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A Review on Cattle Reproduction in Bangladesh

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Abstract: Cattle among other livestock species available are the most versatile component in relation to existing integrated agricultural farming system in Bangladesh. About 90% of total 24.5 million cattle are of non-descript indigenous in origin along with 10% crossbred constitute national herd. Among indigenous cattle (Zebu) in different region non-descript Deshi, Pabna, Red Chittagong and North Bengal Grey are predominant. The reproductive performance of these cattle and other crossbred are poor. Indigenous Pabna cattle attain puberty relatively earlier than other types. It is found that about two services are required for conception. Average calving interval ranged from 365-536 days and average postpartum service period is ranged from 103-161 days among the indigenous and crossbred cattle. Anestrus and repeated conception failure are major causes of the reproductive inefficiencies. Higher prevalence of Brucellosis is reported although its impact in cattle reproduction and human health yet to determine.

Key words: Cattle, reproduction, bangladesh, live stock

INTRODUCTION

Bangladesh lies in the Northeastern part of South Asia between 20024' and 26038' north latitude and 88001' and 92041' east longitude. The county consists of low, flat and fertile land except the hilly regions in northeast and southeast. The mean annual temperature is about 26°C with an extreme range between about 4 and 43°C. The average annual rainfall varies from 1429 to 4338 mm. The 80% of the rainfall occur in Monsoon covering July to October (BBS, 2002). Cattle among other livestock species available are the most versatile component in relation to existing integrated agricultural farming system in Bangladesh. Total cattle population of the country is about 24.5 million, which is about 1.79% of the world and 5.47% of Asian cattle population (FAO, 2004a). In the last 10 years, the cattle population has increased by 0.3% in contrast with 0.4% of the world. Number of cattle per livestock household is 3.5 and that of 0.94 for all household (BBS, 2002). Along with indigenous/local zebu cattle some exotic and their crosses (not exceeding 10%) constitutes the national herd. Among the indigenous types (Mason, 1988), non-descript Deshi, Pabna, Red Chittagong, North Bengal Grey are predominant. Smallholder farmers maintain majority of the animals that are generally maintained on crop residues and other agricultural by-products. Rice straw is the basic feed item satisfying over 80% roughage needs throughout the country. Grazing animals on roadside, fallow land, riverbank or on lands from where crops has harvested partially fulfilling the green roughage requirement. Whereas in some milk pocket areas (Bhaghabarighat, Sirajgong; Takerhat, Faridpur etc.) green fodder are available from November to April and next of the year animals are raised on rice straw and preserve fodder. Rice polish, wheat/pulse bran etc as concentrate sources are playing important role in livestock enterprises throughout the country in variable level. In hilly areas, no attention is

thrown for nutritional management except in few cases when cattle are reared for milk yield. In farm conditions improved feeding and management practices are followed throughout the year. Several attempts have been taken scatterly to increase reproduction potential of Bangladeshi cattle for different periods with variable achievements. Therefore, the aim of this review is to summarize the information available on cattle reproduction so that it would be helpful for designing future reproduction and improvement strategy in the country.

REPRODUCTIVE PERFORMANCE

The main goal in a commercial dairy operation is to optimize calf production per cow as economically as possible. It is well established that maintaining a satisfactory fertility level is the fundamental aspect for successful operation of any cattle breeding program. In Bangladesh, around the year a large number of animals remain barren or unproductive having exposed many times for natural mating or artificial insemination and become a burden for the farmers. Table 1 shows the reproduction performance of indigenous and crossbred cattle of Bangladesh. Indigenous Pabna cattle attain puberty relatively earlier than other types. It was found that the same number of services is required for conception and gestation length more or less similar for all types of indigenous and crossbred cattle. The average calving interval ranged from 365-536 days among the indigenous and crossbred cattle. The lowest and highest calving interval recorded in Red Chittagong and non-descript Deshi respectively. The average postpartum service period is ranged from 103-161 days in indigenous and crossbred cows. The results indicated that the reproductive performance of cattle of Bangladesh is not satisfactory. Rahman *et al.* (2009) found higher prevalence of mastitis (19.9% in dry and 44.8% in wet seasons) in cows of Bangladesh. Parveen *et al.* (2001) characterize Staphylococcal isolates of cows and concluded that gentamicin, chloramphenicol and erythromycin could be of better value in treating cows with the infections.

Table 1: Reproductive performance (superscripts are the shortcut of the references) of cattle in Bangladesh

	Types of cattle				
Parameters or traits	Non-descript deshi	Pabna	Red chittagong	North bengal grey	Exotic crossbred
Age at first service (days)	977.86±50.9[1]	468±12[4], #491±66[3]	1216±121.66[6]	869±29.6[5]	876±192[9]
	1179±2.06				750±31[7]
Services per conception	1.76±0.19[1]	1.29±0.60[12]	1.25±0.12[11]	1.4±0.6[5]	1.62±0.63[9]
	#1.78±0.22[2]	1.57±0.07[13]	1.57±0.53[12]		1.5±0.1[7]
	1.76±0.08[12]		1.2[17]		1.6±0.6[14]
	1.6±0.86[16]		1.61±0.09[13]		
Gestation period (days)	273.48±2.3[1]	#282±11[3]	283.69±11.20[6]	281±1.3[5]	278.7±5[9]
	#274.9±2.51[2]	284.61±4.56[6]	287±3.46[11]		278.3±4.2[14]
	278.5±6.88[16]		281.30±1.43[13]		
	281±10[3]				
Calving interval (days)	484.21±11.50[1]	# 485±137[3]	430.86±76.86[6]	442±7.4[5]	420-528[8]
	#449.9±27.87[2]	489.5±75.70[6]			438±49[9]
	# 536±110[3]	453.6±12.80[17]	409.9±0.12[11]		487.5±17.4[14]
	489.52±75.70[6]		365[17]		#445-487[10]
	#446±107.92[16]				
Postpartum service	120.04±7.84[1]	160.7±80.26[15]	157[17]	110±4.2[5]	139±47[9]
period (days)	141.3±88.36[16]	103.64±6.61[17]			110±2.81[7]
Dry period (days)	#189.3±13.46[2]	# 222±134 [3]		180±6.8[5]	160±49[9]
	# 275±136[3]				

#Farming system, [1]Majid *et al.* (1995), [2]Sultana and Bhuiyan (1997), [3]Hossain and Routledge (1982), [4]Udo *et al.* (1990), [5]Al-amin *et al.* (2007), [6]Ghose *et al.* (1977), [7]Al-Amin and Nahar (2007), [8]Shamsuddin *et al.* (2006b), [9]Sarder (2006), [10]Rahman and Haque (2001), [11]Habib *et al.* (2003), [12]Ahmed and Islam (1987), [13]Khan *et al.* (1999), [14]Alam *et al.* (2008), [15]Mondal (1998), [16]Rahman *et al.* (2001), [17]FAO (2004b)

REPRODUCTIVE MANAGEMENT

Many farms in Bangladesh are so small that only one cow can be kept. Cows are tethered in a stable or on available grazing land. They are used for draught work as well as milk production. These management practices promote the occurrence of post-partum anoestrus and limit behavioural manifestations of oestrus (Shamsuddin, 1995). This is explained by the fact that in intensive farming or in small holdings having one cow, oestrus cannot be detected by primary signs such as standing to be mounted as the cows are always tied up. However, the main weakness affecting the accuracy of oestrus detection is that farmers are missing or misinterpreting or are unaware of secondary signs of oestrus such as mucus discharge and swollen vulva (Shamsuddin *et al*., 2006a). Detection of oestrus and of the return to oestrus after unsuccessful artificial insemination (AI) is clearly difficult under such conditions and inefficiencies have been documented (Shamsuddin, 1995). Traditionally, pregnancy diagnosis is not carried out as part of the artificial insemination programmes. Generally suckling and weaning is not controlled in dairy production system in Bangladesh. The adverse effects of the duration and frequency of suckling on the initiation of post-partum cyclicity was studied by Shamsuddin *et al*. (2006a). In a different study, they found an increased interval from calving to first service and to conception due to frequent suckling (Shamsuddin *et al*., 2001).

The main constraints of cattle reproduction is prolonged postpartum intervals to conception and low Conception Rate (CR), which were the results of inefficiencies in the management of nutrition, oestrus and Artificial Insemination (AI) services (Shamsuddin *et al*., 2001). An economic opportunity survey showed that management improvements directed towards increasing milk production, increasing lactation length, decreasing age to first calving, decreasing calf mortality and decreasing calving interval could increase income by $329-807 per farm per year, depending on the location (Shamsuddin *et al*., 2006b). A participatory rural appraisal demonstrated that the main demand of farmers was for on-farm services that would address feeding, health and problems related to reproduction and that the resulting increased income would enable farmers to pay for such services (Shamsuddin *et al*., 2007). Missing one oestrus extends the calving interval in cows and the age at first calving in heifers by 21 days and it is estimated economic losses of $43 and $11 occur when there is a delay of 21 days in age at first calving and calving interval, respectively (Shamsuddin *et al*., 2006b). Ovarian cyclicity was evaluated by assaying progesterone in two milk samples collected every month at 10 day intervals, showed that 40% of postpartum cows were not detected in oestrus when they completed one or more ovarian cycles (Shamsuddin *et al*., 2001). Another important issue is that AI technicians often state that a cow is in oestrous when she is not. In their earlier studies 30% of cows were stated to be in oestrus when they were not (Shamsuddin *et al*., 2001). In that study, 100% of cows with low level of progesterone in milk by day 21-24 were found not to be pregnant at later per rectum examinations. Such estimation on day 22-24 after AI can be effectively used to identify non-pregnant cows once the participation of farmers and inseminators is ensured by appropriate motivation programmes (Shamsuddin *et al*., 2001).

NUTRITION AND REPRODUCTION

Puberty is a stage when replacement heifers manifest estrus signs and ovulate for the first time. Nutrition is a major determinant of when puberty occurs. Nutrition related infertility (also called sub-fertility) in dairy animals can cause delayed puberty in heifers and prolonged

calving interval in mature cows. For example, with good nutritional management crossbred heifers can be bred at 15-18 months. The age at puberty of zebu cattle in South Asia varies from 24-36 months (Mukasa, 1989). However in a study of 1440 smallholder dairy farms in Bangladesh, the age at first calving varied from 33-40 months, depending on the area studied, irrespective of cattle breeds and nutrition on the best 20% of farms (Shamsuddin *et al*., 2006a). This author estimated a yearly economic gain of USS$561 for a farm with 3.6 crossbred heifers, if the heifers could have an age at first calving of 37 months. Nutritional effects of puberty and sexual maturity is initiated prenatally and continues through postnatal and post weaning development of heifers (Shamsuddin and Aryal, 2009). In typical production system of Bangladesh, calves are allowed to suckle only to stimulate milk letdown and suckling often continues until the cow dries off. Since small dairy farmers would prefer to increase net income from their dairy animals, little attention is paid to calf nutrition. Calves are often fed poor quality milling byproducts and crop residurs during their first 8-12 months of life when the reproductive organs are developing. Replacement heifer management programs are rare in Bangladesh and heifers are often fed surplus dairy cows feed. Anemia caused by parasitic infestation or poor nutrition also delays sexual maturity in heifers. Weak or silent heats occur in heifers due to underfeeding energy, phosphorus or vitamin A. All these factors limit growth of heifers and delay their age at first calving (Shamsuddin and Aryal, 2009).

The target of a dairy farm is to get one calf from a cow every year. The closer a farm gets to this target, the better will be the economic return (Shamsuddin *et al*., 2006a), but it is seldom achieved in the dairy industries of Bangladesh. Other than cattle genetics, diseases, hot and humid climate and underfeeding have all been claimed to prolong the calving interval. Postpartum cows with poor body condition score often remain anoestrus for about a year, which prolongs the interval from calving to first service and subsequently to the next calving. Shamsuddin *et al*. (2006a) collected data on body condition score (BCS) and estrus detection of postpartum cows in smallholder farms and sampled milk from cows for measurement of progesterone as an indication of corpus luteum development that follows ovulation. Cows with lower BCS had longer intervals from calving to first ovulation and less detected estrus than cows with a higher BCS. Similar reports are available on postpartum cows brought for first service (Shamsuddin *et al*., 2001; Siddiqui, 2008). Prolonged deficiency of energy and protein in the diet can exert chronic stress on the hypothalamo-pituitary-ovarian axis. Affected cows and heifers not only delay ovarian cyclicity, but also have poor heat symptoms, which make oestrus detection and timing of breeding difficult for the farmer and inseminator, which will bave negative effects on conception rate (Siddiqui *et al*., 2002). Cows with low BCS will have poor quality oocytes, which do not fertilize normally. Even if fertilized, oocytes of poor BCS cows often do not sustain development to term. Oocytes of heavy cows can be poor quality. For example, over conditioned cows had fewer embryos than those with optimum BCS in a superovulation program (Siddiqui *et al*., 2002). Cows fed a high energy diet on the day of breeding will have a low chance of conception and high levels of glucose in the blood at the time of early embryo development can be detrimental to embryos (Siddiqui *et al*., 2002).

REPEAT BREEDING IN CATTLE

Repeat Breeder Cows (RBC) are a heterogeneous group of subfertile cows with no anatomical abnormalities or infections that exhibit a variety of reproductive disturbances in a consistent pattern over three or more consecutive heat cycles of normal duration

(17-25 days). One of the major constraints of profitable dairy farming is low conception rate (Alam and Ghosh, 1994; Shamsuddin *et al*., 2001). Early embryonic death (<42 days) is a major factor in reproduction failure, which in turn causes economic loss to the dairy industries (Rahman *et al*., 1996). Shamsuddin (1995) reported 5% repeat breeding cases in Bangladesh. Gani *et al*. (2008) found positive correlation (r = 0.94) between repeat breeders and bacterial infection of uterus. They detected bacteria in 62% repeat breeding cases in contrast to only 28% bacterial infections from normal fertile cows where *Staphylococcus* was predominant 37%, followed by *Bacillus* 35%, *E. coli* 29%, *Pseudomonas* 18% while Gram negative minute rod shaped bacteria was 24%. The isolates of *Pseudomonas* and Gram negative minute rod shaped bacteria were obtained only from repeat breeder cows with mucopurulent uterine discharges. Antibiotic sensitivity of their study showed moderate to high sensitivity to amoxicillin, oxytetracycline and ciprofloxacin. Kamal *et al*. (2010) found that double insemination with intrauterine antibiotic improve conception in repeat breeding dairy cattle. Kamal *et al*. (1999) was claimed fungal infection to be cause of repeat breeding in cows and fungi belonging to *Candida*, *Aspergillus* were predominantly isolated (26%) in varying proportions. Repeat breeding cows from which *Aspergillus* were isolated had been suffering from endometritis with mucopurulent utero-vaginal discharge. Alam *et al*. (2007) also found bacteria and fungal infections in varying proportions in repeat breeder cows of Bangladesh.

BRUCELLOSIS IN COWS

According to the Food and Agriculture Organization (FAO), the World Health Organization (WHO) and the World Organization of Animal Health (OIE), brucellosis is considered the most widespread zoonosis worldwide (Mustafa and Nicoletti, 1995). In Bangladesh, brucellosis was first identified in cattle in 1967 by Mia and Islam (1967) and human brucellosis was first reported by Rahman *et al*. (1983). The importance of brucellosis is not known precisely, but it can have a considerable impact on human and animal health, as well as on socioeconomic impacts, especially in which rural income relies largely on livestock breeding and dairy products (Islam *et al*., 1983). In animals, the brucellosis mainly affects reproduction and fertility, reduces the survival of newborns and reduce milk yield. Mortality of adult animals is insignificant (Sewell and Brocklesby, 1990). Rahman *et al*. (1983) reported higher prevalence of brucellosis in cows of better managed farms and estimated 12.8% human brucellosis in herders and agricultural workers. Rahman *et al*. (2006) reported the seroprevalence of brucellosis in cattle as 2.4~18.4% while the herd-level seroprevalence in cattle as 62.5% in Bangladesh. Azimun (2007) reported the seroprevalence of brucellosis as 4.5% in cattle and 6% in human. The overall seroprevalence of brucellosis in cattle was 5% (Rahman *et al*., 2009) which is higher than the overall seroprevalence of brucellosis (2%) reported by Amin *et al*. (2004). Cattle aged more than 5 years age had insignificantly higher prevalence of 7.69 and 2.56% than that aged below 5 years (Rahman *et al*., 2009). The study stated that the higher prevalence of brucellosis in cattle bred by natural breeding (5.72%) may be due to presence of infectious bulls used for natural breeding (Rahman *et al*., 2009).

CONCLUSION AND RECOMMENDATIONS

Prenatal and postnatal nutrition is an important determinant of growth and attainment of puberty in heifers. Nutritional condition of a cow at calving and duration and frequency

of suckling are important determinants to the initiation of ovarian activity. Postpartum cows divert a large amount of nutrient into milk making them prone to postpartum disorders and body condition loss. These delay postpartum onset of ovarian cyclicity. Dietary supplementation with vitamins and minerals of cow diet can help to improve their fertility. Heat detection efficiency should be improved by farmers training on oestrus detection. There is a need to introduce methods to determine the status of cows with respect to cyclicity and pregnancy in association with artificial insemination programmes. Determination of progesterone in milk on day 21-24 is a good means of making decisions on pregnancy by diagnosing the non-pregnant state with high accuracy. Breeding bulls should be regularly screened out following a standard bull health protocol. The traditional hospital based emergency veterinary service should be changed to an on-farm production-oriented one for delivering services on nutrition management, health and reproduction through the farmers' cooperatives.

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