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Present Status of Livestock and Forage Production: A Study On South-West Coastal Bangladesh

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Article info	Abstract
<p>Received: 17 September 2022 Accepted: 16 October 2022 Published: 25 October 2022 Available in online: 15 November 2022</p> <p>*Corresponding author:  shafiqueatku@gmail.com</p> 	<p>Livestock plays a crucial role in the production and economic systems of Bangladesh. The main purpose of the study is to explore the present status of livestock and forage production in the south western coastal Bangladesh. To do this, the study has been adopted different statistical tools and techniques in a cross-sectional data set of 2019. The data has been collected by using a structured questionnaire from the livestock farmers of the Khulna, Bagerhat and Satkhira districts. The study found that, these regions with high livestock population compare with another region. Further it is found that the regions facing obstacle to forage production and diseases infection. In Khulna and Bagerhat livestock producers cultivate only 21% and 24% exotic grass, respectively. A significant percent e.g., 79% and 63% people of the Khulna and Bagerhat do not cultivate any grass, respectively. This study also found that 91%, 51.5% and 84.8% land are saline affected in Khulna, Satkhira and Bagerhat districts, respectively. It is indicated that most of the land are not suitable for producing fodder. The study may be advantageous for the concern authorities for improving livestock production in the south west coastal region as well as economic development of the economy.</p> <p>Keywords: Livestock, forage, Bangladesh, farmers and economic development.</p>

Introduction

In most economies, livestock play a significant role. Livestock provides food, security, improves agricultural productivity, generates monetary revenue for rural and urban communities, provides fuel and transportation, and produces value-added items, all of which can have multiple effects and create a demand for services. Livestock also diversifies production and revenue, provides year-round employment, and spreads risk. Livestock is also a significant source of capital for farming households. Human and economic pressures can steer livestock production in ways that are harmful to the environment because of livestock's value to societies.

Livestock farming is an important aspect of agriculture that can help a significant number of people in underdeveloped countries, maintain their livelihoods and food security. Bangladesh is one of the world's most densely inhabited developing nations. More than 10 million people in Bangladesh work in the cattle industry, which accounts for around 12% of the country's GDP (Chowdhury *et al.* 2016). In 2016–2017, livestock contributed 1.6 percent of the total gross domestic product (GDP), which was 14.31 percent of

agricultural GDP (BBS 2017). The majority of these shares come from small-scale farmers with 1–2 cattle, 2–4 goat/sheep heads, and a few poultry in mixed farming systems (Bhuiyan *et al.* 2017). Depending on the region and agro ecological circumstances, the number of reared animals per household varies. The Old Himalayan Floodplain, the Eastern Hills, and seven other agro ecological zones of Bangladesh have more cattle and goat/sheep heads per dwelling. Due to a lack of feed, animal rearing in low-lying areas is less than in high-lying areas (Rahman, 2016). Aside from that, climatic vulnerability and animal health management have a significant impact on livestock populations in various parts of the country.

As the sector is highly crucial, any damage of the sector has effect on the survival of a society as well nation. For instance, any damage caused by natural hazards such as storm, cyclone, tornado and thunderstorm, drought, food, riverbank erosion and landslide increase suffering of many people. The frequencies of occurrence of these hazards are increasing because of climate change impacts (Hossain and Deb, 2011) and causing damages in different degrees depending on locations of the country. Floods

and cyclones, for example, pose the largest threat to Bangladesh, while earthquakes threaten the northern and eastern regions, and cyclones, droughts, earthquakes, floods, and landslides threaten the southeast. All of these dangers place Bangladesh among the top three most vulnerable countries in the world in terms of human lives lost and economic damage (INFORM, 2018). Changes in feed quality and quantity, biodiversities, genetics, breeding, and rearing are all anticipated to affect livestock productivity as a result of climate change (Thorton et al. 2009). (Ahmed et al. 2013). Droughts and significant rainfall variability can cause severe feed scarcity, which can have disastrous consequences for animal populations. Increasing saline levels as a result of rising sea levels will restrict forage production areas and degrade feed quality. Livestock will suffer from diarrhea, skin illnesses, liver fungus, weight loss, and immune system breakdown if they eat salinity-affected fodder crops (Alam et al. 2017). Because most farmers do not practice vaccination and deworming, and even refuse to grow grass for better livestock production (Islam et al. 2016), increased climate-induced vulnerability will exacerbate its production in the future, which must be addressed for the economic emancipation of smallholder farmers and the continuation of agricultural development in Bangladesh. To build a sustainable livestock production in Bangladesh it is very important to assess the present status of livestock production, and address the food and disaster crisis in the sector. However, none of the previous studies were conducted regarding the issue on the coastal belt Bangladesh. Therefore, this study intended to assess the present status of the livestock and forage production of the mostly disaster prone south western coastal areas of Bangladesh.

Methodology of the study
Study Method

There were two types of studies namely qualitative and quantitative. This study designed following the mixed method (quantitative and qualitative both) though it is mainly quantitative in nature. In the first part, the study considered quantitative research and the second part was set on qualitative research.

The study influenced to use quantitative method because, quantitative data could be interpreted with statistical analysis, and since statistics were based on the principles of mathematics, the quantitative approach viewed as scientifically objective, and rational (Carr, 1994; Denscombe, 2010). A quantitative study can use statistics to summarize present data, describing patterns, relationships, and connections. As the quantitative research is based on specific to general approach, this study also aimed to examine the specific objectives and then generalizing the results over the population through making inferences from the sample.

The study also used qualitative research because only a close ended interview schedule is not enough to explore the real situation of the critical issues are considered in this study. The qualitative research part used to explore the actual and different scenarios of livestock and forage production in south-west coastal Bangladesh.

Selection of the study areas and population

As soil salinity increases each year, dry season is only favorable for the cultivation of crops in the coastal region. However, dry-season agriculture is becoming difficult due to salinity intrusion in the coastal belt of Bangladesh. Each year this is negatively impacting the crop production across the coastal belt (Rawlani and Sovacool, 2011). Since coastal salinity poses great challenges on agriculture, community people are sometimes forced to convert the agricultural land to shrimp fields and other alternative forms of livelihood earning. The salinity also created shortage of grazing land and fodder for the livestock

The government of Bangladesh has identified different eco-zones which are vulnerable to climate change in its own distinct ways. These zones include southwest and central coast of Bangladesh including Khulna, Bagerhat, Satkhira, Barguna, Patuakhali, and

Bhola, which are the major affected coastal districts in the country. Since the coastal area is very vulnerable in agricultural and cattle feed production the study has selected in the southwest coastal zone of Bangladesh (Figure 1).



Figure 1. Bangladesh Map with study area

Therefore, this study considered the south-west coastal zones of Bangladesh namely Dacope, Tala and Mongla upazila of Khulna, Satkhira and Bagerhat districts, respectively. The target population of the study were cattle farmers and forage growers who were living in the target zone.

Determination of Sample Size

The sample size of the study has determined based on the Cochran (1975) developed Equation. As Cochran's equation is considered especially appropriate in situations with large populations. Further, the Cochran formula allows to calculate an ideal sample size given a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population. Cochran (1975) developed the following Equation to yield a representative sample for proportions.

$$n_0 = \frac{z^2 pq}{e^2} \dots\dots\dots 1$$

Where:

- z^2 is the abscissa of the normal curve that cuts off an area α at the tails ($1 - \alpha$ equals the desired confidence level, let α is 5% then confidence level 95%), z-scores for the most common confidence intervals are:

- a. 90% = 2.576
- b. 95% = 1.96
- c. 99% = 2.576

- e is the desired level of precision (i.e. the margin of error), The margin of error is the amount of error that you can tolerate. If 90% of respondents answer yes, while 10% answer no, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55. Lower margin of error requires a larger sample size.
- p is the (estimated) proportion of the population which has the attribute in question (standard of deviation). It means how much the responses you receive will vary from each other and

from the mean number. A low standard deviation means that all the values will be clustered around the mean number, whereas a high standard deviation means they are spread out across a much wider range with very small and very large outlying figures. Since you haven't yet run your survey, a safe choice is a standard deviation of 50% or 0.5 which will help make sure your sample size is large enough.

- q is 1 – p.

This study intended to evaluate the present status of livestock and forage production in south-west coastal Bangladesh. Assume there is a large population but it is not possible to consider all the population of the target area. Therefore, assume p=.5 (maximum variability). Furthermore, suppose the study desire a 95% confidence level and margin of error is 10%. The resulting sample size is demonstrated in Equation 1.

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.10)^2}$$

n₀ = 96cattle farmers

Therefore, the study considered total 100 numbers of cattle farmers (men and women) as sample from the southwest coastal part of Bangladesh.

Sampling technique

The present study aimed to be conducted in Dacope, Tala and Mongla upzilas of above-mentioned districts. Therefore, to get a representative sample, the study applied a purposive simple random sampling technique to select samples from the targeted population. This technique also tried to ensure equal participation of all the strata of the population. The study tried to include male, female, married, unmarried, young and old aged cattle farmers as sample. The study considered the each upzila equally for the number of samples that is 34, 33 and 33 from Dacope, Tala and Monglaupzila respectively.

Data Collection Techniques

The study used a survey method to carry out this research study. Keeping in mind the sample size and scope of the present study the survey method tried to best use to collect data from the large pool of population. A close ended structured interview schedule has developed to collect data from the respondents. Close ended structured interview schedule is a quantitative tool of data collection, which was advocated by Emile Durkheim (1858 - 1917). It is mostly used in survey method to collect data from large number of populations. It is a positivist research method. With proper formulation and responsibly administered, structured interview schedule s become a useful tool to collect data by which statements can be made about specific groups or people or whole population. So, a close ended structured interview schedule has been developed for data collection of the present study.

Contents and Lay out of interview schedule

Close ended questions have been asked so that the respondents do not lose focus of the topic. Simple and understandable questions have been asked so that respondents can easily give the answer. The interview schedule is divided into following parts related with research objectives and research questions. The questions mainly convey the message about the:

1. Socio-economic condition of the livestock and forage growers
2. Present status of livestock and forage production in south-western coastal regions of Bangladesh.

Pre-testing and finalization of interview schedule

The stages of pre-testing and finalization the interview schedule the researcher have to maintain some procedures. Before finalizing the interview schedule, the study has made a draft interview schedule and has completed pre-testing. Based on the pre-testing

findings the translation, consistency and integrity of the interview schedule were checked. Then the study has finalized the schedule and presented to the supervisor for final approval. After getting the final approval the Bengali interview schedule was printed and translated it later into English.

Data Analysis Techniques

Descriptive and inferential statistics has used to determine the present status of livestock and forage production in south-western coastal regions of Bangladesh. This study basically shows the frequency distribution, descriptive statistics and relationship of variables. Data analysis has done by statistical software SPSS 16 and MS Excel.

Ethical considerations

Social researcher must consider the right of the subjects involved in any study (Baker, 1999). Ethical issues are becoming a crucial element in social research. Researcher must maintain the ethical obligation during data collection. In this study ethical standard was maintained in every stage. The detailed of the ethical considerations are given below:

The researcher has collected the data directly, so the researcher has introduced himself with the respondents and the purpose of the study was provided to the respondents. During the interview of the respondents, researcher has ensured that the provided information would entirely be used only for the mentioned academic purposes and the personal identity would be kept strictly confidential. Only the researcher has accessed the interview schedules and other study instruments. The interview schedule and other instruments have been destroyed after completion of the data analysis.

Moreover, privacy is one of the most important aspects with regards to ethics. Never should a researcher breach anyone's privacy. In this study, privacy was safeguarded during the interview process. Participation in the interview depended on the respondent's discretion. The study registered oral consent from all interviewees.

Results

A. Socio-economic condition of the livestock and forage growers

Demographic statistics of respondents

The study commenced the result with summary statistics of the respondents. The next part of demographic statistics described important variables which show the overall pictures of respondents and may influence their livestock and forage production. The variables namely age, educational qualification, occupation, income level, and farm size were discussed.

Table 1. Summary statistics of the Respondents

Sl.	Particulars	Specific particulars
1	Gender	Male (68%)
		Female (32%)
2	Marital status	Married (98%)
		Unmarried (2%)

Source: Survey Results

The study conducted in the area of Dacope, Tala, and Mongla and total covered 100 livestock and forage producers (farmer) as sample. The study found 78% respondents were male and 32% were female which indicated a significant number of females were involved in livestock and forage production. They involved in this profession to generate extra income and support their family (Table 1). The maximum 73% livestock and forage producers were included from middle years age group followed by 21% are young age group. Only 6% of livestock and forage producers were in above 60 years age group (Figure 2).

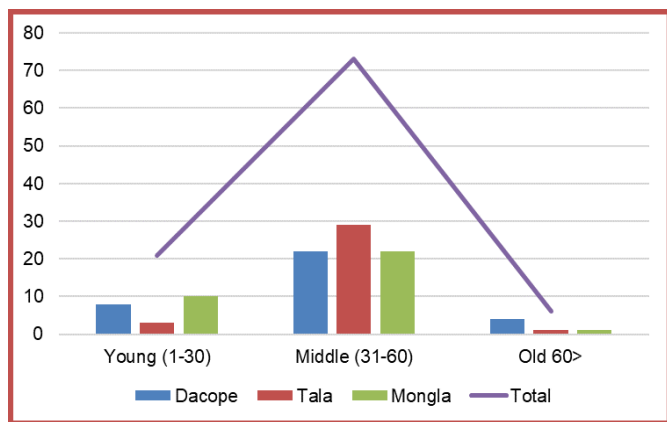


Figure 2. Livestock and forage producers' age distribution.

The age distribution also showed that respondents were from all age groups which were ensured that the respondents were from very young to old age covered in the study. It was confirmed that there was no age biasness. Age of livestock and forage producer was an important factor for their livestock and forage production and it was assumed that different age groups had different experiences about their livestock and forage production.

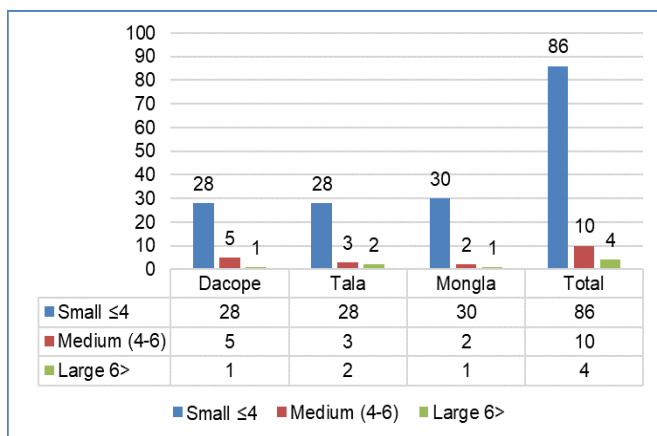


Figure 3. Family size of the respondents

The Figure 3 was presented the family size of the respondents. It demonstrated that maximum number of families were small size. Their family member was less than four. It was also found that almost equal number of families were small size in the three upzilas such as 28, 28, and 30 small families in Dacope, Tala, and Mongla,

Table 3. Types of livestock rearing

Area	Types of livestock reared (%)						Duration of livestock rearing, year (%)					Purpose of livestock rearing (%)		
	Cow	Goat	Sheep	Cow +Goat	Sheep +Goat	Cow +Sheep	<10	10-20	20-30	30-40	>40	Business	Family consumption	other
Khulna	70.6	5.9	2.9	11.8	2.9	5.9	79.4	2.9	17.6	0	0	100	0	
Satkhira	100	0	0	0	0	0	36.4	3	27.3	21.2	12	97	3	
Bagerhat	63.6	21.1	0	15.3	0	0	63.6	3	27.3	3	3	93.9	6.1	

Source: Calculation of data

respectively. On the other hand, very few number of respondents' family were medium and large size. There are only 10 families were medium and 4 families are large size (Figure 3).

Educational qualification is a big issue of livestock and forage producers. However, it was found that 54% of the producers were primary and below primary passed and next 34% were secondary and below secondary passed. It indicated that most of the respondents were less educated and they were not usual to adopt the modern technology for their production process (Figure 4).

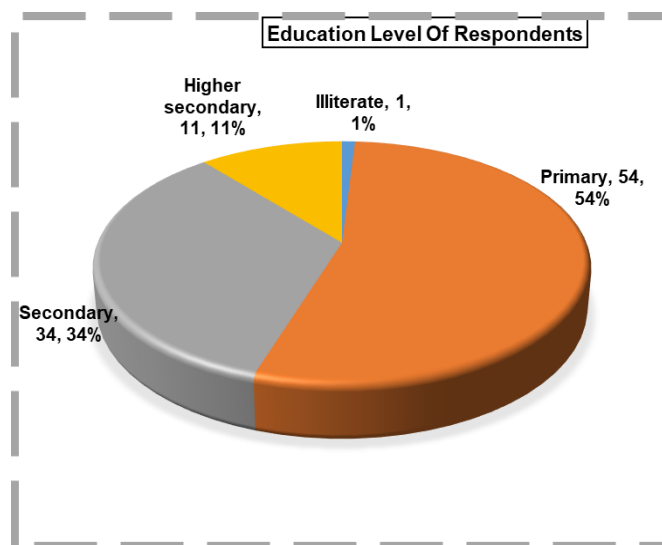


Figure 4. Educational qualification of the respondents

The occupation of the respondents was multidisciplinary (Table 2) and agriculture was the main occupation. It was found that 53% of the respondents' occupation is agriculture. However, only 27% respondents' occupation of Dacope Upzila was agriculture. Whereas 79% and 56% respondents' occupation was agriculture in Tala and Mongla Upzila, respectively. It was indicated that people were mainly depend on the agriculture. The next highest 29% respondents' occupation was under others diversified profession.

Table 2. Occupation of the respondents

Upzila	Agriculture	Business	Service	Others	Total
Dacope	9 (27.3%)	8 (24.2%)	1 (3%)	16 (45.5%)	34
Tala	26 (78.6%)	3 (9.1%)	1 (3%)	3 (9.1%)	33
Mongla	18 (54.5%)	5 (15.2%)	0 (0%)	10 (30.2%)	33
Total	53	16	2	29	100

Source: Calculation of data

Although respondents are involved with multi occupations they are rearing cattle and produce forage, and most of them are owner of

a farm land. Figure 5 showed the respondents' firm size. The study found that majority are marginal (land 0.02-0.20 hectare) farmer in Dacope (52.9%) while in Tala and in Mongla the marginal farmers

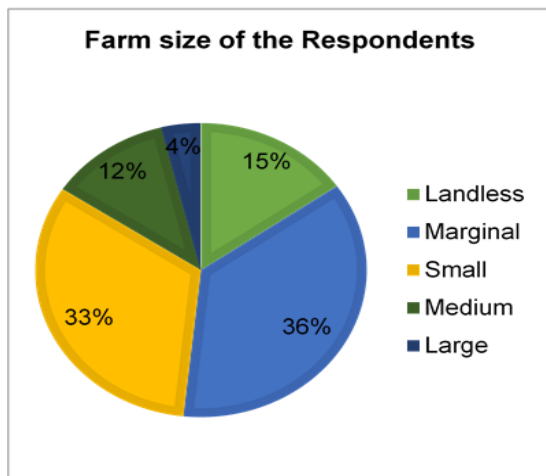


Figure 5. Farm size

were 48.5% and 39.4%, respectively. Landless farmers were (land ≤ 0.02 hectare) 20.6%, 3.0% and 21.2% in Dacope, Tala and Mongla, respectively. Large farmers were found only 2.9% in Dacope and 9.1% in Tala. It also demonstrated that total 36% and 33% of the respondents had marginal and small size farm, respectively. Further, the figure focused that total 15% respondents were landless which is significant number.

The Figure 6 showed the respondents' income level. It was found that 61% respondents belong to low-income group. In Dacope maximum number (79%) of the respondents belong to low-income group while 6% are in high income group. Compare to Dacope, the high-income group of the respondents in Tala and Mongla was higher which was 33% and 42%, respectively.

The part A mainly discussed the issues which were significantly highlighting the socio-economic status of the respondents. This part concluded based on the results that the majority of the livestock and forage growers in the south-west coastal Bangladesh with marginal firm size, low income and less educated. Further, a significant number of farmers were landless which was concentrated highly in the study area.

B. Present status of livestock and forage production in south-western coastal regions of Bangladesh.

Livestock production

This part included livestock production trend, purposes of livestock production, problems of livestock production, what extend the respondents are involved with this occupation. Firstly, it was focused on the types of livestock reared, duration and purposes of the livestock rearing in the following Table 3.

This study considered cow, goat and sheep as livestock. It was found that mostly people were rearing cow. In Khulna 70.6%, Satkhira 100% and in Bagerhat 67% of the respondents were rearing cow. Goat and sheep were in the second and third choice of the livestock producers. However, in Satkhira, people were involved with producing sheep. Some of the livestock producers roduce two of them simultaneously. Such as, they were rearing mix of cow and goat, goat and sheep, and cow and sheep.

The rearing experience of the producers mostly had less than 10 years. The next highest was 20 to 30 years' experiences of rearing livestock. It was proved that as it is profitable occupation recently young people are interested in this occupation. While some other have long experience in this occupation. Some household considered rearing livestock as a tradition. Besides other occupation, some of the people were rearing livestock for fulfilling their family nutrition as well as extra income.

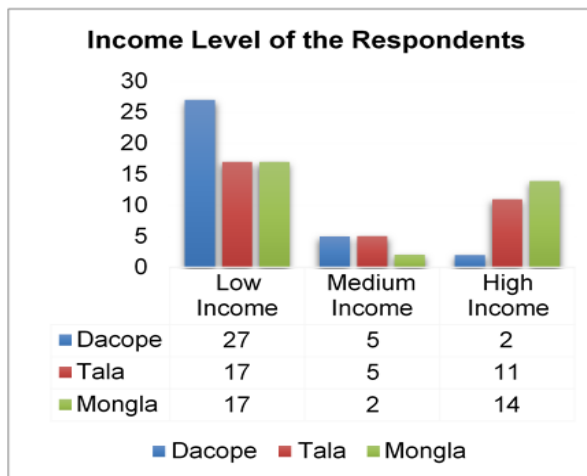


Figure 6. Income of the respondents

Purpose of the rearing livestock is mainly business. It was shown from the table 3 100%, 97%, and 94% livestock producers from Khulna, Satkhira, and Bagerhat, respectively are rearing livestock for business purposes. It is also found that some of them were rearing livestock for family consumption.

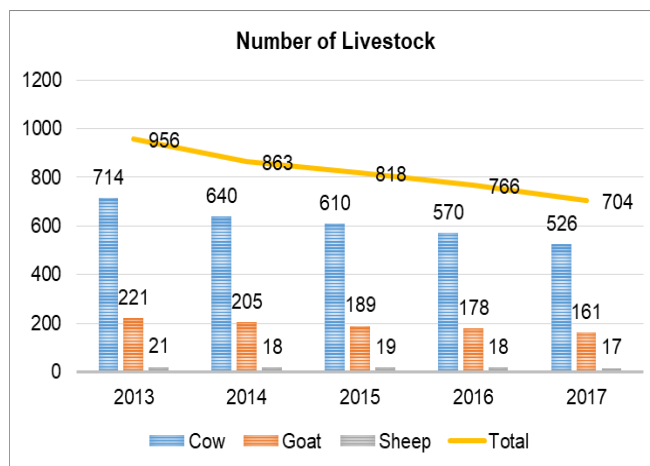


Figure 7. Trend of rearing livestock in the last five year

The figure 7 was presented the trend of livestock rearing by the people. This will lead the researchers and policymakers of livestock department to take proper initiatives to a sustainable production of the livestock to meet the local and national demand of the nutrition? The study found that rearing number of livestock of the people was decreasing trend. The total number of livestock producers were 956 in 2013 while it was found 704 in 2017. The decreasing rates were 9.75%, 5%, 6%, and 8% in the year of 2014, 2015, 2016 and 2017, respectively. The result reveled that livestock producers were reducing livestock. They were facing different challenges for rearing livestock thus they were de-motivating and reducing number of livestock. The study also found the individual class of livestock such as cow, goat and sheep had been decreasing from the year 2013 to 2017. For example, 714, 221 and 21 cows, goats, and sheep, respectively were rearing by the producers in 2013. It is found total 526, 161 and 17 cows, goats and sheep, respectively were rearing by the producers in 2017. It provided a clear message that the sector was diminishing year to year in the south west coastal Bangladesh.

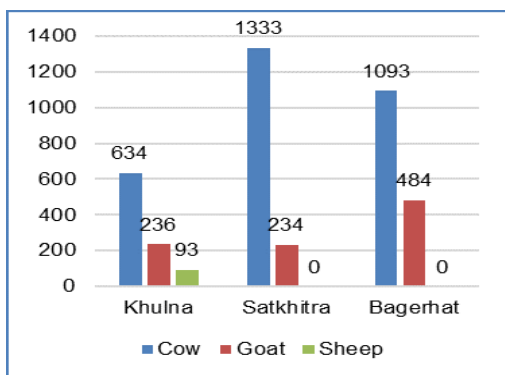


Figure 8. Five-year total livestock in the study area

The figure 8 was presented the five-year total number of livestock in each district of the study area. The results indicated that Satkhira district reared maximum number of cows and Khulna was in the last position for rearing cows. On the other hand, Bagerhat reared maximum number of goats and Khulna lowest number compare to other two districts. While, sheep only produced by the livestock producers of Khulna.

Table 4. Number of livestock in last year (2017).

Area	Livestock	Number of livestock	livestock /Household	Average livestock /household (3 upazila)
Khulna	Cow	95	2.8	5.3
	Goat	38	1.1	1.6
	Sheep	17	0.5	0.17
Satkhira	Cow	250	7.6	-
	Goat	35	1.1	-
	Sheep	0	0	-
Bagerhat	Cow	181	5.5	-
	Goat	88	2.6	-
	Sheep	0	0	-

The table 4 was shown the number of livestock in each district separately in 2017. Per household number of cows reared was 7.6, 5.5, and 2.8 in Satkhira, Bagerhat and Khulna district, respectively. In addition, it presents the average number of cows, goat and sheep per household considering three districts together in 2017. Per household average cows, goat and sheep rearing number were 5.3, 1.6, and 0.17, respectively.

Table 5. Problems during livestock rearing

Problems during livestock rearing (%)			
Problems/Area	Khulna	Satkhira	Bagerhat
Diseases	70.6	45.5	66.7
vaccination	26.5	12.1	30.3
Market facility	2.9	15.2	3
other	0	27.2	0

The figure 9 demonstrated the profit and loss of livestock in south west coastal area of Bangladesh. The livestock producers of the study area were experienced with profit from their rearing livestock. The figure shows that 100% producers from Khulna experienced with profit by rearing livestock. It also showed that 97% and 91% producers from Satkhira and Bagerhat experienced with profit by rearing livestock. Thus, it was proved that rearing livestock was

profitable although they were facing different problems in this occupation. It is motivating the new livestock producers and it will be sustainable for them if the policymaker focuses on the current livestock rearing problems.

The study was tried to explore the problems facing by the livestock producers during the livestock rearing. The study found that during rearing livestock producer facing diseases, vaccination, market policy problems mainly. These problems de-motivated them to rearing livestock. There were 71%, 46% and 67% (Table 5) respondent from Khulna, Satkhira, and Bagerhat districts, respectively said that diseases were the main problem during the livestock rearing.

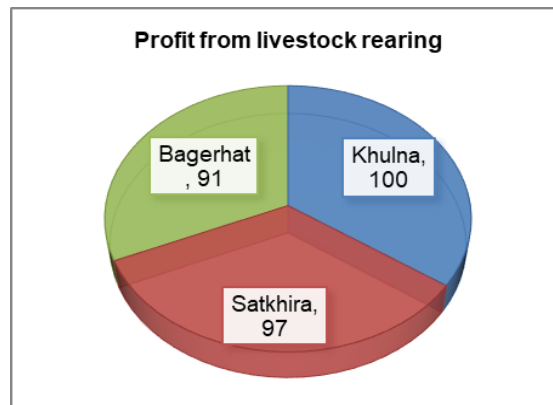


Figure 9. Profit from livestock rearing

The table 6 showed that the number of livestock is decreasing year to year. As the sector is very significant for living the household of south west coastal region of Bangladesh, therefore, this study intended to explore the reasons behind the decreasing livestock in the study area. The study has able to determine the specific causes of the decreasing livestock in the area. It was found that mainly fodder deficiency, unavailable forage and diseases were causes for decreasing livestock. It was also determined some other causes such as economic loss and other unspecified reasons.

The table 6 showed that 41%, 88%, and 64% respondents identified fodder deficiency was the cause for decreasing number of cows in the Khulna, Satkhira, and Bagerhat district, respectively. Further, it was found that 59%, 21%, and 82% respondents identified unavailable forage as the second most cause for decreasing number of cows as livestock in the Khulna, Satkhira, and Bagerhat district, respectively. Disease is in third place as the cause for decreasing cow. These causes also ranked in the same line for decreasing goat.

The study identified different diseases for different seasons. It was found that Anthrax is the main disease for rainy season, while Pneumonia and Diarrhea were the main diseases for the winter and summer seasons respectively. In Khulna, 85%, 67.6%, and 79% respondents identified Anthrax, Pneumonia and Diarrhea were the main diseases in the three seasons, respectively. In Satkhira, 45%, 45% and 30% respondents ranked the diseases for three seasons as Khulna. In Bagerhat, the diseases also ranked same as above by 52%, 52% and 58% respondents (Table 7). The diseases also ranked in the same place for the goat as livestock for the different seasons. The result focused that the livestock producers were facing significantly from the three diseases in three seasons.

Forage production

Table 8 presented the knowledge of livestock producers about animal feed. This table consists with seven different issues of animal feed that were asked to the livestock producers from the three south west coastal districts of Bangladesh.

Table 6. Causes of decreasing livestock (%)

Area (Dist)	Animal	Fodder Deficiency	Disease	Economic loss	Unavailable forage/livestock	other
Khulna	Cow	41.2	24.2	0	55.88	0
	Goat	2.9	0	0	26.5	0
	Sheep	0	0	0	17.6	0
Satkhira	Cow	87.9	66.7	3.03	21.2	36.3
	Goat	9.1	0	9.03	0	0
	Sheep	0	0	0	0	0
Bagerhat	Cow	63.6	6	3	81.8	0
	Goat	15.1	0	0	33.3	0
	Sheep	9	0	0	12.1	0

Source: Calculation of data

Table 7. Seasonal disease of livestock (%)

Area (Dist)	Animal	Rainy					Winter				Summer				
		Anthrax	B.Q	FMD	Pneumonia	Diarrhea	Anthrax	B.Q	FMD	Pneumonia	Anthrax	B.Q	FMD	Pneumonia	Diarrhea
Khulna	Cow	85.2	26.4	2.9	2.9	2.9	2.9	5.9	0	67.6	2.9	0	0	8.8	79.4
	Goat	17.6	8.8	0	0	5.0	0	0	0	29.4	0	0	2.9	11.7	11.7
	Sheep	5.9	2.9	0	0	0	0	5.9	0	2.9	0	0	0	2.9	0
Satkhira	Cow	45.4		6.06	0	0	0	6.06	0	45.4	0	0	3.03	0	30.3
	Goat	9.1	3.03		9.1	0	0	0	0	15.2	0	0	0	0	12.1
	Sheep	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bagerhat	Cow	51.5	42.4	0	0	3.03	0	54.5	0	51.5	0	0	0	0	57.6
	Goat	0	0	3	2	0	0	0	0	15.1	30.3	0	0	5.9	9.1
	Sheep	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Calculation of data

Knowledge about feeds and feeding of livestock, balance diet, feed conversion ratio, hay and silage, nutrition of green grass and training on livestock feeding were included in the survey interview schedule. The study found about 90 to 100% livestock producers without knowledge of animal feed. About 45% respondent said that they have livestock training experiences. The table 8 also represented that, 35.5% respondents from Khulna, 42.4% respondents from Satkhira and 61% respondents from Bagerhat

for producing fodder for livestock. In Satkhira maximum 24% land was good for producing fodder. Only 20%, 39% and 33% livestock producers used 10 to 20 decimal lands for producing forage in Khulna, Satkhira and Bagerhat districts, respectively. The table 10 showed the cultivated forage types, and green grass offering to livestock in the south west coastal region of Bangladesh. The study found that there were two types of grass cultivated in the areas namely exotic and local. In Satkhira, producers mainly

Table 8. Knowledge about the nutritional status of fodder

Area	Knowledge about feeds and feeding of livestock (%)		Knowledge about balance diet (%)		Knowledge about feed conversion ratio (%)		Knowledge about hay and silage (%)		Knowledge about green grass (%)		Training on livestock feeding (%)	
	yes	no	yes	no	yes	No	yes	no	yes	no	yes	no
Khulna	17.6	81.4	17.6	82.4	14.7	85.3	2.9	97.1	2.9	97.1	35.3	64.7
Satkhira	6.1	93.9	6.1	93.9	0	100	3	97	0	100	42.4	57.8
Bagerhat	12.1	87.9	21.2	78.8	9.1	90.9	21.2	78.8	6.1	93.9	60.6	39.4

Table 9. Socio-economic importance of fodder production

Area (Dist)	Land quality (%)				Forage production in cropping pattern (%)		How much lands for forage production? (Deci)(%)		
	good	Fair	Poor	Saline	yes	No	No	10-20	21-30
Khulna	8.8	0	0	91.2	0	100	79.4	19.6	0
Satkhira	24.2	18.2	6.1	51.5	18.1	82.8	27.3	39.4	33.3
Bagerhat	12.1	3	0	84.8	8.8	91.2	63.6	33.3	3

are with livestock training on feeding. The table 9 demonstrated that 91%, 51.5% and 84.8% land were saline affected in Khulna, Satkhira and Bagerhat districts, respectively. It was indicated that most of the land were not suitable

produced exotic grass at 73% and rest of producers (27%) cultivated native grass. On the other hand, in Khulna and Bagerhat livestock producers cultivated only 21% and 24% exotic grass,

Table 10. Forage production

Area (Dist)	Do you have available forage		Type of forage exist in your area		What forage production rate is high			
	yes	No	Exotic	Native	Napier	Para	German	Guinea
Khulna	5.9	94.1	61.8	38.2	91.2	5.9	0	0
Satkhira	61.8	38.2	72.7	27.3	100	0	0	0
Bagerhat	12.1	87.9	2.9	97.1	91.2	5.9	0	0

respectively. A significant percent e.g., 79% and 63% people of the Khulna and Bagerhat did not cultivate any grass respectively. It also showed that most of the livestock producers offer green grass to their livestock. In Khulna, Satkhira, and Bagerhat districts 68%, 88% and 82% livestock producers offered green grass to their livestock, respectively.

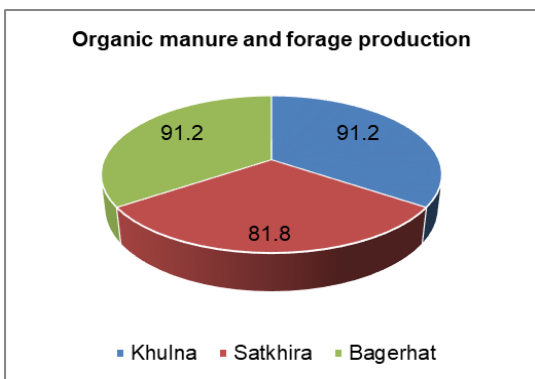


Figure 10. Organic manure and forage production

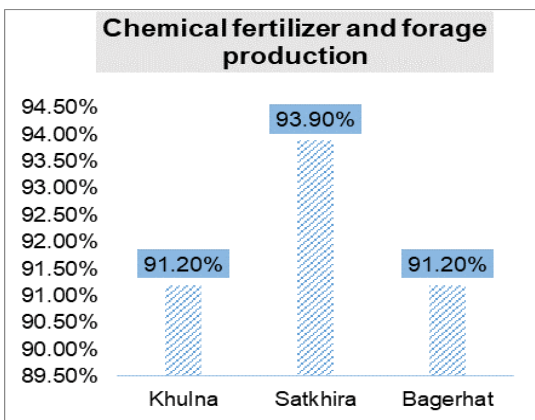


Figure 11. Chemical fertilizer and forage production

A few numbers of livestock producers of the districts above mentioned such as 32%, 12% and 18%, respectively did not offer green grass to their livestock.

The figure 10 and 11 showed the impact of organic manure and chemical fertilizer on forage production. The study revealed that 91.2% livestock/forage producers from both Khulna and Bagerhat districts said that organic manure was positively impacted to increase forage production. The figure 11 showed that in Bagerhat 93.90% respondents agreed that chemical fertilizer was better than organic manure for increasing forage production. It indicated that organic manure and chemical fertilizer had same impact on producing forage in Khulna and Bagerhat districts.

The study was revealed that 61.8% livestock producer from Satkhira with available forage in their locality (Table 10). However, 94% and 87.9% respondents from Khulna and Bagerhat districts with unavailable forage, respectively. In Khulna and Satkhira the available forage mainly exotic type. On the other hand, in Bagerhat

district the available forage mainly local type. There are different sorts of exotic forage available in the study area such as Napier, para, German and guinea. But the study found that mostly Napier type forage was produced highly compare to other forage in the study area.

Table 11. Best season for forage cultivation and benefit offeeding green grass.

Area (Dist)	Best season for forage cultivation(%)			Benefit of feeding green grass (%)		
	Sumer	Rainy	Winter	Milk production increase	Decre ase	As it is
Khulna	61.8	38.2	0	100	0	0
Satkhira	84.8	6.1	9.1	97	0	3
Bagerhat	76.5	23.5	0	100	0	0

Source: Calculation of data

The Table 11 demonstrated the suitable season for producing forage and benefits of feeding green grass. The study found that summer season was the best season for cultivating forage when forage was produced highest amount with low cost. The table 11 showed that only 9% people produced forage in winter season in Bagerhat district.

Feeding green grass is benefited for increasing milk and meat production. It was found that almost 100% livestock producers agreed with the statement that green grass increased milk production in the south west coastal region of Bangladesh.

The study included a part to explore what sorts of forage producing regular/irregular basis in the year 2013 to 2017. The trend showed that Napier production rate in increasing and regular. Other sorts of forage Para and Jambu produced minimum level and almost same rate in all years (Table 12).

The study showed that forage production was significantly impacted said by 73%, 88% and 74% livestock and forage producers from Khulna, Satkhira and Bagerhat districts, respectively. Comparatively, climate extremity had the low negative impact on cow and goat production in this study area (Table 13).

Discussion

The coastal area covers AEZ 13 (Barisal, Bhola, Jhalkati, Pirojpur, Barguna, Patuakhali, Khulna, Bagerhat and Satkhira), AEZ 19 (Feni) and AEZ 23 (Chittagong and Cox's bazaar). The region is comparatively poor and out of 3.22 million rural farm household, 0.62 million are owner cum tenant and 1.8 million households are tenant.

Livestock rearing of poor household of coastal area is better livelihood option. Cattle, goat and sheep rearing considered as major source of family income, nutrition, food security and social status. Livestock population in the region is comparatively high, but the productivity is quite low due to ill health attributing by scarcity of green fodder and diseases infestation (MS Islam et. al. 2019). This study also covers the southwest coastal region specially the Khulna, Bagerhat and Satkhira districts. These regions also with high livestock population compare another region. Further it was also found that these regions facing obstacle to forage production

Table 12. Five years Trend of forage production

Area(Dist)		2017	2016	2015	2014	2013
Khulna	Napier	58.8	29.4	11.8	8.8	
	Para	14.7	5.9			
	Jambu	5.9	2.9			
Satkhira	Napier	90.9	90.9	63.6	27.2	30.3
	Para	3.03	3.03			
Bagerhat	Jambu	9.1	9.1			
	Napier	30.3	24.2	5	5	4
	Para	3.03	3.03			
	Jambu	3.03	3.03			

Source: Calculation of data

and diseases infection. For example, in Khulna and Bagerhat livestock producers cultivated only 21% and 24% exotic grass, respectively. A significant percent e.g. 79% and 63% people of the Khulna and Bagerhat did not cultivate any grass, respectively.

and organic matter as chemical and phytoremediation procedures have been implemented worldwide. The application of organic matter improves physical, chemical and biological properties of saline soil (Diacono and Montemurro, 2015). Organic fertilizer as

Table 13. Impact of climatic extremity on livestock and forage production (%)

Area(Dist)	Extremity	Cow	Buffalo	Goat	Sheep	Forage
Khulna	Salinity (soil)	2.9	0	5.9		88.2
	Flood	14.7	0	5.9		73.5
	Cyclone	29.4	0			58.8
Satkhira	Salinity (soil)	6.1	0	6.1		78.8
	Flood	0	0	0		0
	Cyclone	33.3	0	36.4		97
Bagerhat	Salinity (soil)	9.1	0			84.8
	Flood	39.4	0	72.8		66.6
	Cyclone	75.8	0	33.3		69.6

Source: Calculation of data

Salinity has been increasing over period of time of southwest coastal region of Bangladesh and 0.223 million ha (26.7%) of total cultivated land is affected by various degree of salinity and badly hampered in the crop ecology. It is now threatened in food security. For example, Alam *et. al* (2017) studied to measure the effect of salinity intrusion on food, crops, livestock, and fish species at Kalapara Coastal Belt in Bangladesh. They found about 200 ha fodder crops areas are affected each year due to salinity. Ninety-two percent of the areas were found to be salinity affected in the 36 current cropping patterns. This study also found that 91%, 51.5% and 84.8% land are saline affected in Khulna, Satkhira and Bagerhat districts, respectively. It was indicated that most of the land were not suitable for producing fodder. However, this study found that use of organic manure and chemical fertilizer increased forage production in the southwest coastal belt of Bangladesh. The study also found 91.2% livestock/forage producers from both Khulna and Bagerhat districts agreed that organic manure was positively impacted to increase forage production. In Bagerhat 93.90% respondents agreed that chemical fertilizer is better than organic manure for increasing forage production. In the same issue Iqbal (2015), argued that fertilizer plays an important role to control salinity. Use of Urea in salinity intrusion condition is harmful for crop production but use of recommended dose of Phosphorus, TSP, green manures can neutralize the level of salinity and improve the crop productivity condition under the salinity intrusion condition. He conducted research on salinity and ecological sustainability of crop production of southwest coastal region of Bangladesh using a Approach of Translog Production Function. Again, Sharma and Minhas (2005) argued that Gypsum

source of organic matter and nutrients for soil and plants is important for sustainable land use and crop productivity on saline soil. Purbajanti *et al.* (2016) reported manure as organic fertilizer (5 tonnes/ha) increased chlorophyll content, plant height, crop growth rate, forage yield, dry matter yield and dry matter content of *Brachiariabrizantha*. The impacts of high-quality forages is very significant proved in India. Two new varieties of grasses were introduced (*Super Napier* and a *Sorghum, COFS-29*) from India which increased the daily milk yield of the cattle by 41 percent with no other management changes made (Mark Mitchell, 2020). Whereas this study found that most of the livestock producers (about 90 to 100%) without knowledge of animal feed that were significant for better production of livestock. The livestock producers also without having knowledge nutrition of green grass. Fresh water security is a greater problem, besides human health issues regarding salt environment livestock are also at in risks. Drinking water and fodder scarcity the livestock's especially cow; goat & sheep's are decreased in number. In Satkhira district land scarcity is the major limiting factor; increased yield per unit area may be the best way of improving fodder availability. In many countries fodder grass cultivation for livestock become a model for Livestock farming. This study also found same as above the number of livestock were decreasing due to fodder scarcity in the southwest coastal region of Bangladesh. Overall, the study focused on the present status of livestock and forage production in southwest coastal Bangladesh. The findings of the study were similar and supported by the previous studies. The findings were highly influence to take further initiatives

to sustainable livestock production in the region as well as poor household economic development.

Conflict of interest

There is no conflict of interest among the authors.

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