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Studies on management system and identification of the causes of genetic erosion of indigenous cattle in Mymensingh district

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Abstract

The study was conducted at four villages of Sadar Upazila of Mymensingh district to study the management system and identify the probable causes of genetic draw off of indigenous cattle. The data were collected through personal interview of 151 randomly selected farmers by using a pre-tested structured interview schedule during the period from January to April, 2012. It was observed that the cattle per household was 2.98 in number. Among the farmers, 48% of them provided soft (soiled floor with bamboo fence), 48% semi-concrete (concrete floor with half of concrete wall and half of bamboo fence), 3% of concrete house (concrete floor and wall) and other 1% had no house for their cattle. About 80%, 17% and 3% farmers reared cattle by semi-intensive, intensive and extensive or free grazing system, respectively. More than 84% of the farmers managed feed from both sources (own and purchase) for their cattle even though 15% fully depended on purchasing feed from local market, but a little (1%) of them from their own sources. Among the cow genotypes, more than half (61.16%) was of the indigenous which was significantly ($p<0.01$) higher than the crossbreds (38.84%). It was observed that semen of Holstein were used significantly ($p<0.05$) higher than that of the semen of local or any other crossbred bulls. Most of the farmers (76%) inseminated their cows artificially rather than naturally (19%) and merely of 5% did both. A small number of farmers (11%) followed the existing breeding policy while maximum of them (86%) ignored or overlooked it. The main cause of genetic erosion of indigenous cattle in the study areas, might be due to lack of adherance to breeding policy and practice of insiariminate crosses with exotoc breeds. Nevertheless, lack of farmers' awareness, changes in cattle management system along with agricultural practices might have also contributed to this issue as well. It needs to develop sustainable guidelines by the relevant authorities for proper breeding practices to minimize the uncontrolled and misdirected crossing between exotic and local cattle for conserving and protecting the valuable indigenous cattle in the region.

Key words: Genetic erosion, indigenous cattle, management status

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Introduction

Bangladesh has vast animal genetic resources with a wide variety of indigenous farm animals including the cattle such as Red Chittagong, Pabna type, North Bengal Grey, Munshigonj type, Madaripur type and Non-descriptive native or local type. The total population of cattle in Bangladesh is about 24.5 million which is about 1.8% and 5.5% of the world and Asia, respectively (FAO 2004). Among the total population 90% are indigenous zebu type. Even though they are low productive with poor genetic make-up, they are well adapted to our environmental condition (Mujid et al. 1995), have an ability to maintain body condition on poor quality feedstuffs and also well resistant to diseases. Their adaptive features enable them to effectively cope with the stressful nature of marginal lands. According to Bhuiyan (1997), some additional positive attributes of indigenous cattle of Bangladesh are: a) small size and hence lower metabolic heat production; b) regular breeder; c) lower calf mortality (less than 5 to 6%); d) high variation in phenotypic performance; e) better utilization of low quality roughages and f) stabilize the existing production and marketing system. The management system of indigenous cattle varies based on the socio-economic condition of the farmers, season and availability of feed.

These cattle breeds have evolved over generation to adapt to the agro-climatic and socio-economic needs of people of the country (Hossain et al. 2006). A number of these breeds are now at the risk of extinction because of unplanned breeding and exotic germplasm (FAO, 2007). Crossbreeding of native cattle for increased milk production has been advocated as

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a breeding policy across the country. However, exotic breeds often lack resistance to local diseases climatic conditions produce poorly and lack persistency without having considerable high quality feed and management. Some indigenous breeds are getting endangered at an alarming rate while others are in the process of replacement by certain high producing types. If this trend continues, the invaluable native germplasm would grossly be depleted or even lost for ever. Thus livelihoods of the poor can be negatively affected by replacing traditional breed with improved breeds (FAO 1997).

In this situation, conservation and sustainable development of animal genetic resources requires a broad focus on the adaptive breeds that survive well in the low external input agricultural system of developing countries. The causes of erosion animal genetic resources are the misguided development policies initiated in developing countries. Due to ignore the majority of animal genetic resources adapted to the lower input mixed farming production systems are found throughout the developing world. Instead, the focus has been on the introduction of high-yielding exotic breeds that were developed for high-input production environments (ILRI, 1999).

Approximately 80% of the rural people of Bangladesh depend on the indigenous cattle for their livelihood (Bhuiyan et al. 2007). They can play an important role as cash reserves in low-income mixed farming systems. Thus indigenous cattle of Bangladesh contribute in many ways to human survival and wellbeing especially poor rural people of the country. So it iseems worthwhile to conserve the native genetic resources because these resources are developed over long time and they are adapted to our environmental condition. Considering the above facts and circumstances, the present study was undertaken to know the status and management system, and to identify the probable causes of genetic erosion of indigenous cattle in the study area.

Materials and Methods

The study was carried out from January to April, 2012 by randomly selecting 151 households of four different villages of Shikarikanda, Digharkanda, Baera and Sutiakhali at Sadar Upazila in Mymensingh district. The data were collected by filling up the questionnaire through interviewing the farmers; direct observation and recording the farmers' opinion. The questionnaire was pre-tested for judging suitability of the questionnaire to the respondents. Thereafter it was finalized upon making necessary modifications. Simple and direct questions was included in the questionnaire for collecting information relating to socio-economic condition of the farmers, number of cattle, feeding management, housing, breeding and production information, disease incidence, artificial insemination strategy, present status of cattle population and problem regarding cattle development in the study areas. For the cases, where the farmers were not having any written information (records) on their livestock, it depended on the memory of respondents for obtaining the desired information. Before leaving the farmers' house, the information was checked carefully, and any confusion was rationalized and corrected by comparing these with local standards to keep consistency of data. A number of tables and graphs were prepared on the basis of the aims and objectives of the study by using Microsoft Excel program. The collected data were tested using Statistical Package for Social Science (SPSS, 2002) computer program and unusal data were omitted from the data bank. After that data was sorted according to the purpose of analysis. Tabulated data were analyzed and condensed using SPSS computer program and Microsoft Excel program to deliver the results.

The nature of the recorded dada in data sheet for different variables was unequal. It is important to test the hypothesis that the given data have been obtained by random sampling from a specified population with definite values for its parameters. The given data was arranged in the form of a frequency distribution with observed frequency for the various classes. The corresponding expected (theoretical) frequencies were obtained on the basis of population distribution. Finally, the data were analyzed using x^2 statistic with the following formula:

$$x^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Where, O_i = Observed frequencies; E_i = Expected frequencies; i = No. of observation (starting from 1 to k)

Results

Status of cattle genotypes in study areas

The status of cattle genotypes for 151 households in study areas are shown in Table 1.

Table 1. Status of cattle genotypes for 151 households in study areas

Cattle genotypes	Cows		Bull plus calves		Total Cattle	Cattle per household		
						Cattle	Cow	Bull plus calves
	No.	%	No.	%				
Local	148[a]	61.16	43[b]	20.67				
Holstein x Local	41[b]	16.94	71[a]	34.14				
Sahiwal x Local	31[b]	12.81	43[b]	20.67	450	2.98	1.6	1.38
Sindhi x Local	12[c]	4.99	28[c]	13.46				
RCC x Local	10[c]	4.13	23[c]	11.06				
Total number	242 (54%)		208 (46%)					

RCC, Red Chittagong Cattle; Means with different subscript in the same column differ significantly ($p<0.05$)

Total cattle were 450 of 151 households along with 2.98 in number for per household in addition to cows and bull plus calves of 1.6 and 1.38, respectively. The existing cow genotypes were 242 in number for Local (148), Holstein × Local (41), Sahiwal x Local (31), Sindhi x Local (12) and Red Chittagong Cattle (RCC) x Local (10), and were 61.16, 16.94, 12.81, 4.99 and 4.13%, respectively. Likewise the bull plus calves were 43, 71, 43, 28 and 23 out of 208 for Local, Holstein × Local, Sahiwal x Local, Sindhi x Local and RCC x Local (10), and of 20.67, 34.14, 20.67, 13.46 and 11.06%, respectively.

Production status of cows

Production status of cows is shown in Table 2. The average milk yield and lactation length of indigenous cows were 2.37±0.26kg/d and 276.56±19.17 days, respectively. Conversely, the average milk was 9.33±2.44, 3.00±0.38, 3.16±0 and 2.25±0.25kg/d for Holstein x Local, Sahiwal x Local, Sindhi x Local and Chittagong x Local cows, respectively. The average lactation length was 326.39±19.34, 306.28±25.52, 267.56±26.51 and 260.18 ±14.52 days for Holstein x Local, Sahiwal x Local, Sindhi x Local and Chittagong x Local cows, respectively.

Table 2. Milk yield and lactation length of different cow genotypes

Cow genotype	n	Milk yield (Kg/d)	Lactation length (d)
LO	53	2.37±0.26[b]	276.56±19.17
HL x LO	41	9.33±2.44[a]	326.39±19.34
SL x LO	40	3.00±0.38[b]	306.28±25.52
SN x LO	23	3.16±0.27[b]	267.56±26.51
RCC x LO	11	2.25±0.25[b]	260.18 ±14.52

LO, local; HL, Holstein; SL, Sahiwal; SN, Sindhi; RCC, Red Chittagong Cattle; means with different subscript in the same column differ significantly ($p<0.01$)

Housing and feeding management of cattle

Cattle management systems are summarized in Table 3 and 4. Aproximately 48%, 48% and 3% of the farmers provided soft (soiled floor with bamboo fence), semi-concrete (concrete floor with half of concrete wall and half of bamboo fence) and concrete house (concrete floor and wall), respectively other than of 1% had no house for their cattle. Eighty percent of the farmers reared cattle by semi-intensive system whereas 17% by intensive and only 3% of extensive or free grazing system. A small number of farmers (1%) supplied feed for their cattle from own source while maximum (84%) arranged feed from both sources. However 15% were fully depended on the purchasing feed from local market. Merely 5% of farmers used Urea Molasses Straw (UMS) technology whereas 95% of them were not aware of any feeding technology for their cattle.

Table 3. Types of housing for the cattle

Types	No. households	Percentage
Soft	72	48
Semi-solid	73	48
Solid	4	3
No house	2	1

Table 4. Feeding source with system and technology for the cattle

Parameters		No. farmers	%
Feeding source	Own	2	1
	Purchase	23	15
	Both	126	84
Feeding system	Extensive	5	3
	Intensive	25	17
	Semi-intensive	121	80
Feeding technology	No treatment	144	5
	UMS	7	95

UMS, Urea Molasses Straw.

Breeding of cattle

The breeding bull genotypes that were used to breed is summarized in Table 5. Semen of bulls utilized were 10%, 48%, 25%, 12% and 5% for Local, Holstein x Local, Sahiwal x Local, Sindhi x Local and Red Chittagong, respectively for natural/artificial breeding. Breeding system along with strategy is given in Table 6. About 76% of the farmers bred their cows artificially rather than naturally (19%). In context, only 5% of them bred their cattle both of artificial and natural means. Merely 11% followed existing breeding policy, but majority of them (87%) accepted artificial insemination by their own choice (Table 6) whereas 2% in other means.

Table 5. Bull genotypes used to breed in the study areas

Bull genotypes	Number	Percentage
Local	18^{c}	10
Holstein x Local	82^{a}	48
Sahiwal x Local	42^{b}	25
Sindhi x Local	21^{c}	12
Red Chittagong	8^{d}	5

RCC, Red Chittagong Cattle; Means with different subscript in the same column differ significantly (p<0.05)

Table 6. Breeding system along with strategy

Parameters		Percentage
Breeding system	Artificial insemination	76
	Natural service	19
	Both	5
Breeding strategy	Farmer choice	87
	Breeding policy	11
	Others	2

Purpose of Cattle husbandry

Purposes of cattle husbandry is shown in Figure 1. Majority of the farmers (85%) reared their cattle for partial income whereas 1% for other, and merely of 10% and 4% for family maintainence and commercial purposes, respectively.

Discussion

More than half (61.16%) of the cow genotypes of local were significantly (p<0.05) higher than the others as Holstein × Local; Sahiwal x Local; Sindhi x Local and Red Chittagong x Local. Similarly bull plus calves for Holstein × Local were significantly (p<0.05) higher than the other genotypes. Among the bull plus calf genotypes only 20.67% was local which indicated that indigenous cattle were constantly being crossed with unrelated breeds/varieties causing the great losses of the valuable cattle genotypes in these places.

A notable issue was that the farmers had no draught animal for the preparation of land and very often it was performed by machineries of their own or hired. This phenomenon of using various equipment and machineries in agricultural fields by the farmers seems to be a major cause of the loss of indigenous draught animals. Hammond and Leitch (1996) also reported that the mechanization in agriculture is a cause of genetic losses of livestock.

The average milk yield was fairly similar among the different cow genotypes excluding the yield of 9.33±2.44 kg/d for Holstein x Local was significantly (p<0.01) higher than the others. Though the milk yield of indigenous cattle was low (2.37±0.26kg/d), but it was a little bit higher than the RCC x Local (2.25±0.25 kg/d). The average lactation length was 326.39±19.34, 306.28±25.52, 267.56±26.51 and 260.18 ±14.52 days for Holstein x Local, Sahiwal x Local, Sindhi x Local and RCC x Local cows, respectively. It was revealed that daily milk yield of indigenous cow was comparatively lower than the other crossed genotypes, devoid of Red Chittagong x Local. With the exception of RCC x Local, the lactation length of other crossed cows were greater than the indigenous cow and these distinct variation in lactation length clearly indicated that the total lactation yield was also high in crossed cows than indigenous one. The extensive use of graded bull's semen (Table 5) obviously exposed the idea that the low production of indigenous cows directly enhanced the farmers to rear dairy based crossed cows instead of indigenous stock. Thus, the indigenous cattle were continuously being crossed with exotic ones and being caused the serious losses of genetic make-up in the indigenous cattle at study areas.

It was observed that almost all the farmers provided housing facilities for their cattle without a few (1%). Near about 48%, 48% and 3% of the farmers provided soft (soiled floor with bamboo fence), semi-concrete (concrete floor with half of concrete wall and half of bamboo fence) and concrete house (concrete floor and wall), respectively for their cattle (Table 2). The result was comparable to the result of Rashid et al. (2007) and Hossain et al. (2004), who reported

that 54%, 24% and 22% house was soft, semi-concrete and concrete house, respectively. It was found that most of the farmers (80%) reared cattle by semi-intensive system, some (17%) by intensive and merely 3% of extensive or free grazing system. The extensive or free grazing cattle rearing were very unfortunate owing to shortage of grazing land. A very little number (1%) of farmers supplied feed for their cattle from own source while maximum (84%) had both type of feed sources, however 15% were fully depended on the purchasing of feed from local market. Simply 5% of the farmers used Urea Molasses Straw (UMS) technology whereas 95% of them were not aware of any feeding technology for their cattle. Rashid et al. (2007) obtained that 54% of the farmers did not accept any new technology. Though their value was extremely lower than the present value, but the farmers' awareness and motives about the new technology was mentionable, and often it appeared to be the same. Nevertheless, Hossain et al. (1999) and Rahman et al. (1998) explained that traditional knowledge on cattle feeding like chopping of straw, mixing of green grass with straw; feeding tree leaves etc. were practiced by the rural farmers in this district, also found by the present study. Feed scarcity along with ignorance on modern feeding technology in the experimental areas thought to be the causes of decreasing the cattle population gradually.

There was no remarkable deviation in between the artificial breeding of the present finding (76%) with that of the finding (75%) observed by Rahman (1996) at Dhaka district of Bangladesh even though in case of the value for the both of artificial plus natural service (25%) was distinctly differed from the present one (5%). The equal value (76%) for artificial breeding was found by Rashid et al. (2007) at Jessore district of Bangladesh and correspondingly differed for both of the artificial plus natural breeding (24%) with that of the observed value (5%) as well. Merely 11% of the farmers followed breeding policy, but majority of them (87%) accepted artificial insemination by their own choice (Table 6) whereas 2% in others. This observation clearly defined about the indiscriminate crossing among the animals in experimental zones and obviously pointed toward the inadequacy of breeding bulls and weakness of proper breeding policy/strategy in most of the cases as well. Accordingly, these facts critically might responsible for the genetic drain/genetic losses of indigenous stock of cattle which matched the expression of Talukder and Hoque (2003) for indigenous cattle genotypes of Bangladesh, and Rege and Tawah (1999) of Africa.

Maximum (85%) of the farmers reared cattle for partial income indicated that there was a less fascination for rearing the cattle. This was probably due to scarcity and high price of animal feed along with shortage of grazing land. These feelings of the farmers enormously constrained the rate of cattle rearing which might influence the genetic losses of cattle genotypes in the study areas.

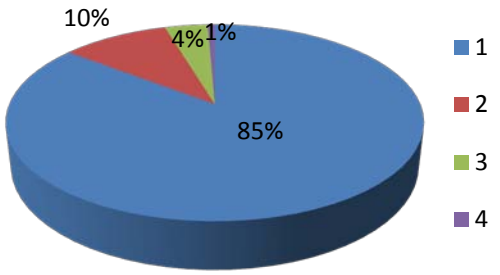

Figure 1: Purpose of cattle husbandry (1, Partial income; 2, Family maintain; 3, Commercial purpose; 4, Other)

Conclusion

The cattle in study areas were perceived as inferior for its poor genetic make-up with few economic values and pushed it to become threatened. Defective and being weak in existing breeding policy was not enough to meet up the farmers' demand and naturally this was not exclusively followed by the beneficiary as well as implementing agencies, and thus practices of indiscriminate crossing between unrelated animals might have been thought to be the major cause of genetic erosion of indigenous cattle in the study areas. Nevertheless, lack of farmers' awareness, present demand and changes in cattle management system, and lastly the existing agricultural practices might have also been contributed to this issue as well. There is a need to generate of awareness among the people on the suitability of indigenous cattle and simultaneously being necessary to develop guidelines for satisfactory and sustainable breeding program with a view to avoid uncontrolled crossing between animals to minimize the drainage of genetic reserves of indigenous cattle thus securely saving them from the threatening of genetic erosion.

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