Introduction

Animal welfare is relatively new topic in Bangladesh. The term is more used in commercial animal farming as it indirectly is related with the production amount and the performance of the animal. A good Human-Animal Relationships (HARs) can enhance the production in farm. Research showed that cows that are called by their names tend to have higher milk yield in farms (Bertenshaw et al., 2009). In human the emotion and stress may steer the immunity of the body (George, 1969) that may further indirectly make the body susceptible to microorganism and lead to diseases. The animal physiology is not so different from human and same can occur in them too. Though it is mostly considered in commercial farming it is as well as important in backyard farming too.

A good welfare can be determined by various indicators among which the relation of animal with its stockman is a very useful one. It was found that production and quality of veal can be enhanced by positive stockman ship in a farm (Lensink et al., 2000b). Another way of welfare determination is Need Index Method which was found detailed in Animal Needs Index for Cattle ANI 35L/2000 – Cattle (Bartussek et al., 2000). In backyard farming, fully following one system is difficult due to information shortage and randomness of one household to another.

The backyard goat farming is very popular in the world. There are more than 950 million goats reared in the world (FAOSTAT, 2013). Approximately 90% of these goats are located in Asia and Africa. The goat population in Bangladesh is about 26.1 million (DLS, 2018). Considering all the benefits, about 65% of rural household are attached with backyard goat farming directly or indirectly (Chowdhury et al., 2015). But, because of the illiteracy and absence of proper training may cause management problems and poor welfare in backyard goat farms. Poor welfare may cause a hamper in production and less survivability of the goats which may hinder the economic goal of the farmer and also decrease the national animal protein production. Unfortunately, there is a presence of very minimum information regarding the welfare status of the existing backyard goat population. According to Huque and Khan (2017), “there are 3 zones in Bangladesh separated by the concentration of goat population. Among them the Rajbari is in the zone A, which indicates a high concentration of goats, approximately 119-359 goat/Km^2.” Kalukhali is a new Upazila in Rajbari district and a significant amount of people in the villages of this Upazila are marginal farmer. So, backyard goat farming is a very common practice in this region.

Aims and objectives:

The main aim of this study was to assess the management and welfare practices used in backyard goat farming which are directly or indirectly involve with animal welfare. It also enumerates the HARs in a very simple way as unlike commercial farm in backyard farming the factors are more random and difficult to trace. Some mal-practices in the backyard farming in that area which is related to animal welfare were also highlighted. This study will help understanding the current welfare condition in the backyard farming of Kalukhali Upazilla in Rajbari district of Bangladesh and will help to overcome the problems to improve the welfare which will lead to a more efficient and ethical goat production with less disease susceptibility.

Methodology

Study area, population and timeline:

The study was undertaken in Kalukhali upazila at Rajbari district of Bangladesh. No study related to Animal welfare in backyard goat farming was taken there before and the data collection for the study was more accessible for the researcher at that area. The area is rich in goat population and the primary source of goat was backyard goat farms in there. That's why the area was chosen foor this study. The upazila comprises of 7 unions. They are Ratandia, Kalikapur, Boalia, Majhbari, Modapur, Mrigi and Shaorayel. The timeline for the study was 13th October, 2019 to 21th November, 2019 consisting 42 days only. As the study period was short to conduct a proper survey that's why only 4 unions (Boalia, Modapur, Shaorayel & Kalikapur) among the 7 were chosen. The unions were chosen in random manner. A number of 20 households in each union were selected by simple random sampling.

Data collection:

The prerequisites for selecting households were house related to backyard goat farming, with less than 20 goats per house, mostly performing the goat farming as a side business and most importantly people with very low knowledge about animal welfare. The total sample number was 80. The number was low due to time shortage. The necessary data were collected by survey. The survey was done by going door to door with the help of a team consisting of the researcher himself and the livestock service providers (LSPs) in the Upazilla Veterinary Hospital (UVH).

Unlike commercial farming in this situation, getting proper information on stockman ship and the normal housing or feeding condition was more difficult. The information was less trustworthy and random too. For this, some factors were detected considering both the stockman ship and animal need index method. The factors were selected randomly from feeding, housing, breeding, cleaning, handling and other managerial sides also including the relationship between the rearer and animals. Proper score was fixed for each factor so that it can be analyzed and an estimative conception on the animal welfare of the total area can be found. The factors with their scoring are put down collectively in to the appendix.

A questionnaire was made according to the objectives of the study. Maintaining the information related to study the questionnaire was built. There were both open ended and close ended questions and the data were collected by face to face interview. The feeding, housing, breeding, cleaning etc. were mostly emphasized in the management field during the questionnaire building. The relation between goat and handler was observed directly by the interviewer. Any question causing direct offence to the rural people, their culture or religion were prohibited and contact number was taken for further interaction. A sample of the questionnaire is also included in the appendix section.

The data collection or performing the survey was risky as the rural people are not so cooperative to the outside people. For that reason, a team was formed for data collection with the LSPs form each own union. Permission from higher authority was also taken for avoiding any complication.

Statistical analysis:

The collected data were analyzed with mainly in tabular method and also in graphical method. The collected data were calculated and analyzed in MS excel software. The total score is calculated for each house and the median, mean, standard deviation of the scores are also calculated. The highest positive score here can be +31 and the lowest negative score can be -26. Definitely the higher score indicates better providing and behavior with the animal which indirectly marks good welfare. And the lower does the opposite. Also, the common disease occurrence is compared with the poor scored houses, more precisely those with lower score than the median. The confirmation of the common diseases was done simply by signs-symptoms and any previous prescription from veterinary doctors. Descriptive statistics were done among different variables. Associations in different factors were done by Chi-square test. The probability level of significant was considered as $P<0.01$.

Results and Discussion

Common management information:

Table-1: Descriptive statistics of common management information of goat rearing in studied area (N= 80)

Traits	Category	Frequency (%)
Farm size	More than 5 goats	10 (12.5)
	5 or a smaller number of goats	70 (87.5)
Breed	Black Bengal	14 (17.5)
	Jamunapari	29 (36.3)
	Cross	37 (46.3)
Water source	Tube-well	80 (100)
	Others	0 (0)
Grazing time	Noon	15 (18.8)
	Morning, evening, afternoon	65 (81.2)
Frequency of feeding	Twice daily	48 (60)
	More than twice in a day	32 (40)
Feeding rice	Yes	71 (88.8)
	No	9 (11.2)
Extra premix given	Yes	24 (30)
	No	56 (70)
Letting out of goat during rain	Yes	11 (14)
	No	69 (86)
Major floor material	Earth	70 (87.5)
	Concrete	8 (10)
	Others	2 (2.5)
Major roof material	Tin	52 (65)
	Others	24 (30)
	No roof	4 (5)
Major wall material	Tin	39 (48.8)

	Others	29 (32.2)
	No wall	12 (63.7)
Bedding used	Straw	19 (23.8)
	Others	10 (12.5)
	No beddings	51 (63.7)
Presence of sunlight	Yes	60 (75)
	No	20 (25)
Presence of dampness	Yes	15 (18.8)
	No	65 (81.3)
Daily cleaning	Once	50 (62.5)
	More than once	28 (35)
	Rarely	2 (2.5)
Stocking density	<1 sq. m/goat	2 (2.5)
	≥1 sq. m/goat	14 (17.5)
	≥2 sq. m/goat	64 (80)

Table 1, shows the common management information on backyard goat farming. The majority of the house had goats less than 5 in number (87.5%). About 46.2% of the farmers had cross-breed goats where the Black Bengal and Jamunapari was found in 17.5% and 36.2% in the study area.

The source of water was 100% from tube well which is a very good practice to avoid any water born disease. Only 18.8% of the farmer let the goats roam around during noon time, the rest grazed in morning, evening and afternoon. Grazing during noon time is tiresome for the goats due to excessive heat. About 86% of farmer did not let the goats roam around during raining and took care of them, so that they hadn't got wet which is also a good practice related to animal welfare. The practice of feeding cooked rice was about 88.8% which may be the cause of frequent digestive problem in the animals. Among the 80 houses, in 47 houses the farmer complained about frequent digestive disturbance and only 3 of those houses were confident about never feeding any cooked rice or rice gruel. Giving extra premix with the feed was not so common. Only 30% of the farmers had the ability and practice. The usual feeding time was twice a day (57.5%). The major percentage (87.5%) of floor type used was earth, whereas in roof and wall the material was tin (65% and 32%

accordingly). In 2.5% of the floor, 30% of the roof, 33.2% of the wall some traditional other materials were used like bamboo, wood, jute-stick, straw and polythene. There was no roof found in 4 houses and no wall in 12. About 63% of farmers did not use any bedding for the goats. The major bedding material used was straw (23.8%). Only in 4 houses traditional bed called 'Choki' was found which provides better condition as slatted floor for goat rearing. About 62.5% cleaned the house once, 35% twice and only 2.5% rarely cleaned it. Dampness was found in 18.8% of the houses and presence of sunlight was in 75% houses. Among 80 houses, 64 had more than 2 square meter space for each goat, 14 had more than 1 square meter space and only 2 have less than 1 square meter space. Goats usually require an average of 1.1 square meter of space in case of female and 3 square meter space in case of male (FAOSTAT, 2013). The stocking density was found quite comfortable in backyard goat farming unlike the commercial one. This can be because in the villages, there is always abundant land available and there is always a tradition of keeping livestock in home. That's why there had been always some places solely for the domestic livestock, also the goats.

Table-2: Association among farm managements and farm size (N= 80)

Exposure	**Outcome**											
Farm size	Feeding per day		Wall material			Roof material			Dampness		Stocking density	
	≤2 times	>2 times	No wall	Tin	Others	No roof	Tin	Others	Damp	Not Damp	High	Optimum
≤ 5 Goats	38	32	6	38	26	2	17	51	11	59	0	70
> 5 Goats	10	0	6	2	2	2	4	4	4	6	5	5
P value (chi-square)	**0.006**		**0.00**			**0.025**			**0.06**		**0.00**	

Stocking density: Optimum= 1 sq. meter/goat, High = <1 sq. meter/goat

Chi square test was done to show the association among some selected management factors with the farm size. Farm size was categorized as farm with less than or equal to 5 goats and farm with more than 5 goats. The factors chosen to compare the influence were feeding per day, wall material, roof material, dampness and stocking density. The P value for feeding per day was 0.006

which is lower than 0.05 and it means there is significant association between farm size and feeding per day. Usually the farm with higher goats (>5 goats) had lower time of feeding in a day (almost all of them were fed only twice or less than twice a day). It's natural that the more the number of goats, the difficult the feeding procedure and so, the frequency will be less. Wall material with a P value of 0.00 shows highly significant association with farm size. The P values for roof material were 0.025 that is less than 0.05 and indicate connection with the farm size. As larger the number of goat size, there will be more materials needed with greater cost. So naturally farmers will try to use some cheap ones. This may lead to some lower welfare if the goats are not provided with their optimum requirements. The P value with the dampness was 0.06 that is little higher than 0.05 but can be considered as close to significant. And lastly the P value of stocking density was 0.00 which indicate its highly significant association with the farm size. Genuinely, a greater number of goats will lead to less amount of area for each. Normally in backyard goat farming, the size of the house is prefixed during the very 1st period of building the farm. So, there is no perfect plan of area per each goat. Then if the farmer tends to increase the number of goats, it may indirectly influence the stocking density and may cause discomfort to the goats. As re-building is never an option in backyard goat farming. Which may be a cause of low welfare in the farm.

Relation between goat and human:

Table-3: Stockman-ship and the relationship between goat and human (N= 80)

Traits	Category	Frequency (%)
Handling of goat	Rough	9 (11.2)
	Not rough	71 (88.8)
Hitting with stick	No	61 (76.2)
	Sometimes	8 (10)
	Yes	11 (13.8)
Reaction of goat during restraining by owner	Feared	7 (8.8)
	Happy	43 (53.7)
	Normal	30 (37.5)
Reaction of goat during restraining by unknown	Dull	2 (2.5)
	Normal	6 (7.5)
	Try to escape	72 (90)

There were found 11.2% farmers who roughly handled their goats. About 13.8% of the farmers used stick always while handling and 10% sometimes use stick. When the goats are handled by the owners, in 8.8% of the cases the goats were feared. In 53.7% of the cases they were happy and in 37.5% of the cases they were normal. On the contrary, when the goats were restrained by an unknown person, in 2.5% of the cases they were dull, in 7.5% of the cases they were normal and in 90% of the cases they tried to escape. Normally a goat will feel happy while with it's rearer and will try to escape from any unknown person. Getting feared by the owners indicates any previous rough behavior that may made the goat fearful towards the rearer. Whereas showing dullness to an unknown person means either the goat is in pain for any sickness or the human-goat interaction on that house was very poor and threatful to the goats. So, the goats are not showing their usual behaviors. All the behavior of the goats and owner were observed manually by the data collector himself.

Table-4: Goats' responses in relation to owners' behavior (N= 80)

Exposure	**Category**	**Outcome**			
		Use of stick		Relationship with owner	
		Not used	Used	Happy and good	Fearful
Handling of the goat	Not rough	59	12	69	2
	Rough	2	7	4	5
P value (Chi-square)		**0.00**		**0.00**	

Chi square test was done to demonstrate the relation between human approach and the reaction of the goats. The factor handling was used and categorized as rough handling and not rough handling. Using a stick while handling has high significance with the rough behaving that has 0.00 as P value. The P value of relationship with owner was 0.00 too that also very significant relation with the handling of the goats. Normally, the owners that are more used to handling their goats with stick will be a rough handler even when they are hand handling. Both the rough handling and the using of a stick indicate poor animal human interaction and animal welfare in the farms. Whereas in the 2nd one, the goats will be more fearful when they will be restrained in rough manner than usual. So, the fearfulness of the goats of a farm can be a good indicator of poor animal human

interaction and animal welfare. Both the tests confirm the significance of the chosen traits or factors in this study.

Management information related to diseases and treatments:

Table-5: Health, disease and disease prophylaxis management at Kaluakhali Upazila (N= 80)

Traits	Category	Frequency (%)
Vaccination	PPR	34 (42.5)
	No Vaccination	46 (57.5)
Deworming	Not performed	12 (15)
	Performed	68 (85)
Common cold	Occurred	56 (70)
	Not occurred	24 (30)
Prevalence of common cold	Within 5 months	17 (30.4)
	Before 5 months	39 (69.6)
Diarrhea	Occurred	34 (42.5)
	Not occurred	46 (57.5)
PPR	Occurred	21 (26.2)
	Not occurred	59 (73.8)
Prevalence of PPR	Within 5 months	6 (28.6)
	Before 5 months	15 (71.4)
Health service provider	Quack	42 (53.8)
	UVH	36 (46.2)
Separation of sick goat	Not performed	62 (77.5)
	Performed	18 (22.5)

Deworming was done by 85% of the farmers. The common deworming period was 3-4 months and the source were the Upazilla Veterinary Hospital mainly. Vaccination was done in 42.5% of the farms. Vaccine was given only against PPR. About 70% of the farms were found where common cold occurred and among them 30.4% complained of common cold occurrence within last 5 months. Diarrhea was found in 42.5% of the farms. PPR case was found in only 26.2% of

the farms and among them 28.6% were within last 5 months. Only 22.8% of them separate the sick goats. About 53.8% of the farmers consult with only the quacks in case of medical emergency. Among them, 80% complained about the transport difficulties as main problem.

Table-6: Management and welfare related to castration (N= 80)

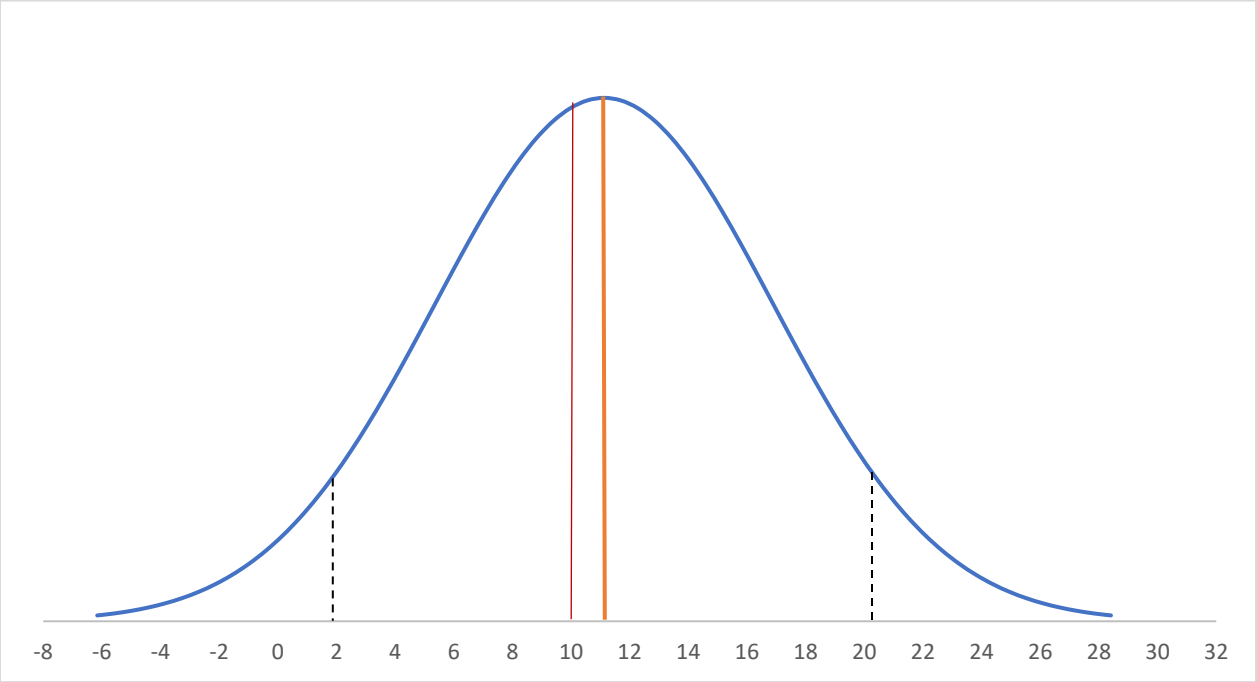
Traits	Category	Frequency (%)
Age of castration	≤15 days	40 (50)
	>15 days	40 (50)
Anesthetics	Used	50 (62.5)
	Not used	30 (37.5)

There was a mal-practice of not using any anesthesia during castration in that area. Around 37.5% of the cases there was no use of anesthetics. This is very unethical. The castrations were usually done by quacks or dressers and nurses. So closed method of castration was mainly done as it requires less skill and also in most of the cases, no ligation or suturing was done in spermatic artery. Even a decent post-operative antibiotic and pain killer course were also not maintained in most of the cases. Practiced castration age was in very early like 15-20 days after birth mostly, as early castration helps the growth well (Louca et al., 1977).

Calculation of the stockman-ship scores:

The mean or average score of the whole sample was 11.125 which is positive number and greater than the median value 10. It means the human animal relation and welfare in the total area was better than average. The standard deviation was 5.7619 that is high and indicate the scores were more scattered from the mean value. It may be due to more randomness of the management in backyard goat farming. All the household scores are shown in the distribution graph bellow emphasizing their dispersion from the average value.

Figure-1: Distribution bell curve of the scores



Here the bell curve indicates that most of the households were scored within 2 to 20 where the range of possible score was -26 to +31. Also, the average score which is 11.125 is marked as orange line in the middle and the most score or the median (10) is as red line. Among the scores 39 of the households were scored upper than the average and 41 of them were lower. There were also two households with negative score which really indicate very poor practice of animal welfare.

Conclusion

The backyard goat farming system looks better in studied area. Farmers have positive behavior towards their goats. A little percentage of poor welfare were evident which were due to some mal practices, ignorance and poor economic condition. If these bad practices can be eliminated and the farmers are provided training on the importance of good human animal interaction, the backyard goat farming will be more sustainable and the animal welfare will be well maintained.

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Biography

The author Arnab Bala, son of Gouranga Lal Bala and Aruna Rani Biswas passed his Secondary School Certificate (SSC) examination from Karnaphuly Paper Mill's High School, Rangamati in 2011 and Higher Secondary Certificate (HSC) examination from Government Hazi Mohammad Mohsin College, Chattogram in 2013. Thereafter he enrolled for Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU), Bangladesh and now is an intern student in this university.

Appendix

Indicators related to animal welfare (Scores are given within bracket):

Source of water: Tube well (+1), Pond/river (-1)

Extra premix given with food: Yes (+1), No (0)

Grazing Time: Morning/Evening (+2), Afternoon (+1), Noon (-1)

Grazing during rainy season: Yes (-1), No (+1)

Floor type: Earth (-1), Brick/Concrete (+1), Slated (+2)

Roof type: No roof (-1), Straw/Jute-stick (+1), Concrete/Tin (+2)

Wall type: No wall (-1), Straw/Bamboo/Jute-stick (+1), Concrete/Tin (+2)

Manger: Yes (+1), No (-1)

Water trough: Yes (+1), No (-1)

Bedding: No bedding (-1), Jute-bag/ Straw/Paper (+1), Choki (+2)

Dampness in floor: Yes (-1), No (+1)

Water logging: Yes (-1), No (+1)

Presence of sunlight: Yes (+1), No (-1)

Cleaning per day: Rarely (-1), Once (0), Twice (+1), More than twice (+2)

Separate room for male and female: Yes (+1), No (-1)

Space given per goat (sq. m.): Less than 1 (-1), Greater than or equal to 1 (+1), Greater than or equal to 2 (+2)

Use of very large buck in breeding: Yes (-1), No (-1)

Deworming: Yes (+1), No (-1)

Anesthesia in castration: Yes (+1), No (-1)

Isolation of sick: Yes (+1), No (-1)

Rough behaving: Yes (-1), No (+1)

Hitting with stick while handling: Yes (-2), Sometimes (-1), No (+1)

Reaction due to owner's handling: Dull (-2), Feared (-1), Normal (0), Happily excited (+1)

Reaction due to unknown person handling: Dull (-2), Feared (-1), Normal (0), Try to escape (+1)

Questionnaire prepared for data collection:

Goat data in Kalukhali Upazilla

Date:

Owner's information:

Name: Sex: Age:

Occupation: Union:

Mobile no:

General goat information:

No of goat: Breed: Sex:

Housing:

Floor type:	Roof type:	Wall type:
Bedding material:	Manger:	Water trough:
Separate room:	Dampness:	Water logging:
Presence of sunlight:	Daily cleaning:	Total area (sq. meter):

Feeding:

Water source: Grazing time: Daily feeding time:

Grazing during raining: Extra premix given: Force feeding:

Rice feeding:

Other general management:

Vaccination: Deworming: Deworming interval:

Castration: Age of castration: Castration method:

Anesthetics used in castration: Separation of sick one:

Use of larger breed in service of small one: Hoof cutting:

Rough behave by owner while handling:

Hitting with stick:

Reaction of goat while restrained by owners:

Reaction of goat while restrained by unknown:

Previous diseases information:

Any common cold in previous 5 months:

Any digestive disturbance in previous 5 months:

PPR in previous 5 months:

Treatment given by: