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Research Article
(Araştırma Makalesi)

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On-farm Management, Breeding Practice and Constraints Between Two Sheep Breeds in Bangladesh

Bangladeşte Yetiştirilen İki Koyun Irkına Ait Bakım-Besleme ve Yetiştirme Uygulamalarındaki Farklılıklar

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ABSTRACT

Objectives: On-farm management, breeding practices, and constraints were studied between Jamuna basin indigenous and Muzaffarnagari crossbreed sheep production.

Material and Methods: Data were collected from 40 Jamuna basins indigenous and 15 Muzaffarnagari crossbreed sheep households through a questionnaire following several visits.

Results: Flock size and ewe's percentage were higher (64.07 ± 4.60 vs. 9.18 ± 0.73 and 68.63 vs. 53.68%) in Muzaffarnagari cross breed farms while breeding rams and lamb's percentage were higher (10.35 vs. 2.58% and 37.60 vs. 28.79%) in Jamuna basin indigenous farm. Kucha pens with earthen floors and semi-pucca pens with slat over the concrete floor were used in respective study areas. Together with common pasturing and grazing, 40 vs. 66.7% and 40 vs. 66.7% of farmers provide a supplement in their Jamuna basin indigenous and Muzaffarnagari crossbreed sheep respectively. Free mating was common practices with unselected flock-born rams (60%) in Jamuna basin sheep farms whereas 100% of breeders_went for rams selection in purchasing (60%) and flock born in Muzaffarnagari crossbreed_sheep farms. Diarrhea with dog bite and parasite were remarkable constraints in study areas, respectively.

Conclusion: Long terms farming education or demonstration studies, motivation, ram selection, controlled breeding, and constraints improving efforts may increase sheep production in investigated areas.

ÖZ

Amaç: Jamuna yerli koyun ırkı ile Muzaffarnagari melez koyun ırkları arasında sürü yönetimi, yetiştirme pratikleri konusunda bir karşılaştırma yapılmıştır.

Materyal ve Yöntem: Araştırma bulguları, 40 baş Jamuna ve 15 baş Muzaffarnagari melezi koyun yetiştiren işletmelere yapılan ziyaretlerle anket yoluyla elde edilmiştir.

Bulgular: Çalışmada, sürü büyüklüğü ve koyun varlığı, Muzaffarnagari melezi koyun yetiştiren işletmelerde daha yüksek iken (64.07 ± 4.60 vs. 9.18 ± 0.73 ve 68.63 vs. %53.68), damızlık koç ve kuzu yüzdeleri (10.35 vs. %2.58 ve 37.60 vs. %28.79) yerli Jamuna koyunu yetiştiren işletmelerde daha fazla bulunmuştur Araştırmada, toprak zeminli Kucha ve beton zemin üzerine çıtalı yarı pucca işletmeleri kullanılmıştır. Hayvanların beslenmesinde her iki genotipi yetiştiren çiftçilerin merayı otlatma şeklinde hayvanların beslenmelerinde kullanma oranları sırasıyla; 40 vs. %66.7 ve 40 vs. %66.7. Jamuna havzasındaki koyunculuk işletmelerinde sürüde serbest asım uygulaması doğan kocların % 60'ında yaygın uygulama iken, yetiştiricilerin tamamı (% 100'ü) kendi sürülerinde doğan erkek hayvanları koç olrak kullanmışlardır. Oysa Muzaffarnagari melez koyunculuk işletmelerinde bu oran %60'dır. Parazit ve köpek ısırmasına bağlı enfeksiyonlardan kaynaklanan ishaller, bölgede görülen önemli bir olumsuzluktur.

Sonuc: Bölgede uzun vadeli yetistirici eğitimi, koç seçimi ve bilinçli yetiştiricilik uygulamaları ile koyunlarda verim artışı sağlanabilir.

INTRODUCTION

Mixed livestock production systems are predominant in Bangladesh. Considerable numbers of cattle along with small ruminants (sheep and goats) are kept by smallholders. Contribution of Livestock in Gross Domestic Product (GDP) is 1.47% and GDP share in agriculture is 13.46%. According to the Bangladesh Economic Review (BER, 2017), livestock contributes around 3% of the national GDP and provides 15% of total employment. About 75% of people rely on livestock to some extent for their livelihood. Department of Livestock Services (DLS, 2019) reported that importantly, about 50% of the total population of Bangladesh indirectly employed, and 20% directly

employed in livestock for their livelihoods. The current report says, Bangladesh possesses 35.37 million sheep (DLS, 2019) and stand as third in number after the cattle and goat population.

Sheep provide farm households with cash income, meat, fiber, and manure. As compared to large ruminants such as cattle, sheep have shorter production cycles, faster growth rate, ease of management, and low initial capital investment (Gizaw et al., 2013a; Tadesse et al., 2015). Also, they require small space and feed and therefore are efficient meat producers for the smallholder especially in Bangladesh where there is a day-to-day shrinkage of grazing lands (is no enough grazing lands). Moreover, sheep production provides an opportunity for smallholder farmers to use the marginal land as well as crop residues for feeding. Also, care-taking of sheep can be carried out by any family members, which is another additional opportunity. Furthermore, sheep provide direct cash income and social security to farmers in the bad crop years (Getachew et al. 2010). They are also the sources of foreign currency in a large scale production system (Berhanu et al., 2006). Low productivity can be attributed to genotype, feeding, animal health, and environmental stresses. Feed shortage in quality and quantity contributes to the reduced productivity (Ylsehak et al., 2013). Poor veterinary services further worsen the situations. Disease information and causes of mortality are to be supportive to improve survival as well as productivity. It has been argued that reductions in lamb mortality can be achieved only by identifying and targeting the specific causes and further identifying the underlying factors of mortality on a farm (Tibbo, 2006). Proper housing, nutrition, and health care are important tools in reducing death loss of small ruminants especially of lambs or kids, and making production sustainable and profitable (Ünal et al., 2018). Shelter floor is associated with thermal conductivity, contamination, foot, and other diseases, adverse behavior of animals (Tahta et al., 2016). Henceforth, a comfortable shelter floor is an important factor in profitable animal production.

The sheep production in Bangladesh is mainly based on indigenous breeds except an exotic Muzaffarnageri cross-breed that is being very popularly reared in field farms mainly in Meherpur, Chuadanga, Chaipainawabganj districts and gradually pick-upping in a fewer number by the farmers of other districts. Indigenous sheep of Bangladesh are sparsely distributed throughout the country with a relatively higher concentration in several agro-ecological zones; coastal regions, barind tracts, north-eastern wetlands, Sundarbans-delta regions, and Jamuna river basin areas (Pervage et al., 2009). There were limited studies on their management, breeding, and farmer's constraints in field sheep production with an intensive system of rearing. The sheep are raised on harvested or fallow lands, roads, and canal sides under traditional feeding systems and also graze on aquatic weeds and grass in knee-deep water (Sultana et al., 2010). Hassan and Talukder (2011) stated that Bangladeshi indigenous sheep are well adapted to hot and humid agro-climatic conditions, capable of lambing twice a year each with multiple births. Sultana et al., (2011) reported that they have the ability to adapt to the harsh environment, poor management, and feeding practices. They are efficient users of low-quality roughages and also can utilize efficiently stubbles of cultivated crops, tree toppings, farm waste, small vegetation in harvested fields or fallow lands, roads and canal-side grasses, and even graze on aquatic weeds and grass in knee-deep water which makes them suitable for swampy habitat as well as in coastal regions (Banerjee et al., 2010). No other domestic animals are capable of existing on such feed. With their small muzzles and split upper lips, they can nibble tiny blades of vegetation, which cannot be eaten by bigger animals (Banerjee, 1989).

Very little attention has been paid to the breeding system until to date for sheep improvement in Bangladesh. Quite recently, initial steps of community-based awareness sheep breeding programs have been started by government institutes (Department of Livestock Services, DLS, and Bangladesh Livestock Research Institute, BLRI) for sheep genetic improvements in some sheep producing areas of Bangladesh (Bhuiyan et al., 2017). The field farmers till to date, follow traditional breeding in their sheep production with home breed undersized, not fully matured ram without following any breeding guideline. Assisted reproductive technologies (ARTs) are although developed in the Bangladesh Agricultural University (BAU), Mymensingh to transfer of high-quality genetic merits, but not yet piloting. Moreover, valuable germplasm is still being neglected (Bhuiyan et al., 2017).

In Bangladesh, sheep production is reputed due to their high prolificacy, early maturity, extreme disease resistance, superior skin quality, and wide range of adaptability under adverse agro-climatic condition (Sultana et al., 2011). Jumna region sheep were comparatively better in reproductive performance than other regional Bangladeshi indigenous sheep-like Coastal and Barind sheep (Pervage et al., 2009). Former some researchers (Zohera et al., 2014, Ahmed et al., 2018) mentioned intensive management and production systems were to be supportive of their experiments in the research station. Therefore, our study was aimed to identify on-farm management,

breeding, and constraints in the Jamuna basin indigenous and Muzaffarnagari cross-breed sheep production system of Bangladesh.

MATERIAL and METHODS

Study area

The study was conducted purposively at different sheep households of Tangail district (Gopalpur and Bhuapur upazilla) and Meherpur district (Meherpur Sadar and Mujibnagar upazilla) from October to March in 2018. The study areas were located 70 to 80 km and 410 to 420 km away from the research station respectively. Gopalpur (24.5583°N 89.9167°E), Bhuapur (24.4583°N 89.8667°E), Meherpur Sadar (23.7750°N 88.6417°E), and Mujibnagar (23.39°N 88.36°E). These areas covered by 1872 mm (Tangail district) and 1467 mm (Meherpur district) of annual average precipitations.

Figure 1. A. Jamuna basin indigenous sheep at farm house, B. Jamuna basin indigenous sheep at grazing field , C. Muzaffarnagari cross breed sheep at farm house, D. Muzaffarnagari cross breed sheep at grazing field

Selection of study area and farms

The study areas were selected based on the availability of Jamuna basin and Muzaffarnagari cross sheep from Tangail and Meherpur districts, respectively. Sheep farms were selected from the register book of respected local Upazilla livestock office using a simple random sampling technique.

Farm visits, data collection, and analysis Farms visits were made following contract addresses. An informal survey with a simple checklist type of questionnaire was used for interviewing the respondents individually. The questionnaire constituted all open types of information ranked in various scales (1, 2, 3; Yes, No). Interviewing sessions were made during farmer's leisure periods in farmyard or grazing fields. Flock sizes and structure, breeding practices and selection criteria of breeding males, nutrition, management practices, disease, prevention and treatment, and major sheep production constraints information were recorded. While most of the information was provided by the farmers, housing

conditions and feeding systems were subjectively evaluated by the researcher. Collected data were tabulated first in the Excel sheet. They were then analyzed by frequency and descriptive of Descriptive Statistics using Statistical Package for the Social Sciences (SPSS ver. 22).

RESULTS

Flock size and structures

The average flock size and composition of Jamuna basin indigenous (JBI) and Muzaffarnagari (MZN) cross sheep are presented in Table 1.

The results obtained from the present study showed that per household flock size was larger (64.07 ± 4.60, range of 35 - 96) in MZN cross-breed sheep than JBI sheep (9.18 ± 0.73, range of 5 - 30). Flock composition in terms of ewe, ram, and lamb were 4.93 ± 0.36 vs. 44.33 ± 3.92, 0.95 ± 0.12 vs. 1.67 ± 0.19, 3.45 ± 0.39 vs. 18.60 ± 1.39 between two studied breeds, respectively. Mature ewes were higher (68.63%) in MZN cross-breed sheep than JBI (53.68%) sheep flocks. On other sites, breeding rams and lambs values were higher (10.35 and 37.60 %) in JBI sheep than MZN cross-breed sheep flocks (2.58 and 28.79 %), respectively.

Housing system

Sheep housing for the studied two breeds is presented in Table 2.

Table 1. Flock size and composition of sheep in study areas

Sheep categories	Sheep Households (n = 55)							
	JBI sheep farm owner (n = 40)				MZN cross sheep farm owner (n = 15)			
	n	Mean ±SE	Range	Total flock (%)	n	Mean ±SE	Range	Total flock (%)
Mature Ewe	197	4.93±0.36	3-15	53.68	665	44.33±3.9	25-76	68.63
Breeding rams	38	0.95±0.12	0-2	10.35	25	1.67±0.19	1-3	2.58
Lambs (weaning)	138	3.45±0.39	1-14	37.60	279	18.60±1.39	9-28	28.79
Total	367	9.18±0.73	5-30	100	969	64.07±4.60	35-96	100

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari)

Table 2. Types of house and shelter of sheep at night in study areas

Sl. no.	Items	Sheep Households (n = 55)			
		JBI sheep (n = 40)		MZN cross sheep (n = 15)	
		Frequency	%	Frequency	%
1.	House position				
	Separate house	6	15.0	15	100
	Common house of other livestock	21	52.5	-	-
	Extended house/ Veranda	13	32.5	-	-
2.	House types				
	Kutcha	40	100	-	-
	Semi- Pucca	-	-	15	100
3.	Floor type				
	Earthen	39	97.5	-	-
	Slat over earthen	1	2.5	3	20
	Slat over Concrete	-	-	12	80

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari)

The results indicated that most of the JBI sheep farmers (52.5 %) keep their animals' in a common sheltering house of other animals, 32.5% in the extended family house (Varanda), and only 15% farmers' kept in separately build the house. They had all Kucha houses with mostly (97.5 %) earthen floor without any slat. All households of MZN cross sheep sheltered their animals in separately built semi-pucca houses where 80% of the house had slat over the concrete floor and 20% had slat over the earthen floor.

Feed resources and feeding

Feed resources and feeding of Jamuna basin indigenous and Muzaffarnagari cross sheep are presented in Table 3.

In both study areas, farmers fed their sheep on natural pastureland, fellow land, tree leaves or forage, road or riverside grass, and crop residues. In the Jamuna basin area, 40 % of farmers use supplement feeds to their sheep with rice or wheat bran (52.5%), mineral/salt (22.5%) in the leisure period of animals.

On another site, 66.7% of farmers use supplement feeds to their sheep with rice straw (46.7%), rice/wheat bran (53.3%), maize crush (46.7%), mineral/salt (60.0%) and vitamin (33.3%) for MZN cross sheep breed. In both study sites, 55 vs. 80% farmers of JBI and MZN cross-breed sheep farms, respectively allowed to graze their sheep for 8 - 10h and 45 vs. 20% farmers for 10 - 12h. In the Jamuna basin areas, 100% of farmers were found to be contributed sheep by themselves whereas 73.3 and 26.7% of farmers and employers, respectively contributed sheep in Meherpur areas.

Table 3. Feeds and feeding of sheep at study areas

Sl. no.	Items	Sheep Households (n = 55)			
		JBI sheep farm (n = 40)		MZN cross sheep farm (n = 15)	
		Frequency	%	Frequency	%
1.	Feed sources				
	Nature pasture land	40	100	15	100
	Fellow land	40	100	15	100
	Tree leaves / forages	40	100	15	100
	Road / river side	40	100	15	100
	Crop residue	40	100	15	100
2.	Supplements				
	Yes	16	40	10	66.7
	No	24	60	5	33.3
3.	Types of supplements				
	Rice / wheat bran	21	52.5	8	53.3
	Rice straw	-	-	7	46.7
	Maize grain/ crush	-	-	7	46.7
	Salt / minerals	9	22.5	9	60.0
	Vitamins	-	-	5	33.3
4.	Time of grassing				
	8-10h	22	55	12	80
	10-12h/ down to dusk	18	45	3	20
5.	Sheep contributor				
	Farmer himself	40	100	11	73.3
	Employee	-	-	4	26.7

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari)

Table 4. Breeding practices prevailed in field sheep production

Sl. no.	Items	Sheep Households (n = 55)			
		JBI sheep farm (n = 40)		MZN cross sheep (n = 15)	
		Frequency	%	Frequency	%
1.	Source of breeding rams				
	Home breed / own	24	60.0	6	40.0
	Neighbors	15	37.5	-	-
	Purchase	1	2.5	9	60.0
2.	Selection of ram for breeding				
	Yes	-	-	15	100.0
	No	40	100.0	-	-
3.	Criteria for ram selection				
	Body conformation	-	-	15	100.0
4.	Mating systems				
	Free mating	40	100.0	15	100.0
	Controlled mating	-	-	-	-

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari)

Breeding practices

In studied sheep breeds farms, there were found no practice of controlled mating, thus showed about 100% of free mating in the flocks (Table 4).

About 60 vs. 40% of farmers bred ewes with their own breeding rams and 2.5 vs. 60% with purchased rams in JBI and MZN cross-breed sheep farms, respectively. About 37.5% of households get their ewes serviced with rams from their neighbors in common grazing areas in JBI sheep farms only. Whatever the sources, 100% of households of MZN cross-breed sheep did selection of breeding rams mainly on body conformation. Ram selection was not found in practice for JBI sheep householders.

Disease prevalence and health management

The major diseases and health management of sheep in the study areas are presented in Table 5.

Diarrhea, dysentery, pneumonia, peste des petits ruminants (PPR), parasite (bottle jaw), bloat, foot and mouth disease (FMD), tetanus, alopecia, and rabies (dog bite) are the most important diseases prevalent in the studied areas for two sheep breeds. According to respondent, diarrhea, pneumonia, rabies (dog bite) and PPR were the most occurrence (60, 38, 30 and

20%, respectively) diseases in JBI sheep farms while diarrhea, parasite, and FMD occurred (53, 47 and 40%, respectively) in MZN cross-breed sheep farms. When animals got sick, most of the households (72%) took local advice in JBI sheep and this is almost the opposite in MZN cross-breed sheep households whereas, 64% of farmers took veterinary advice for their animals. Farmers in Jamuna basin areas had little (13%) access to vaccination and deworming program while higher access (80.0 and 100.0%, respectively) were found in MZN cross-breed sheep farms.

Constraints of sheep production

The overall constraints in sheep production in the study areas are given in Table 6.

These constraints as reported by the respondents were a disease, parasite, pasture land, shed problem, and treatment as 90.0 vs. 26.7%, 2.5 vs. 46.7%, 0 vs. 13.3%, 7.5 vs. 6.7%, 0 vs. 6.7%, respectively in JBI and MZN cross sheep farms. As a statement of the report, disease and parasite were mostly affecting constraints in JBI and MZN cross sheep farms, respectively.

Table 5. Common Sheep Diseases and Health practice in the study areas

Sl. no.	Items	Sheep Households (n = 55)			
		JBI sheep (n = 40)		MZN cross sheep (n = 15)	
		Frequency	Farm %	Frequency	Farm %
1.	Diseases				
	Diarrhoea	24	60	8	53
	Dysentery	6	15	1	7
	Pneumonia	15	38	1	7
	PPR	8	20	-	-
	Parasite / bottle jaw	2	5	7	47
	Bloat	5	13	1	7
	FMD	1	3	6	40
	Tetanus	-	-	2	13
	Allopasia	3	8	-	-
	Rabies/ Dog bite	12	30	-	-
2.	Measures taken when sick				
	Take local treatment	29	72	5	36
	Take Veterinary treatment	11	28	9	64
3.	Use of vaccine				
	Yes	5	13	12	80
	No.	35	87	3	20
4.	Use of deworming				
	Yes	5	13	15	100
	No.	35	87	-	-

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari), PPR (Peste des Petits Ruminants), FMD (Foot and Mouth Disease)

Table 6. Constraints of field sheep production in study areas

Sl. no.	Constraints	Sheep Households (n = 55)			
		JBI sheep (n = 40)		MZN cross sheep (n = 15)	
		Frequency	%	Frequency	%
1	Diseases	36	90.0	4	26.7
2	Parasite	1	2.5	7	46.7
3	Pasture land			2	13.3
4	Shed problem	3	7.5	1	6.7
5	Treatment	-	-	1	6.7

JBI (Jamuna basin indigenous), MZN (Muzaffarnagari)

DISCUSSION

Flock size and composition

Flock size and composition is an important indicator of a management system which exploits some degree of management, constraints, and productivity (Ibrahim, 1998). In the present study, comparatively higher flock size of sheep per family in Meherpur district indicates that the area favors MZN cross sheep breed, the higher dependency of farmers on sheep, the higher chance of success in productivity with minimum constraints and acceptance of village-level sheep breeding strategy if planned. However, the current flock size for JBI sheep was in line with the findings of (Lakew et al., 2017) in Horro sheep and Adiyo Kaka (8.20 ± 2.05 and 11.3 ± 1.27 %, respectively). The current flock size of MZN cross sheep was also larger than Menz sheep (31.45 %) in the cool highlands of Ethiopia (Tesfaye, 2008).

The current proportion of ewes and rams in JBI sheep farms were in agreement with the previous findings of 54.2 and 15.6 % (Gemiyu, 2009) while the findings in MZN cross sheep farms were in line with the female (Dibissa, 2000) and male (Gemiyu, 2009) mature sheep (70 and 2.4 %), respectively. The largest proportion of breeding ewes in both sheep breed flocks describes/indicates that farmers in the study

areas maintain breeding ewes for a long period of time and the importance of culling is not fully recognized. This confirms by similar studies in southern and southwestern Ethiopia irrespective of differences in a production system and resource (Endashew, 2007; Tsedeke, 2007; Belete, 2009). The ram to ewe ratios were 0.20 and 0.04 for JBI and MZN cross sheep, respectively. The ratio for JBI sheep raising areas was higher than the recommended breeding ratio for small ruminants. This might be due to individually rearing of smaller sheep flock size. This also exploits that the farmers in this site are not aware of or not follow the proper breeding system. The ratio for MZN cross sheep was similar to the recommended breeding male to female ratio (1:25) under the traditional production system (Wilson and Durkin, 1988). This presents farmers are of this site very conscious of proper breeding system.

Housing systems

Housing is associated with productivity by making management easier, reducing stress, and disease hazards. Farmers in both study sites, house their sheep at night to shelter from theft, predators, and environmental changes. This is in agreement with reports of Belete et al. 2010; Fikru and Gebeyaw (2015). JBI sheep mostly kept in a common house together with other livestock, locally called kutcha house (a temporary house is made of tin, bamboo, mud, and other materials with earthen floors) and the next confined house was Varanda (a barn constructed as an expansion of the main family houses). These might be due to smaller flock size and maybe favor of the diseases and disease conditions of sheep. These types of adjoining houses were also observed by Samuel (2005), Endeshew (2007), Tsedeke (2007), and Zewdu (2008). The farmers confined their MZN cross sheep mostly in separately build the semi-pucca house (made of tin, breaks, rods, and cement with or without a concrete floor). This is might be due to larger flock size and this can make the management easier. Belete (2009) also reported a separate house of sheep sheltering in his study in the Goma district of Southern Ethiopia.

Feeds and feeding

Feeds and feeding is the basic factor of animal production. Mainly roughage and concentrate constitute the feeds of the small ruminant. Natural pasture, fellow land, crop residue, river or roadside pasture, tree leaves, forage, and fodders are the common resources of roughage. According to the current study, farmers (100%) opined that their sheep take this roughage during pasturing on availability in various amounts all the year-round irrespective of season in both study sites. The report of Islam et al. (2016) was in line with the present study that stated as 96.90 - 100 % of farmers feed tree leaves and green grass to their coastal indigenous sheep of Bangladesh. Banerjee et al., (2010) and Islam et al., (2018) also stated Bangladeshi indigenous sheep as efficient use of these roughages. Bangladeshi sheep farmers use wheat bran, rice bran or polish, khesari bran, maize or maize crush, til oil cake, mustard oil cake, broken rice, rice straw, salt, etc as supplement feeds for a small ruminant. Providence of supplement varied in both study areas and this might be due to farmer's status, flock size, shortage of feed. In supplemented farms of Jamuna basin areas in Tangail district, farmers commonly used rice gruel or rice bran or wheat bran and salt only. Whereas, farmers of Meherpur district used wheat or rice bran, maize crushes, salt, and rice straw (locally called Bichali) supplement to their farms. Generally, women members of the family were employed to sheep rearing in Jamuna basin farms. It was observed in some farms (45%) that sheep became free of confinement in the morning and started roaming and grazing up to dusk (10 -12h). In other farms (55%), sheep were confined again for few hours into another confinement on the yard and then they allowed grazing up to evening (8-10h). These findings were in agreement with Islam et al., (2016) who stated that most of the farmers (43%) of the coastal area of Bangladesh graze their sheep from dawn to dusk, while 40 % graze for 10 h and 13% graze for 12h only. MZN cross sheep were found to be confined in an en-closer on the yards for few hours. Then the farmer himself or an employee took them out for grazing, mostly it was 9:00 am to 5:00 pm (8-10h, 80%) or up to dusk (10-12h, 20%).

Breeding practices

Breeding with high genetic merit can increase productivity; therefore, selection and source of sire together with controlled or uncontrolled mating are of outstanding importance inbreeding. According to the current study, the farmers of JBI sheep farms in the Tangail district were not adapted to a controlled mating system and selection of breeding ram. Castration was an uncommon practice and homebred rams with different ages run together with ewes throughout the year. Farmers who had no breeding rams, ewes got service from similar neighborhoods rams. They, sometimes purchase ram from the local market. This type of breeding was also reported by Falconer (1989), Ndamukong et al. (1989), and Kosgey *et al.* (2006). Therefore; inbreeding prevailed in these smaller sheep flocks. Small flock size and inbreeding potentially were also indicated by Seleka (2001). The uncontrolled mating was observed in MZN

cross sheep production systems in Meherpur district with flock born and purchase rams. In both cases, farmers went for ram selection on the base of body conformation. According to farmer's points, flock born selected rams is being changed after two years of breeding to a low level of inflow of animal inheritance for inbreeding.

Disease prevalence and management

The disease is the main bottleneck of the production system as it pertains to farmers' economic loss in consequence of animal treatment and transport cost, weight loss, and in some cases, total animal loss. Therefore, it is important to know the disease condition of an area to provide intervention in hindrances of production. Disease occurrence in livestock is a common phenomenon and reported on many years by researchers Solomon and Gemeda (2000), Markos (2006); Tsedeke (2007); Tsedeke and Entries (2011). Diarrhea was the most common occurrence in both study sites, whether, pneumonia and rabies (dog bite) in the JBI sheep farms and parasites and foot and mouth disease (FMD) in MZN cross sheep farms were prevalent along with other diseases. These variations might be due to the flock size and management practices of respective sheep farm owners. Farmers of the MZN cross sheep were found more conscious in the prevention and treatment of diseases than JBI sheep owners. They mostly took veterinary advice in treating the sick animals and more deworming and vaccination programs. These might be due to improved genetic resources and livelihood of farmers in Meherpur districts. While the poor and marginal farmers of Jamuna basin areas had rather access to local treatment with little or without disease prevention measures.

Constraints of sheep production

Farmers in Jamuna basin areas of Tangail district did not experience well in constraints like pasture land (food shortage), shed problem, parasitic infestation, and type of treatment except for diseases. These might be because of their smaller flock size. In this site, farmers explained diseases like diarrhea and rabies (dog bite) were their main constraints of sheep production. Farmers, although did not bring out, the genotype is a problem in Jamuna basin areas (researcher observation). This might be due to a lack of knowledge of the farmers about better-producing sheep breeds and the fact that their animals could be improved as there exists within breed variability. In Meherpur district, farmers complained of disease and parasite as their main constraints of sheep production. They were experienced mostly in constraints of FMD and liver fluke in their sheep. These might be because of low pasturing lands, genotype, and geographical attributes.

CONCLUSION and RECOMMENDATION

Sheep are one of the important commodities in the mixed farming system in the study, especially as a livelihood option. Farmers keep indigenous sheep genotype in smaller flock sizes at Jamuna basin areas of Tangail district. Here, to avoid inbreeding with flock born or neighborhood ram, a participatory flock improvement for strategic breeding programs among sheep keepers should be carefully designed with the aim at farmers need to cope with trait preference in existing traditional herding and breeding practice. Nonetheless, ram selection is of farmer's choice in Meherpur district, controlled breeding which needs to be encouraged and supported by introducing control breeding methods. Disease and parasite are among the major production constraints in the study areas and therefore efforts should be furnished to improve these constraints.

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