nutritive value and imbalanced micronutrients (Leng, 1990; Akbar, 1992). Micronutrients are involved in the synthesis of reproductive steroids and other hormones, and combat anoestrous of cows (Habib *et al*., 2018). Deficiencies of mineral (phosphorus) and vitamins (A and E) also affect the reproduction of animals (Kamal, 2010). According to Shamsuddin and Aryal (2010), mineral deficiencies in diets lead to weak or silent heat in dairy animals which influences to delay of age at sexual maturity and first calving of heifers. In South Asia, pubertal age of zebu cattle varies from 24-36 months (Mukasa, 1989), and the age at first calving varies from 33-40 months (Shamsuddin *et al*., 2006) whereas, productive and reproductive traits of dairy animals are the important factors to determine the profitability of dairy production (Fikire *et al*., 2007, Saeed *et al*., 1987).

According to Cavestany and Galin (2001), and Pursley *et al*. (1997), primary metrics of productive and reproductive efficiency criteria for the dairy animals are daily milk yield, lactation period and first calving age. Beside these, number of services required per conception, days open and interval of calving are the important reproductive features for determining the profitability of milk production (Nibret and Tadele, 2014). Although each of these reproductive measures affects the dairy business's profitability in a slightly different way but the calving interval affects both the total milk production of the dairy herd and the number of calves born. Again, milk production levels and lactation persistency are crucial factors for determining the appropriate calving intervals (Arbel *et al*., 2001).

The conventional dairy animals feeding methods are based on the rice straw, natural grass supplemented with few or no concentrate mixture. Seasonal fluctuation affects the quantity

and availability of fodder for the feeding of dairy animals which hampers the sustainability of dairy animal production. There is an acute shortage of feed during lean period of Bangladesh and low quality rice straw used as basal diets for animals that negatively affects the profitability of dairy production (Akbar, 1992). Incorporation of green fodders and concentrate mixture in the diet of dairy cows can mitigate the loss of dairy profitability. In Bangladesh, crossbred cows are generally fed on stall while the local cows are usually sent out to the grazing land and fed *ad libitum* rice straw (Khan *et al*., 2009).

Dairy production has become a concerning issue in Bangladesh including Narsingdi district where livestock and its products are major sources of income of farmers. Again, reproduction and lactation performances of dairy animals are closely related to the income of dairy farmers. According to Zegeye (2003), productive and reproductive performances of dairy animals' are generally influenced by the genetics, diseases, feeding and other management practices. Again, Bangladesh is suffering from a severe shortage of feeds and fodder (Khan *et al*., 2009), which limits the dairy production in the rural areas of Bangladesh. However, no information reveals regarding the genotypes, storage of feeding and practices, productive and reproductive performances of local and Holstein crossbred cows at different villages of Palash Upazila under the Narsingdi district in Bangladesh. Therefore, data on feed storage, feeding practices, productive and reproductive performances of indigenous and Holstein crossbred cows at the Palash Upazila of Narsingdi district would suggest future genetic and non-genetic improvement of cows for the sustainable dairy animal production and profitability.

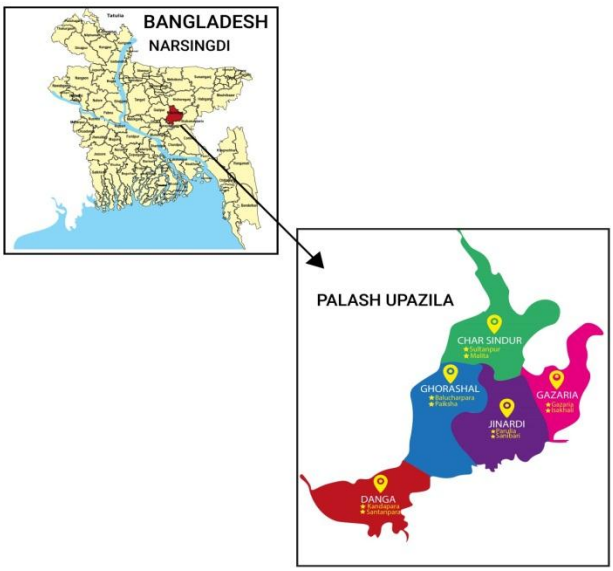
Materials and Methods

Study area and duration

The study was conducted at different villages of Palash Upazila under the Narshingdi district in Bangladesh. These villages were Balucharpara and Paiksha from Ghorashal union, Kandapara, and Santanpara from Danga union, Parulia and Sanerbari from Jinardi union, Gazaria and Isakhali from Gazaria union, Sultanpur and Malita from Charsindur union (Photograph 1). This study area's latitude and longitude range over 23.9642° N and 90.6489° E, respectively. The annual average temperature and rainfall vary from 12.7 to 36 °C and 2376 mm, respectively. The duration of the study was three months.

Data collection

Primary data were collected through direct interview method from the dairy farm owners. Before the actual interview, the farmers were given short briefings regarding the study's nature and purpose. The questions were asked systematically and explanations were made whenever it was felt necessary. A total of 100 dairy farmers were surveyed focusing on the objectives of the study. The questionnaire contained both open and closed forms of questions. Data were collected by face to face interviewing with the farm's owner with the questionnaire.



Photograph 1: Map showing the studied areas

Statistical analysis

Data from questionnaires were organized and analyzed using Microsoft excels. Respondent percentages for the rearing of genotypes, collecting sources of green grass, straw storage and feeding systems were determined. One-way ANOVA was performed using SPSS software (IBM-20 Corporation, 2011) to investigate the productive and reproductive performances of cows in studied areas. Duncan Multiple Range Test (DMRT) was also done to determine the significance of differences among the villages' means.

Results and Discussion

Rearing of genotypes

The rearing pattern of dairy genotypes (indigenous and Holstein crossbred) at the studied villages of Palash Upazila is depicted in Figure 1. It was found that the rearing of indigenous dairy genotype was dominant at Balucharpara village (15.38%), whereas Holstein crossbred genotype was dominant at Paiksha village (20.09%). Indigenous genotype rearing response was found more at Balucharpara village whereas, Holstein crossbred genotype rearing farmers (5.61%) were observed lower in that village. About 3.50% Kandapara village farmers reared native dairy cows (Fig. 1). Considering the overall villages, it was noted that 40% farmers reared indigenous cows whereas, 60% farmers reared Holstein crossbred cows (Data not shown).

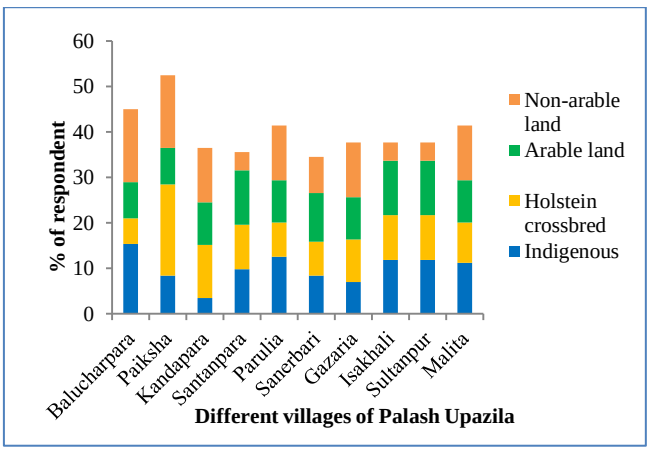


Fig. 1: Dairy genotypes and collecting sources of green grasses

Collection of green grasses

Collection of green grasses from arable and non-arable lands of different villages at Palash Upazila is given in Figure 1. Results revealed that 12% farmers from each Santanpara, Isakhali, and Sultanpur village were collected green grasses from the arable lands for feeding their dairy cows whereas, the least percentages (8%) of farmers from Balucharpara and Paiksha villages collected grasses from the arable land. Again, most of the farmers (16%) of Balucharpara and Paiksha villages harvested green grasses from the non-arable land. The lowest percentages (4%) of farmers from Santanpara, Isakhali and Sultanpur villages were collected green grasses from non-arable land (Fig. 1). Overall, 75 and 25% of farmers were collected green grasses from the arable and non-arable lands, respectively (Data not shown). These findings are in agrees with Akbar (1991) who mentioned that 87% of total feeds for livestock come from cultivated lands and the rest from the roadside, embankment, forest, and low lands. According to Khan *et al*. (2009), green grasses are generally offered to the crossbred cows and which are composed of roadside grass, cultivated fodder, weeds of crop fields, aquatic weeds and tree leaves.

Straw storage system and feeding system

The storage system of straw and feeding system of dairy cow that were followed by the farmers is shown in Fig. 2. It indicates that 11.43% farmers from each Balucharpara, Kandapara, Gazaria, Sultanpur and Malita villages were stored straw as a stack on the ground, but only 4.29% farmers followed such storage system at Sanerbari village. Around 14.81% farmers from Paiksha and Sanerbari villages were stored straw inside the house and that was the maximum in that village compared to the other villages. Rice straw is being considered as basal feed for dairy animals in Bangladesh during an acute shortage of green grass (Habib *et al*., 2018) so; dairy farmers always try to storage rice straw to mitigate that feeding crisis. However, most of the farmers faced deficiency of straw from March to April whereas; the minimum shortage was found from mid-October to mid-December (Alam *et al*., 1987).

The majority of the farmers (13.95%) of Gazaria and Sanerbari villages were followed the individual feeding system whereas, the lowest percentages (6.98%) of farmers from Paiksha and Kandapara villages followed such feeding system. Again, maximum farmers (12.28%) of each Paiksha and Kandapara villages were followed the group feeding system for their dairy cows than that of the other villages (Fig. 2). This study found that most of the farmers have medium and small-sized farms and limited lands for fodder production hence, they were followed the cut and carry method for the feeding of dairy cows as an individual, group feeding or both feeding system.

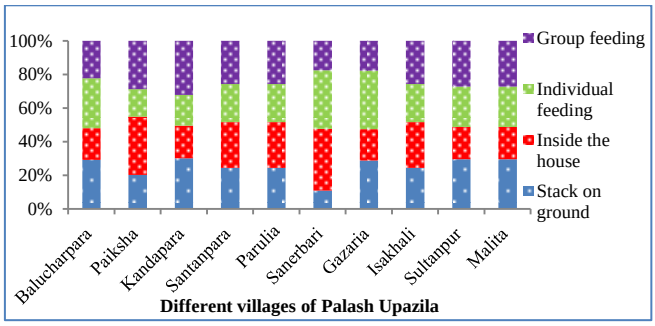


Fig. 2: Storage system of straw and feeding system

Productive and reproductive performances of dairy cow

Age at puberty

The average age at puberty of indigenous and Holstein crossbred cows of studied areas are presented in Tables 1 and 2. Results revealed that age at puberty of indigenous (P=0.69) and Holstein crossbred (P=0.99) cows were non-significant among the villages of Palash Upazila. The highest pubertal age of indigenous cows was found at Malita village (1200.00±40.99 days) whereas, the lowest age at puberty was recorded at Sanerbari village (1085.00±50.89 days). Again, age at puberty of Holstein crossbred cows were varied from 790-829 days over the villages of Palash Upazila (Table 2). When the heifers attain her body condition and sexual maturity for accepting service for the first time that time is known as her age at puberty which has significant importance in dairy production. Generally, pubertal age of cattle varies regarding the genetics, environment, feeding and management practices (Gidey, 2001).

Service per conception

Avg. service per conception number for indigenous and crossbred cows was statistically similar (P=0.99) in all studied villages. The number of service per conception for indigenous and crossbred cows at different villages was varied from 1.00-1.50 and 1.13-1.67, respectively (Table 1 and 2). It was noted that crossbred cows required 0.13-0.17 more service per conception than the indigenous cows which might be due to the genetic improvement of cattle. Similarly, Chowdhury (1995) reported that the average service per conception of indigenous, indigenous x Holstein and Sahiwal x Holstein cows were 1.70, 1.72, and 2.01, respectively. Semen quality, insemination techniques, the timing of AI, reproductive diseases and feeding practices are responsible for requiring more services per conception.

Table 1. Productive and reproductive performances (mean ± SE) of indigenous cows

Villages of Palash Upazila	Age at puberty (days)	Service per conception (no.)	Gestation length (days)	Calving interval (days)	Milk yield (L/day)	Lactation length (days)
Balucharpara (22)	1093.33±57.88	1.33±0.50	277.44±5.81	415.56^{bc}±7.26	2.11±0.33	233.33±12.25
Paiksha (12)	1165.00±44.35	1.50±0.58	278.00±3.56	460.00^{a}±11.55	2.00±0.00	225.00±10.00
Kandapara (5)	1165.00±21.21	1.50±0.71	280.00±7.07	450.00^{ab}±0.00	1.75±0.35	240.00±14.14
Santanpara (14)	1126.67±60.88	1.17±0.41	278.50±5.96	467.50^{a}±4.18	1.68±0.21	230.83±34.56
Parulia (18)	1133.33±46.33	1.00±0.00	276.67±5.68	456.67^{ab}±18.89	2.00±0.32	219.17±5.85
Sanerbari (12)	1085.00±50.89	1.17±0.41	281.67±6.06	459.17^{ab}±4.92	1.67±0.23	220.00±7.75
Gazaria (10)	1172.50±15.00	1.50±0.58	285.00±4.08	448.75^{ab}±4.79	1.83±0.39	230.00±0.00
Isakhali (17)	1180.00±24.49	1.50±0.55	277.33±6.47	458.33^{ab}±7.53	2.08±0.58	223.33±9.83
Sultanpur (17)	1156.25±54.76	1.38±0.52	277.75±5.23	461.88^{ab}±7.04	1.81±0.26	221.88±7.53
Malita (16)	1200.00±40.99	1.33±0.52	280.50±5.96	466.67^{a}±4.08	1.75±0.27	233.33±11.69
P-value	0.69	0.99	0.98	0.04	0.97	0.98

Parenthesis value in each village indicates the number of observations. ^{abc} Mean values in a column with uncommon superscript letters differed significantly.

Gestation length

The average gestation lengths of indigenous and crossbred cows at different villages are presented in the Tables 1 and 2. Results revealed that gestation length did not differ statistically among the studied villages for indigenous (P=0.98) and crossbred cows (P=0.97). In this study, indigenous and crossbred cows' gestation length was varied from 276-280 and 280-286 days, respectively. According to Asaduzzaman and Miah (2004), the gestation length of Sahiwal x indigenous and Friesian x indigenous were 281.1 and 282.7 days, respectively. However, Mukasa-Mugerwa *et al*. (1991) mentioned that gestation length is more or less constant and varying slightly due to breed, calf sex, litter size, dam age, year and month of calving.

Calving interval

Data on the calving interval of cows are given in Tables 1 and 2, and it was found that a significant difference exists in the calving interval of indigenous cows (P=0.04) but the crossbred cows did not differ (P=0.98) statistically. The calving interval of indigenous cows was the lowest at Balucharpara village (415.56±7.26 days) and the highest at Santanpara village (467.50±4.18 days). Again, the calving interval of crossbred cows varied from 405-422 days over the villages. Results clearly indicated that indigenous cows take more time to produce next-generation calf than crossbred cows. This difference may be due to the effect of genotype, environment, feeding, and management. Long calving interval is a common problem in profitable dairying, and it is linked to poor body condition score and mineral deficiency primarily inorganic phosphorus (Swai *et al*., 2005). The long calving intervals result in low calf crop and low production level (Ayalew *et al*., 2018).

Table 2. Productive and reproductive performances (mean ± SE) of Holstein crossbred cows

Villages of Palash Upazila	Age at puberty (days)	Service per conception (no.)	Gestation length (days)	Calving interval (days)	Milk yield (L/day)	Lactation length (days)
Balucharpara (12)	790.00±22.80	1.50±0.55	280.83±7.36	422.50±30.62	5.83^{a}±0.75	310.00±12.65
Paiksha 43)	828.75±48.24	1.13±0.35	281.25±6.04	421.88±24.49	4.81^{ab}±0.96	300.63±15.45
Kandapara (25)	823.13±20.86	1.50±0.53	281.25±5.18	420.00±17.11	5.19^{ab}±0.84	300.00±22.68
Santanpara (21)	810.00±22.80	1.67±0.52	286.00±2.45	410.83±2.04	4.08^{ab}±0.38	290.83±35.84
Parulia (16)	814.00±21.91	1.40±0.55	283.40±5.50	408.00±5.70	4.20^{ab}±0.45	305.00±12.25
Sanerbari (16)	810.00±21.60	1.50±0.58	287.00±2.45	405.00±7.07	3.63^{bc}±0.25	290.00±7.07
Gazaria (20)	816.67±28.05	1.33±0.52	283.00±4.69	405.00±8.37	3.92^{ab}±0.38	297.50±14.05
Isakhali (21)	818.57±28.54	1.14±0.38	285.29±3.25	408.57±5.56	3.71^{ab}±0.49	297.14±9.94
Sultanpur (21)	800.00±10.95	1.17±0.41	286.33±3.14	413.33±6.06	4.58^{ab}±0.86	315.00±10.49
Malita (19)	818.00±29.50	1.40±0.55	285.60±3.78	412.00±5.70	3.50^{bc}±0.35	292.00±9.75
P-value	0.99	0.99	0.97	0.98	0.05	0.97

Parenthesis value in each village indicates the number of observations. ^{abc} Mean values in a column with uncommon superscript letters differed significantly.

Milk yield

The milk yield of indigenous cows at different villages of Palash Upazila is given in Table 1 and found statistically similar (P=0.97) among the studied villages. The highest daily milk yield of indigenous cow was found at Balucharpara village (2.11±0.33 L) whereas, the lowest observed at Sanerbar village (1.67±0.23 L). Again, the milk yield of crossbred cows was differed significantly (P=0.05) among the studied villages. The highest daily milk yield of crossbred cow was found (5.83±0.75 L) at Balucharpara village and the lowest was found at Malita village (3.50±0.35 L) (Table 2). Compared to the indigenous cow, Holstein crossbred cow gave 1.83-3.7 L more milk, and this could be due to the complementary or heterosis effects. Nahar *et al*. (1992) reported that the average daily milk yield of Holstein x indigenous, Sahiwal x indigenous, Sindhi x indigenous, and Jersey x indigenous crossbred cows were 5.5±0.1, 2.9±0.1, 3.0±0.1, 3.8±0.1 kg, respectively.

Lactation length

The lactation length of indigenous and crossbred cows was remained statistically similar over the villages of Palash Upazila. It was found that lactation length of indigenous and crossbred cows was varied from 219-240 and 290-315 days, respectively (Table 1 and 2). Similar findings reported by Khan (1990) who reported that average lactation length of Pabna, Sindhi and Sahiwal crosses were 200, 251 and 282 days, respectively which are almost similar to the present findings. This study indicated that crossbred cows have long length of lactation period than that of the indigenous cows which is in line with the findings of Ayalew *et al*. (2018). However, a lactation length of 305 days (10 months) is commonly accepted as a standard for sustainable dairy animal production. An extended lactation period has practical implications for the dairy farmers and enterprise as it provides compensation for the extended calving interval period (Fikirie *et al*., 2007).

Conclusions

Overall, 40% farmers reared indigenous cows whereas, 60% farmers reared Holstein crossbred cows in the studied areas. About 75% farmers were collected green grasses from the arable lands and the rest 25% were from the non-arable lands. The results indicated that 11.43% farmers from each Balucharpara, Kandapara, Gazaria, Sultanpur and Malita villages were stored straw as a stack on the ground. Among the villages, 14.81% farmers from each Paiksha and Sanerbari villages were stored straw inside the houses. Among the productive and reproductive performances, calving interval of indigenous cows and milk yield of Holstein crossbred cows only statistically varied among the studied villages of Palash Upazila. However, the performances of indigenous and Holstein crossbred cows were observed better in Balucharpara village compared to the other villages of Palash Upazila.

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