



## Socio-geographic distribution of livestock and poultry in Bangladesh- A review

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### Abstract

Bangladesh, a country of 147,570 Km<sup>2</sup>, had a total human population of 144.0 million in 2011 which is estimated as 160 million in 2015. Livestock that includes cattle, buffalo, goat and sheep and poultry such as, chicken, ducks and pigeons are important to her food and agriculture. Their total population according to Agricultural Census (2008) is 25.67, 0.54, 16.3, 1.29, 97.8, 39.43 and 7.48 million, respectively. The objective of the study was to analyse the concentration of livestock and poultry and their proportional availability to humans of different regions and their distribution to different farm categories. The average distribution range of the above animals and poultry was 19.7 to 361.7, 0.39 to 15.4, 12.4 to 359, 0.3 to 43.0, 105 to 1212, 6 to 746 and 1.5 to 190 per square kilometre, respectively; and that of human population was 86.7 to 8229/Km<sup>2</sup>. Their distribution, comparing with that of human population, that excludes the use of non-habitable land for them, shows that the average range of each farm animal and poultry available in the country was 21 to 464, 0.28 to 32.3, 8.9 to 412, 1.4 to 46.6, 72.8 to 1875, 24 to 829, and 8.9 to 198 per 1000 people, respectively. The production areas of cattle were classified into four zones (Zone A, Zone B, Zone C and Zone D), and that of each of others into three zones (Zone A, Zone B, and Zone C). They were characterized using the socioeconomic attributes of their respective zone, and the geographic distribution map of each genotype was developed and reported. The Farm household rear 85.6%, 81.0%, 75.6%, 75.8%, 75.5%, 77.5%, and 82.2%, respectively, of the total population of the above animals and poultry, respectively; and the rest is kept by the Non-Farm households. The Non-Farm and the small households together rear 73.9%, 67.1%, 82.6%, 79.9%, 82.2%, 80.2%, and 70.3%, respectively, and this shows that livestock and poultry; in addition to the production of milk, meat and eggs; support livelihood improvement of the land poor farmer in the country. However, the database of animal sourced foods (ASF) produced by them in different regions, their consumptions, wet marketing and the extent of value additions, availability of feeds and fodder, and health problems in addition to regional planning for mitigation of climate pollution of animal origin are utmost concerns for doubling of livestock and poultry production and productivity by 2030.

**Key words:** livestock and poultry, socio-economy, geography, farm and non-farm households

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*Bang. J. Anim. Sci. 2017. 46 (1): 65-81*

### Introduction

Bangladesh, a flat Bengal delta country of 147,570 Km<sup>2</sup> with sixty four districts, had a total human population of 139.0 million in 2008. Hilly forest canopies in the northeast and southeast, two elevated tracts in the northern and central region, and the delta of the Bay of Bengal in the south and of the major rivers made variations in the topography of the country. This, in addition to other socioeconomic factors, affects the availability of farm animals and poultry to different categories of farm holdings, an

agricultural production unit having cultivated land of  $\geq 0.05$  acre. They are classified into i) small, ii) medium and iii) large category having 0.05 to 2.49 acres, 2.50 to 7.49 acres and  $\geq 7.50$  acres of operated land, respectively (BBS, 2010). The rest having no operated or cultivated or  $< 0.05$  acres of cultivated land are termed as Non-Farm households.

Cattle, Buffalo, Goat, and Sheep are the farm animals, and Chicken, Ducks and Pigeons are the poultry; important to food and agriculture of the country and owned by different households; were enumerated during the agricultural census of

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2008; and their total population of 25.67, 0.54, 16.3, 1.29, 97.8, 39.43 and 7.48 million, respectively in 2008 was reported according to districts and farm categories, and all these data were used to determine socio-geographic distribution of farm animals and poultry of Bangladesh in order to provide a clear and logical presentation for further use in research and education.

The study of distribution of farm animals and poultry and their ecosystem along the geographic gradients in a country is gradually becoming more and more important; taking consideration of the continuous rising of human habitations on land, changes in the climate and environment, and increasing agrarian practices for cereal crop productions; for supporting resource base production planning. In addition, research, a methodical searching of new knowledge and practical solutions in the form of answers to pre-set questions, on the social and geographic distribution of farm animals and poultry in the country is essential for generation of production practices/systems to improve production and productivity of milk, meat and eggs. The pre-set questions of the current research work are

- i) what is the distribution pattern of farm animals and poultry compared to human population or households along the geographic area of the country ? and
- ii) how the non-farm and farm holders comparatively share the farm animals and poultry?

Taking support of the farm animals and poultry population of the Agricultural Census 2008 (BBS, 2010), the human population census of 2011, and district areas published by Bangladesh Bureau of Statics (BBS) 2012, methodical multifarious analyses were done in searching of new knowledge and information to support the answers to these pre-set questions succinctly. Some of the published data (Huque and Sarker, 2014; Food and Agriculture Organization (FAO), 2005, Jahan and Rahman, 2003) are not sufficient to respond to the questions posed here, and they are published in various forms to support the objectives of the concerned research works at various extents (Mia, 2013; FAO, 1999; FAO, 2000). A quantitative database on different

social and geographic characteristics of an individual farm animal and poultry species, like that of cereal crops, is important and essentially required to support their further improvement programmes. FAO (2005) developed the map of livestock population density using its population data that differ with the data of the government. Moreover, social attributes of each of the livestock species were not considered in the study.

The present research works, thus, were undertaken with the objectives

- i) to determine the geographic distribution of different species of farm animals and poultry in different regions of the country, and map out their concentration compared to human population, and
- ii) to determine extent of ownership of different species of farm animals and poultry by different social categories of farmers and proportional sharing of the animals and poultry by farm and non-farm holdings.

### **Methodology**

The population data on different farm animals and poultry, according to farm category and districts of the agricultural Census 2008 (BBS, 2010), the district area and human population of according to the census 2011 (BBS, 2012) were used as original data of the present study. All the data were inserted in the computer using Microsoft Office Excel 2007 to analyse the data according to the objectives of the research. Descriptive statistics were performed to analyse average, maximum or minimum values, standard deviation of a set of data, scattered distribution of data on any variable or relationship between two variables, found appropriate, were computed. The data on the distribution of farm animals and poultry compared to human population along the districts was used to develop an animal population map using ArcView GIS software (version 3.2). The different districts of the country were grouped according to the concentration of animals compared to a number of people, and in the present study the number of each species of animals for a thousand heads, for

thousand households, or in a square kilometre land area is computed and tabulated.

Moreover, the proportional sharing of each of the farm animals and poultry species between Non-farm (having no or  $\leq 0.049$  acres of land) and Farm (having  $\geq 0.05$  acres of land) holders, the percent distribution of different species of farm animals and poultry among different categories of Farm holders and Non-farm holders were computed according to different districts and all these attributes were used to characterize different districts. Clustering of the area, according to concentration of animals helped to identify production zones of each animal or poultry and based on that geographical distribution map for each of the farm animal species were developed, and reported using tables and figures.

**Discussion**

The data of the last agricultural census (Census of Agriculture, 2008) published in 2010 and that of the human population census of 2011, were used to present the innate information of livestock and poultry distribution and their availability in different regions of the country. A time difference between the two censuses (2010-2011) without showing any regional distribution extrapolated total number of livestock was published in BBS 2012. The data on different variables related to different farm animals and poultry are presented and discussed below.

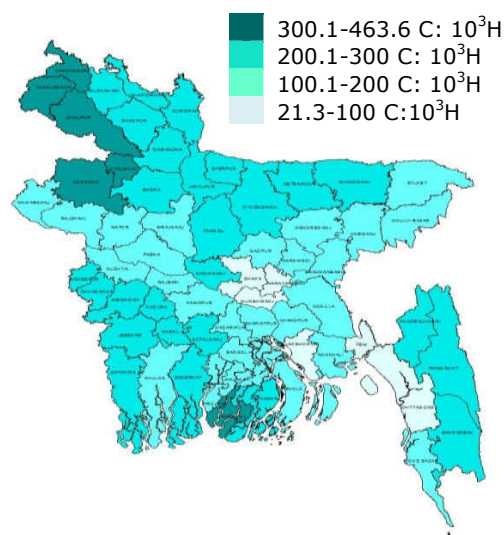
**Socio-geographic distribution of cattle**

**Country profile**

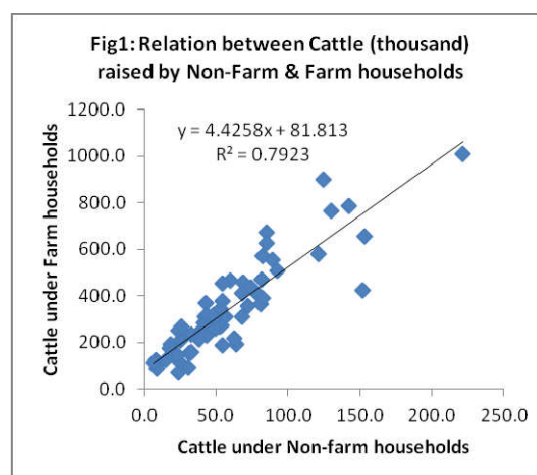
The distribution of human and cattle population per square kilometre ( $Km^2$ ), availability of cattle in proportion to 1000 people ( $C:10^3H$ ) or in 1000 households ( $C:10^3HH$ ), ratio of cattle number between Farm to Non-Farm holdings, and per cent (%) distribution of total cattle among the different farm categories are presented in Table 1. The range of human population per square kilometer of Bangladesh in 2012 was 86.7 to 8229.0 with an average number of  $1124.0 \pm 1057$ , and the same for cattle was 19.7 to 361.7, and  $188.5 \pm 78.7$ , respectively. However, FAO (2005) mapped the distribution of cattle and Buffalo at a range of  $<50.0$  to  $>500$  cattle/ $Km^2$ , and a variation in population data with the government

of Bangladesh resulted in the difference. The database of a country is important but the ongoing globalization process requires minimization of differences in databases irrespective of their sources for strategic development of regional and global animal agriculture.

**Map 1. Cattle production zones on Bangladesh**



The average number of cattle per 1000 people ( $C:10^3H$ ) varied from 21 to 464 in showing an average number of  $204 \pm 85.6$  in the country. The same for 1000 households ( $C:10^3HH$ ) were 134 to 3472 and  $1106 \pm 772$ , respectively. The per cent households (HH) keep cattle varied from 4.40 to 68.0 with an average of  $38.6 \pm 11.8$  (Table 1).



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Fig 1 shows a strong linear relation between the number of cattle kept by Non-farm and Farm holders of different districts, and a linear equation:  $Y (x10^3) = 4.4258x + 81.813$ ;  $r = 0.89$  shows that Farm holders (y) of a district always keep 81.813 thousand more cattle than Non-farm holders (x), and the number of the former (y) was always 4.43 times higher than the latter (x). The average ratio of cattle kept by the two was 6.7:1 (Table 1). About 85.6% of the total cattle is kept by the Farm holders and the rest 14.4% is kept by the Non-farm holders, many of them were landless. Among the farm holders 59.5% of the total cattle were kept by the small farmers, and the medium and large farmers kept 22.3% and 3.80% of the total cattle, respectively. It shows that almost 73.9% of the total cattle are kept by small and landless farmers of the country, and cattle development would definitely help livelihood improvement of the rural poor in addition to dairy and meat production.

### Geographical profile

The landscape is one of the factors that affect the distribution of human or cattle per unit geographical area. Cattle raising shares land and cattle number per Km<sup>2</sup> (19.7 to 361.7/Km<sup>2</sup>) may be one of the indicators of its distribution in the

country that describes the intensity of cattle rearing in Bangladesh. But, the area not habitable by farm animals or human like that of water bodies, rivers, it may limit unbiased dispersion of cattle number over a certain area. Based on the number of cattle in proportion to human population (total cattle heads per 1000 people, C: 10<sup>3</sup>H) four cattle production zones such as i) Zone A having  $\geq 300.1$  cattle/1000 people (C: 10<sup>3</sup>H), ii) Zone B having 200.1-300 C: 10<sup>3</sup>H, iii) Zone C having 100.1-200.0 C:10<sup>3</sup>H, and iv) Zone D having  $\leq 100.0$  C:10<sup>3</sup>H were developed (Table 1), and they are shown in different colours of a country map (Map 1). The districts grouped according to production zones and their major socioeconomic attributes are shown in Table 2. The average range and the average of human population per Km<sup>2</sup> in cattle production zone A, B, C and D were 488 to 903 and 750, 86.7 to 1200 and 823, 522 to 1935 and 1075 and 1200 to 8229 and 3012, respectively; and the same for cattle were 152 to 362 and 287, 19.7 to 337 and 203, 82 to 250 and 164 and 109 to 175 and 134, respectively. The same for cattle number per 1000 households (C:10<sup>3</sup>HH) were 515 to 2014 and 1119 in Zone A, 188 to 3472 and 1188 in Zone B, 134 to 2682 and 1090 in Zone C and 257 to 1393 and 803 in Zone D.

**Table 1.** Human and cattle population distribution, their proportional availability and farm holding characteristics

Items	Statistics	Cattle production zones based on their availability in proportion to human				Bangladesh
		Zone A	Zone B	Zone C	Zone D	
Human Population/ Km <sup>2</sup>	Range	488-903	86.7-1200	522-1935	1200-8229	86.7-8229.0
	Av $\pm$ sd	750 $\pm$ 148	823 $\pm$ 335	1075 $\pm$ 365	3012 $\pm$ 2813	1124 $\pm$ 1057
Cattle Population/ Km <sup>2</sup>	Range	152-362	19.7-337	82-250	109-175	19.7-361.7
	Av $\pm$ sd	287 $\pm$ 78.6	203 $\pm$ 91.7	164 $\pm$ 44	134 $\pm$ 23.6	188.5 $\pm$ 78.7
C: 10 <sup>3</sup> H	Range	313-464	201-298	106-196	21.3-99.5	21-464
	Av $\pm$ sd	378 $\pm$ 52.6	243 $\pm$ 34.3	157 $\pm$ 30.2	68.3 $\pm$ 33.7	204 $\pm$ 85.6
C: 10 <sup>3</sup> HH	Range	515-2014	188-3472	134-2682	257-1393	134-3472
	Av $\pm$ sd	1119 $\pm$ 654	1188 $\pm$ 847	1090 $\pm$ 783	803 $\pm$ 520	1106 $\pm$ 772
Per cent HH keep cattle	Range	42.3-68.0	30.1-59.2	24.4-44.9	4.4-29.2	4.4-68.0
	Av $\pm$ sd	57.7 $\pm$ 8.70	43.7 $\pm$ 6.6	34.2 $\pm$ 5.4	17.1 $\pm$ 9.5	38.6 $\pm$ 11.8
Farm to Non-Farm Holdings	Cattle ratio	6.7:1	7.78:1	6.16:1	3.89:1	6.7:1
Farm Holdings		86.4	87.7	85.1	77.9	85.6
Small	% of total cattle	53.5	58.0	61.8	62.7	59.5
Medium		27.0	25.3	20.1	13.7	22.3
Large		6.00	4.50	3.10	1.60	3.80
Non-Farm Holdings		13.6	12.3	14.9	22.1	14.4

Following a similar trend to that of C:10<sup>3</sup>H, the average range or the average percent household keeps cattle was 42.3 to 68.0 and 57.7%, 30.1 to 59.2 and 43.7%, 24.4 to 44.9 and 34.2% and 4.4 to 29.2 and 17.1%, respectively in different production zones. The cattle ratio of Farm to Non-Farm holdings in the production zones was 6.7:1, 7.78:1, 6.16:1 and 3.89:1, respectively. The percent of total cattle kept by Non-Farm holdings varied from 12.3% to 22.1%, and by Farm holdings is 77.9% to 87.7%, respectively. The small farmers keep 53.5% to 62.7% of the total cattle, medium farmers keep 13.7% to 27.0% and large farmers keep 1.60% to 6.0% in different production zones (Table 1).

All these data required to be supported by the production and availability of animal sourced food (ASF), their wet marketing and extent of value additions. Moreover, the database development of feeds and fodder availability and health problems are also important for strategic planning for doubling their production and productivity speculated in the sustainable development goals of 2030.

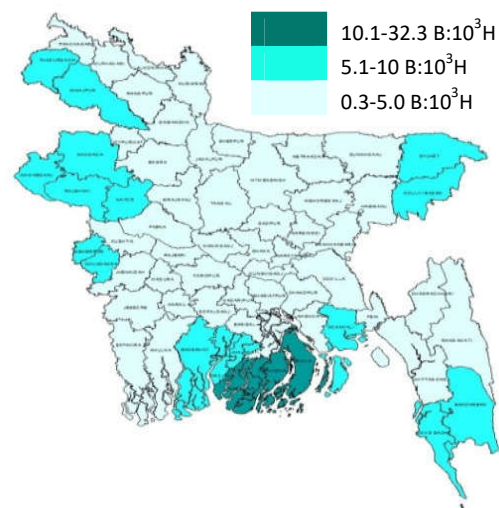
#### **Socio-geographic distribution of Buffalo**

##### **Country profile**

Buffaloes, compared to cattle, are thinly distributed throughout the country. Their availability per 1000 people (B:10<sup>3</sup>H) varied from 0.28 to 32.3 with an average of 4.64 heads, while the country had the same distribution of human population (86.7 to 8229/Km<sup>2</sup> and 1124 (1057/Km<sup>2</sup>, Table 3). The distribution of Buffalo population ranged from 0.39 to 15.4/Km<sup>2</sup> with an average of 3.77/Km<sup>2</sup>, and 2.12 to 194.8/10<sup>3</sup>HH with an average of 26.2/10<sup>3</sup>HH. The percent household keeps buffalo ranged from 0.05 to 3.23 with an average of 0.69 in different districts. Having 6.1:1 proportional distribution of the total Buffalo between the Farm and Non-farm holdings, 81.0% of the total Buffalo were raised by the former and the rest 19.0% is kept by the latter. Compared to that of the cattle (3.80%, Table 1) the share in the total buffalo by large farmers (10.3%) is higher. Small and medium farmers share 48.1% and 22.7%, respectively (Table 3). The share of the medium farmer was similar to

that of the cattle (22.3%). The sharing of Buffalo by Farm and Non-Farm households of different districts does not follow a significant linear relation ( $y = 0.0671x + 0.8692$ ;  $r = 0.41$ ,  $p > 0.05$ , Fig 2) like that was found for other farm animals. It indicates that the Farm or Non-Farm households of different districts may keep a higher or lower number of Buffaloes depending on their socioeconomic or regional advantages or limitations.

**Map 2.** Geographic distribution of buffalo



In other words, availability of larger buffalo herds in the river and southern deltas irrespective of farm holdings may be one of the factors of weak relations of Buffalo with farm categories, like that of other farm animals and poultry. Buffalo production based on its concentrated area, like the south coastal and river delta areas, thus, demands different strategic planning and investment of both public and private sectors. Planning of backward and forward linkages in addition to health and hygiene are important for doubling production by 2030.

##### **Geographic profile**

Based on Buffalo number in proportion to human concentration, all the districts were grouped into i) Zone A, Buffalo producing area having  $\geq 10.1$  heads per 1000 people (B:10<sup>3</sup>H), ii) Zone B, the area having 5.1 to 10.0 B:10<sup>3</sup>H, and iii) Zone C.

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**Table 2.** Cattle distribution in respect to area and the number of population and population in different production zones

Production Zone	Socio-geographic attributes		Districts
Zone A	Cattle/Km <sup>2</sup>	152-362	Barguna, Dinajpur, Joypurhat, Naogaon, Panchagarh and Thakurgaon
	C:10 <sup>3</sup> H	300.1-463.6	
	C:10 <sup>3</sup> HH	515-2014	
Zone B	Cattle/Km <sup>2</sup>	19.7-337	Bagherhat, Bandarban, Bogra, Chuadanga, Gaibandha Gopalganj, Jamalpur, Jessore, Jhenaidha, Khagrachari, Kurigram, Lalmonirhat, Manikganj, Magura, Meherpur, Mymensingh, Narail, Netrakona, Nilphamari, Patuakhali, Rangamati, Rangpur, Satkhira, Sherpur, Sunamganj and Tangail
	C:10 <sup>3</sup> H	200.1-300	
	C:10 <sup>3</sup> HH	188-3472	
Zone C	Cattle/Km <sup>2</sup>	82-250	Barisal, Bhola, Brahmanbaria, Chandpur, Comilla, Cox's Bazar, Faridpur, Gazipur, Hobiganj, Jhalokathi, Khulna, Kishoreganj, Kustia, Madaripur, Moulvibazar, Narsingdi, Natore, Nawabganj, Noakhali, Pabna, Pirojpur, Rajbari, Rajshahi, Shariatpur, Sirajganj and Sylhet
	C:10 <sup>3</sup> H	100.1-200.0	
	C:10 <sup>3</sup> HH	134-2682	
Zone D	Cattle/Km <sup>2</sup>	109-175	Dhaka, Chittagong, Feni, Lakshmipur, Munshiganj and Narayanganj
	C:10 <sup>3</sup> H	21.3-100	
	C:10 <sup>3</sup> HH	257-1393	

**Table 3.** Distribution of human and Buffalo population, their proportional availability and holding characteristics

Items	Statistics	Buffalo production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human population/Km <sup>2</sup>	Range	476-522	86.7-1070	97.4-8229	86.7-8229
	Av ± sd	495±24	807±250	1278±1221	1124±1057
Buffalo population/Km <sup>2</sup>	Range	7.15-15.4	0.49-8.86	0.39-5.93	0.39-15.4
	Av ± sd	10.7±4.25	5.86±1.98	2.56±1.17	3.77±2.63
Buffalo per 1000 People	Range	13.7-32.3	5.11-9.52	0.28-4.94	0.28-32.3
	Av ± sd	21.9±9.52	7.31±1.55	2.53±1.16	4.64±4.86
Buffalo/1000 household (HH)	Range	34.5-195	4.35-130	2.12-67.6	2.12-194.8
	Av ± sd	127.8±83.3	37.9±37.5	15.3±13.3	26.2±35.9
Per cent HH keep Buffalo	Range	1.26-3.23	0.73-3.19	0.05-0.85	0.05-3.23
	Av ± sd	2.18±0.99	1.27±0.63	0.38±0.18	0.69±0.64
Farm to Non-Farm Holdings	Buffalo ratio	18.6:1	8.54:1	4.4:1	6.1:1
Farm Holdings		94.4	86.6	78.1	81.0
Small	% of total Buffalo	27.9	39.7	52.5	48.1
Medium		36.7	32.1	18.4	22.7
Large		29.8	14.8	7.36	10.3
Non-Farm Holdings		5.61	13.4	21.9	19.0

**Table 4.** Buffalo distribution in respect to area and the number of population and population in different production zones

Production Zone	Buffalo per 1000 people		Districts
Zone A	Buffalo/Km <sup>2</sup>	3.14-9.63	Barguna, Bhola and Patuakhali
	B:10 <sup>3</sup> H	13.7-32.3	
	B:10 <sup>3</sup> HH	7.47-154	
Zone B	Buffalo/Km <sup>2</sup>	0.49-8.86	Bandarban, Bagherhat, Chuadanga, Cox's Bazaar, Dinajpur, Jhalokathi, Meherpur, Moulvibazar, Pirojpur, Natore, Nawabganj, Naogaon, Noakhali, Rajshahi, Sylhet and Thakurgaon
	B:10 <sup>3</sup> H	5.11-9.52	
	B:10 <sup>3</sup> HH	4.35-130	
Zone C	Buffalo/Km <sup>2</sup>	0.39-5.93	Barisal, Brahmanbaria, Bogra, Chandpur, Comilla, Faridpur, Gaibandha, Gazipur, Gopalganj, Hobiganj, Jamalpur, Jessore, Jhenaidha, Joypurhat, Khagrachari, Khulna, Kishoreganj, Kustia, Kurigram, Lalmonirhat, Madaripur, Manikganj, Mymensingh, Narail, Netrakona, Nilphamari, Narsingdi, Pabna, Panchagarh, Rajbari, Rangpur, Rangamati, Satkhira, Sherpur, Shariatpur, Sirajganj, Sunamganj and Tangail

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**Table 5.** Distribution of human and goat population, their proportional availability and farm holding characteristics

Items	Statistics	Goat production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human Population/Km <sup>2</sup>	Range	520-1210	86.7-1289	658-8229	86.7-8229
	Av ± sd	910±157	803±384	1577±1600	1124±1057
Goat/Km <sup>2</sup>	Range	119-359	12.4-175	20.6-131	12.4-359
	Av ± sd	235.6±58.8	96.6±49	64.6±29.5	126.5±85.1
Goat per 1000 People (G:10 <sup>3</sup> H)	Range	203-412	103-180	8.9-99.3	8.9-412
	Av ± sd	261±61.3	130±21.5	52±21	138.6±92.1
Goat per 1000 Household (G:10 <sup>3</sup> HH)	Range	240-3439	111-1595	66.7-1134	67-3439
	Av ± sd	1129±881	630±408	434±329	698±617
Per cent HH keep Goat	Range	31.8-58.1	15.7-32.9	1.7-20.3	1.7-58.1
	Av ± sd	43±7.2	22.6±4.1	11.8±4.5	24.3±13.7
Farm to Non-Farm Holdings	Goat ratio	3.7:1	4.3:1	2.9:1	3.6:1
Farm Holdings		77.4±5.2	77.9±6.8	72.2±7.7	75.6±7.15
Small	% of total Goat	58.4±5.8	56.3±8.3	59.9±7.1	58.2±7.28
Medium		16.8±4.1	18.3±9.6	11.0±3.9	15.1±7.20
Large		2.3±1.3	3.3±3.4	1.4±1.0	2.29±0.21
Non-Farm Holdings		22.6±5.2	22.1±6.8	27.8±7.7	24.4±7.15

**Table 6.** Goat distribution in respect to area and the number of population and population in different production zones

Production Zone	Goat per 1000 people	Districts
Zone A	Goat/Km <sup>2</sup>	Chuadanga, Dinajpur, Jesspre, Jhenaidha, Joypurhat, Kustia, Lalmonirhat, Magura, Meherpur, Naogaon, Natore, Noabganj, Pabna, Panchagar, Rajbari, Rajshahi, Satkhira and Thakurgaon
	G:10 <sup>3</sup> H	
	G:10 <sup>3</sup> HH	
Zone B	Goat/Km <sup>2</sup>	Bagerhat, Bandarban, Barguna, Bhola, Bogra, Faridpur, Gaibandha, Jamalpur, Khagrachari, Khulna, Kurigram, Manikganj, Mymensingh, Narail, Nilphamari, Patuakhali, Rangamati, Rangpur, Shariatpur, Sherpur, Sirajganj and Tangail
	G:10 <sup>3</sup> H	
	G:10 <sup>3</sup> HH	
Zone C	Goat/Km <sup>2</sup>	Barisal, Brahmanbaria, Chandpur, Chittagong, Comilla, Cox` s Bazar, Dhaka, Feni, Gazipur, Gopalganj, Habiganj, Jhalakathi, Kishoreganj, Lakshmipur, Madaripur, Moulvibazar, Munshiganj, Narayanganj, Narsingdi, Netrokona, Noakhali, Pirojpur, Sunamganj and Sylhet
	G:10 <sup>3</sup> H	
	G:10 <sup>3</sup> HH	

**Table 7.** Distribution of human and sheep population, their proportional availability and farm holding characteristics

Items	Statistics	Sheep production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human Population/Km <sup>2</sup>	Range	757-1290	477-1200	86.7-8229	86.7-8229
	Av ± sd	1005±192	864±256	1211±1245	1124±1057
Sheep/Km <sup>2</sup>	Range	29.7-43.0	5.2-18.3	0.3-15.5	0.3-43.0
	Av ± sd	31.2±8.3	12±4.47	4.5±2.98	8.8±9.3
Sheep per 1000 People (S:10 <sup>3</sup> H)	Range	21.3-46.6	10.3-18.6	1.4-9.5	1.4-46.6
	Av ± sd	31.8±10.4	13.9±2.98	4.3±1.96	9.1±9.6
Sheep per 1000 Household (S:10 <sup>3</sup> HH)	Range	166-246	28.1-181	2.3-79.8	2.3-246.6
	Av ± sd	161±75.6	78.6±41.4	25.8±20.9	50.5±55.5
Per cent HH keep Sheep	Range	2.4-8.8	0.7-3.1	0.2-1.2	0.2-8.8
	Av ± sd	4.6±2.2	2±0.72	0.5±0.28	1.2±1.5
Farm to Non-Farm Holdings	Sheep ratio	3.0:1	3.40:1	3.50:1	3.4:1
Farm Holdings		74.7	75.8	75.9	75.8
Small	% of total Sheep	57.7	52.4	56.3	55.7
Medium		14.8	18.5	16.5	16.7
Large		2.30	5.0	3.20	3.40
Non-Farm Holdings		24.4	24.2	24.1	24.2

**Table 8.** Sheep distribution in respect to area and the number of population and population in different production zones

Production Zone	Sheep per 1000 people	Districts
Zone A	Sheep/KM <sup>2</sup>	29.7-43.0
	S:10 <sup>3</sup> H	21.3-46.6
	S:10 <sup>3</sup> HH	166-246
Zone B	Sheep/KM <sup>2</sup>	5.2-18.3
	S:10 <sup>3</sup> H	10.3-18.6
	S:10 <sup>3</sup> HH	28.1-181
Zone C	Sheep/KM <sup>2</sup>	0.3-15.5
	S:10 <sup>3</sup> H	1.4-9.5
	S:10 <sup>3</sup> HH	2.3-79.8

**Table 9.** Distribution of human and chicken population, their proportional availability and farm holding characteristics

Items	Statistics	Chicken production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human population/Km <sup>2</sup>	Range	86.7-1125	373-1935	528-8229	86.7-8229
	Av ± sd	355±555	1025±281	2435±2624	1124±1057
Chicken/Km <sup>2</sup>	Range	105-1212	344-1108	252-868	105-1212
	Av ± sd	708±393	763±184	503±194	722±241
Chicken per 1000 People (Ch:10 <sup>3</sup> H)	Range	1118-1875	502-989	72.8-487	72.8-1875
	Av ± sd	1368±226	760±142	332±143	802±323
Chicken per 1000 Household (Ch:10 <sup>3</sup> HH)	Range	929-16664	776-14376	966-6825	776-16664
	Av ± sd	6155±5672	4373±3398	3352±1994	4499±3722
Per cent HH keep Chicken	Range	57-70.1	37.2-75.4	6.09-49.3	6.1-75.4
	Av ± sd	64.9±4.4	56.7±7.02	33±14.3	55±11.8
Farm to Non-Farm Holdings	Chicken ratio	5.34:1	3.38:1	1.93:1	3.5:1
Farm Holdings		82.2	76.0	64.4	75.5
	Small	49.1	59.9	50.1	57.7
	Medium	24.1	14.3	11.6	15.5
	Large	5.31	1.74	1.85	2.3
Non-Farm Holdings		17.8	24.0	35.6	24.5

**Table 10.** Chicken distribution in respect to area and the number of population and population in different production zones

Production Zone	Social Characteristics	Districts
Zone A	Chicken/KM <sup>2</sup>	105-1212
	Ch:10 <sup>3</sup> H	1118-1875
	Ch:10 <sup>3</sup> HH	929-16664
Zone B	Chicken/KM <sup>2</sup>	344-1108
	Ch:10 <sup>3</sup> H	502-989
	Ch:10 <sup>3</sup> HH	776-14376
Zone C	Chicken/KM <sup>2</sup>	252-868
	Ch:10 <sup>3</sup> H	72.8-487
	Ch:10 <sup>3</sup> HH	966-6825



## Distribution of livestock in Bangladesh-A review

**Table 11.** Distribution of human and Ducks, their proportional availability and holding characteristics in Bangladesh

Items	Statistics	Duck production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human population/Km <sup>2</sup>	Range	477-966	373-1712	86.7-8229	86.7-8229
	Av ± sd	744±194	1006±312	1347±1519	1124±1057
Duck/Km <sup>2</sup>	Range	323-606	149-746	6-357	6-746
	Av ± sd	471±82.2	354±135	169±82.8	287±156
Duck per 1000 People (D:10 <sup>3</sup> H)	Range	503-829	257-479	24.1-244.6	24-829
	Av ± sd	655±115	353±69.7	155±56.1	306±183
Duck per 1000 household (D:10 <sup>3</sup> HH)	Range	704-9242	274-8963	53.4-1810	53-9242
	Av ± sd	3372±3227	2601±2338	836±542	1910±2157
Per cent HH keep Duck	Range	32.3-66.5	23.1-59.8	2.37-31.6	2.4-66.5
	Av ± sd	45.5±10.2	36.4±10.7	17±6.43	28.9±14.3
Farm to Non-Farm Holdings	Duck ratio	4.78:1	4.06:1	3.40:1	3.86:1
Farm Holdings		82.1	79.0	74.8	77.5
Small	% of total	59.7	61.5	53.6	57.7
Medium	Duck	19.0	15.5	17.9	17.0
Large		3.40	1.90	3.37	2.80
Non-Farm Holdings		17.9	21.0	25.2	22.5

**Table 12.** Duck distribution in respect to area and the number of population and population in different production zones

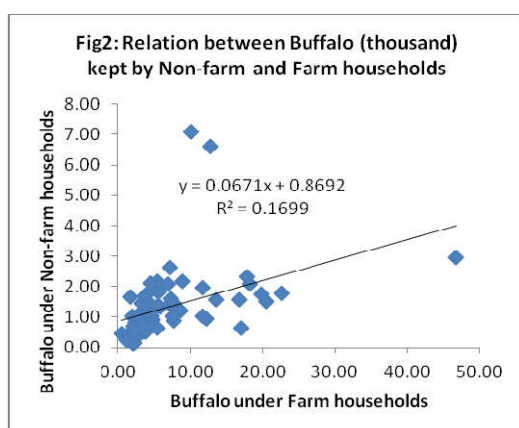
Production Zone	Social Characteristics		Districts
Zone A	Ducks/KM <sup>2</sup>	323-606	Barguna, Bhola, Dinajpur, Jhalokati, Joypurhat, Naogaon, Noakhali, Patuakhali and Pirojpur
	D:10 <sup>3</sup> H	503-829	
	D:10 <sup>3</sup> HH	704-9242	
Zone B	Ducks/KM <sup>2</sup>	149-746	Bagherhat, Barisal, Bogra, Brahmanbaria, Chandpur, Chuadanga, Comilla, Feni, Gaibandha, Gopalganj, Jessore, Jhenaidah, Khulna, Kurigram, Lakshmipur, Magura, Meherpur, Mymensingh, Narail, Natore, Netrakona, Rajshahi, Rangpur, Satkhira, Shariatpur and Sherpur
	D:10 <sup>3</sup> H	257-479	
	D:10 <sup>3</sup> HH	274-8963	
Zone C	Ducks/KM <sup>2</sup>	6-357	Bandarban, Chittagong, Cox's Bazar, Dhaka, Faridpur, Gazipur, Hobiganj, Jamalpur, Khagrachari, Kishoreganj, Kustia, Lalmonirhat, Madaripur, Manikganj, Moulvibazar, Munshiganj, Narayanganj, Narsingdi, Nawabganj, Nilphamari, Pabna, Panchagarh, Rajbari, Rangamati, Sirajganj, Sunamganj, Sylhet, Tangail and Thakurgaon
	D:10 <sup>3</sup> H	24.1-245	
	D:10 <sup>3</sup> HH	53.4-1810	

**Table 13.** Distribution of human and Pigeons, their proportional availability and farm holding characteristics

Items	Statistics	Pigeon production zones based on their availability in proportion to human			Bangladesh
		Zone A	Zone B	Zone C	
Human population/Km <sup>2</sup>	Range	477-1210	373-1290	86.7-8229	86.7-8229
	Av ± sd	868±212	881±240	1343±1408	1124±1057
Pigeon/Km <sup>2</sup>	Range	59-190	30-99	1.5-101	1.5-190
	Av ± sd	126±34	61.5±20.5	36±23.3	61±42.6
Pigeon per 1000 People (Pg:10 <sup>3</sup> H)	Range	109-198	51-98	8.9-49.6	8.9-198
	Av ± sd	147±31.3	71±17	29.6±12.1	64.4±49
Pigeon per 1000 household (Pg:10 <sup>3</sup> HH)	Range	151-1802	70-1179	18.2-588	18.2-1802
	Av ± sd	613±513	380±299	215±167	340±335
Per cent HH keep Pigeon	Range	4.1-8.8	2-5.8	0.5-4.6	0.5-8.8
	Av ± sd	6.3±1.6	3.8±1.4	2.2±0.8	3.5±1.96
Farm to Non-Farm Holdings	Pigeon ratio	7.1:1	6.9:1	4.5:1	5.7:1
Farm Holdings		86.8	86.5	78.3	82.2
Small	% of total	53.4	54.5	51.2	52.5
Medium	Pigeon	27.4	26.7	21.4	24.0
Large		6.0	5.20	5.60	5.60
Non-Farm Holdings		13.2	13.5	21.7	17.8

## Distribution of livestock in Bangladesh-A review

The production area having  $\leq 5.0$  B:  $10^3$ H; and the districts, along with the range of Buffalo/Km<sup>2</sup> or their availability in every  $10^3$ HH, is listed in Table 4. The Buffalo distribution map was developed based on the availability of the animal in proportion to the human population (B: $10^3$ H) in different districts, and it is shown in Map 2. The average range and the average of B: $10^3$ H was 13.7 to 32.3 and 21.9 in production Zone A, 5.11 to 9.52 and 7.31 in production Zone B, and 0.28 to 4.94 and 2.53 in production Zone C. The same statistics for the distribution of human population per square kilometer area in the three production zones were 487 to 703 and 571, 86.7 to 1070 and 807 and 97.4 to 8229 and 1278, respectively.



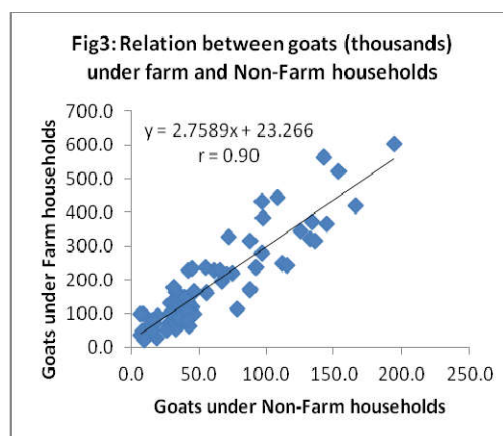
The Buffalo population was 3.14 to 9.63/Km<sup>2</sup> and 6.64/Km<sup>2</sup>, 0.49 to 8.86/Km<sup>2</sup> and 5.86/Km<sup>2</sup> and 0.39 to 5.93/Km<sup>2</sup> and 2.56/Km<sup>2</sup>, respectively. The average number of Buffalo per 1000 households varied from 7.47 to 154, 4.35 to 130 and 2.12 to 67.6, and its average was 65.5, 37.9 and 15.3, respectively in the three production zones. A similar trend in percent household keeps Buffalo (2.18%, 1.23% and 0.38%, respectively) or number of Buffalo shared by Farm to Non-Farm in three productive zones (18.6:1, 8.33:1 and 4.4:1, respectively) were also found. The Farm holders keep 94.4%, 85.6% and 78.1%, respectively, of the total Buffalo population in three productive zones (A, B and C), and the rest 5.61%, 14.3% and 21.9%, respectively is kept by the Non-Farm holders. The small, medium and large farmers keep 27.9%, 36.7% and 29.8%, respectively, of the total Buffalo in production Zone A, and the same in production Zone B and

production Zone C are 40.1%, 31.1% and 14.5%, respectively and 52.5%, 18.4% and 7.36%, respectively. It shows that medium and large farmers of Borguna, Patuakhali and Bhola districts keep more number of Buffalo, and their concentration per Km<sup>2</sup> or per 1000 households are also reported to be the highest among the district. Some of the districts in the north-west, the west, the northeast, the east and in the south delta have higher concentrations of Buffalo than the rest of the district of the country.

### Socio-geographic distribution of goats

#### Country profile

The country has 12.4 to 359 goats/Km<sup>2</sup> with an average of 126.5/Km<sup>2</sup> on a similar plane of the distribution of human population. The number of goats per 1000 people (G:H $10^3$ ) in different districts varied from 8.9 to 412, with an average number was 138.6 G:H $10^3$ , and the range of number per 1000 households (G:HH $10^3$ ) varied from 67 to 3439 with an average of 698 goats. The percent household keeps goats varied from 1.70% to 58.1% with on an average of 24.3% goats keeping household. Compared to large ruminant animals (Cattle and Buffalo), a higher percent of goat (24.4% of the total) is kept by the Non-Farm households (Table 5).



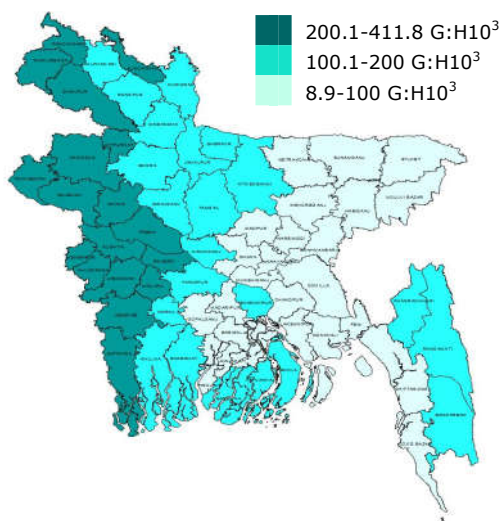
The rest 75.6% is kept by the Farm households, and the share of the total goat by the Non-Farm and Farm holdings is 3.6:1 (Table 5). The small, medium and large farmers kept 58.2%, 15.1% and 2.29% of the total goat, respectively. The number of goats kept by the Non-Farm holders in different districts is significantly ( $p < 0.001$ )

related in a linear trend ( $r=0.90$ ) with that kept by the Farm householders (Fig 3). The equation  $y = 2.7589x + 23.266$ ,  $r = 0.90$ ;  $p < 0.001$ ) shows that Farm households (y) of a district always kept a higher number of goats, and a minimum difference is 23.27 thousand goats (Fig 3).

### Geographic profile

Depending on the range of Goat number available per 1000 people ( $G:10^3H$ ) the total geographical area of the country is divided into three production zones (Zone A having 200.1 to 411.8  $G:10^3H$ , Zone B having 100.1 to 200.0  $G:10^3H$  and Zone C having 8.9 to 100  $G:10^3H$ ), and a goat production map is developed (Map 3).

**Map 3.** Geographic distribution of goats



The list of the districts in three production zones is shown in Table 6. The map shows that the highest concentration of goats exists in the north, west and south-west border districts and it extends centripetally resulting in production Zone B covering the adjacent districts of production Zone A, and both the zones stretch from the north down to the south. Some of the districts of the south delta and of the south east border area are also included in production Zone B. The rest of the districts of the central, northeast, and the east has the lowest concentration of goat and they are included in production Zone C.

Table 5 shows that the human population concentration per square kilometre varied from 520 to 1210, 86.7 to 1289 and 658 to 8229 with an average of 910, 803 and 1577, respectively in the three production zones, while the same for the goat population were 119-359, 12.4-175 and 20.6-131 with 235.6, 96.6 and 64.6, respectively. The number of goats per 1000 households ( $G:10^3HH$ ) in Production Zone A, B, and C varied from 240 to 3439, 111 to 1595 and 66.7 to 1134, and the average number was 1129, 630 and 434, respectively. The downward trend in goat concentration along the production zones is also supported by a similar trend in per household kept goats, and it varied from 31.8 to 58.1%, 15.7 to 32.9% and 1.7 to 20.3% with an average of 43.0%, 22.6% and 11.8%, respectively in production Zone A, B and C. The average ratio of goat kept by the Farm and Non-Farm holdings was 3.7:1, 4.3:1 and 2.9:1, respectively (Table 5). The Farm households kept 72.2% to 77.9% of the total goat and the rest 22.1% to 27.8% goat is kept by the Non-Farm holdings. The small, medium and large farmers kept 56.3% to 59.9%, 11.0% to 18.3% and 1.40% to 3.3% of the total goat of the country (Table 5).

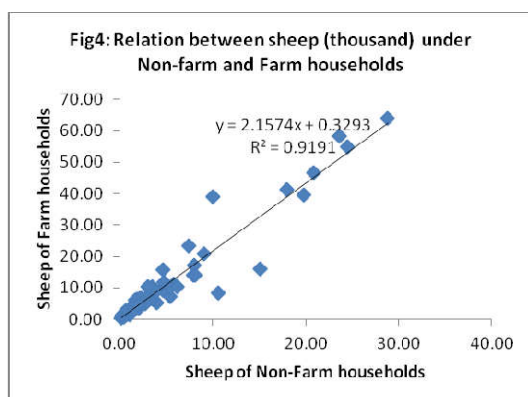
### Socio-geographic distribution of Sheep

#### Country profile

The sheep of Bangladesh are not of any definite breed (s) or type (s), and they are called Bangla sheep. Having a thin distribution of about 0.3 to 43.0 sheep/ $Km^2$  or an average of 8.80 sheep/ $Km^2$  the number of sheep per 1000 people ( $S:10^3H$ ) found to range from 1.4 to 46.6 with an average of 9.10, or per 1000 households ( $S:10^3HH$ ) was 2.3 to 246.6 with an average of 50.5 sheep. Only 0.2 to 8.8% of the total household keep sheep and its average level is only 1.20%. Similar to goat, Non-Farm households keep 24.2% of the total sheep, and a ratio of 3.40:1 was found in the number of sheep kept by the Farm and Non-Farm households. The former kept 75.8% of the total sheep. The small, medium and large farmers kept 55.7%, 16.7% and 3.40% of the total sheep, respectively (Table 7). Similar with goat, a significant ( $p < 0.01$ ) linear relation ( $r=0.96$ ) was found between the number of sheep kept by the Farm and Non-Farm households of the different districts of the country (Fig 4). Farm households (y) always kept 0.329 thousand more sheep in a

## Distribution of livestock in Bangladesh-A review

district than the Non-Farm households, and their number of sheep increases linearly with that of the Non-Farm holders (x). The linear relation is quantified by the equation: y (Sheep of Farm households in thousands) = 2.1574x Sheep of No-Farm households in thousands + 0.3293.

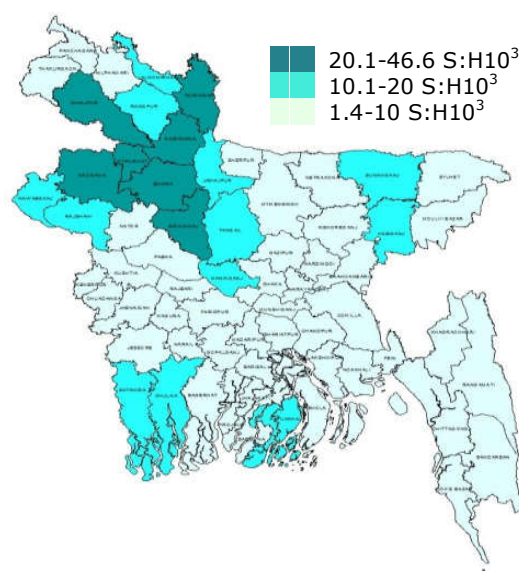


### Geographic distribution

According to the range of sheep concentration compared to the human population ( $S:10^3H$ ) the total area of the country was classified into three production Zones. They are production Zone A having the highest range of 20.1-46.6  $S:10^3H$ , followed by production Zone B with a range of 10.1-20  $S:H10^3$ , and production Zone C having 1.4-10  $S:H10^3$  (Table 7). The distribution of districts according to the three production zones is shown in Table 8. The distribution characteristics of the three sheep production Zones are presented in Table 7. It shows that the production zone A had a range of human population per square kilometre from 757 to 1290 with an average of 1005, and that of sheep population was 29.7 to 43.0 with an average of 31.2. The human and sheep distribution characteristics in production Zone B and C are 477 to 1200 with an average of 864, and 5.2 to 18.3 with an average of 12, respectively; and 86.7 to 8229 with an average of 1211 and 0.3 to 15.5 with an average of 4.50, respectively. The range of sheep per 1000 households ( $S:10^3HH$ ) was 166 to 246, 28.1 to 181 and 2.3 to 79.8 in the three production zones, respectively, and its average was 161, 78.6 and 25.8, respectively. The percent household keeps sheep varied from 2.4 to 8.8%, 0.7 to 3.1% and 0.2 to 1.2%,

respectively, and their average along the production zones were 4.60%, 2.0% and 0.5%, respectively. Similar to Goat, a Farm household keep 3.0 to 3.5 times more sheep than that kept by Non-Farm households of different production zones. The former keeps 74.7 to 75.9% sheep and the latter keeps 24.1 to 24.4% sheep in the three production zones. The small farmer among the Farm holders keep 52.4% to 57.7%, the medium farmer keeps 14.8% to 18.5% and the large farmers keep 2.30% to 5.0% sheep.

**Map 4. Geographic distribution of sheep**

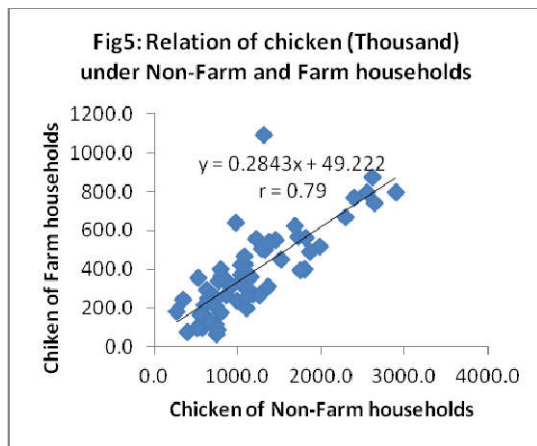


### Socio-geographic distribution of Chicken

#### Country profile

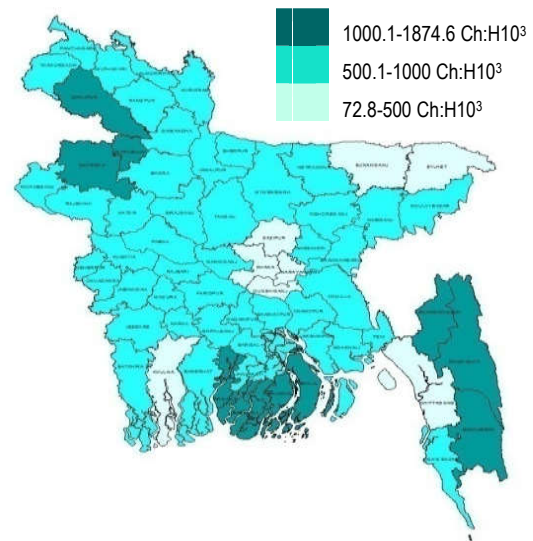
The country has 105 to 1212 chickens/ $Km^2$  with an average number of 722. On the same population distribution (86.7 to 8229/ $Km^2$ ), on an average 802 chicken were available for each 1000 people ( $Ch:H10^3$ ) with a range of 72.8 to 1875. The range of chicken per 1000 households ( $Ch:10^3HH$ ) varied from 776 to 16664 with an average number 4499 (Table 9). Almost 55.0% of the total household keep chicken and the ratio of chicken distribution between the Farm and Non-Farm households is 3.5:1. The Farm households keep 75.5% of the total chicken and the rest (24.5%) is kept by the Non-Farm households. The small, medium and large households keep 57.7%, 15.5% and 2.30% of the total chicken, respectively. A significant

( $p < 0.01$ ) linear relation ( $r = 0.79$ ) was found between the number of chickens kept by the Farm and Non-Farm households of the different districts of the country (Fig 5). Farm households (y) always kept 49222 more chicken than the Non-Farm households and their number of chicken increases linearly ( $y = 0.2843x + 49.222$ ) with that of the Non-Farm holders (x).



11.6% to 24.1% and 1.74 to 5.31% of the total chicken, respectively (Table 9).

**Map 5.** Geographic distribution of chicken



**Geographic profile**

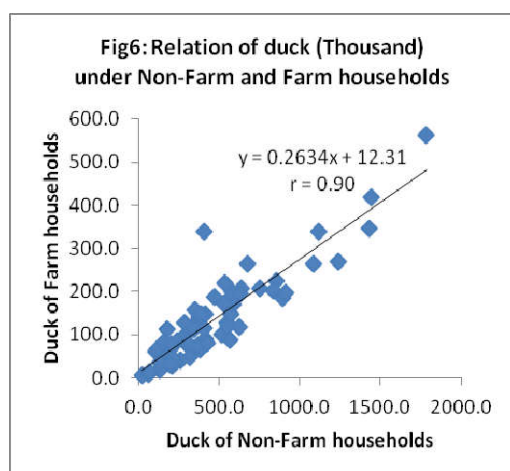
Three production zones were identified (Production Zone A, Zone B and Zone C (Table 9 and Table 10) according to the distribution of chicken per 1000 peoples (Ch:10<sup>3</sup>H). It varied from 1118 to 1875, 502 to 989 and 72.8 to 487 with an average of 1368, 760 and 332 in three production zones, respectively. The districts under three production zones along with the characteristics of the zones are listed in Table 10. The chicken or human population/Km<sup>2</sup> in three production zone varied from 105 to 1212, 344 to 1108 and 252 to 868 with an average number of 708, 763 and 503, respectively, and 86.7 to 1125, 373 to 1935 and 528 to 8229 with an average of 355, 1025 and 2435, respectively. The Ch:10<sup>3</sup>HH, on the other hand, varied from 929 to 16664, 776 to 14376 and 966 to 6825 with an average number of 6155, 4373 and 3352 chickens in the three production zone, respectively. The ratio of chicken kept by Farm and Non-Farm household was 5.34:1, 3.38:1 and 1.93:1, respectively. About 64.4% to 82.2% of the total chicken is kept by the former and 17.8 to 35.6% are kept by the latter. The small, medium and large farmers kept 49.1% to 59.9%,

**Socio-geographic distribution of Ducks**

**Country profile**

The number of ducks varied from 6 to 746/Km<sup>2</sup> with an average number of 287/Km<sup>2</sup> on a similar range of human population distribution described for other farm animals and poultry (Table 11). The ratio of ducks per 1000 people varied from 24 to 829 with an average of 306 in the country, while the ratio per 1000 households varied from 53 to 9242 with an average of 1910. About 2.4% to 66.5% of the total household in the country keep ducks and their average percent is 28.9%. The Farm holds keep 3.86 times number of ducks than that of the Non-Farm household. The relation between the number of ducks kept by the two groups of households in different districts is linearly related ( $p < 0.01$ , Fig 6), and the equation  $y = 0.2634x + 12.31$  describes the number of ducks (thousands) kept by Farm households (y) in relation to the number kept by the Non-Farm households (x) of different districts. About 77.5% of the total duck are kept by the Farm households of the country, of them 57.7% is kept by the small, 17.0% of the medium and 2.80% of the large households; and the rest 22.5% is kept by the Non-Farm households (Table 11).

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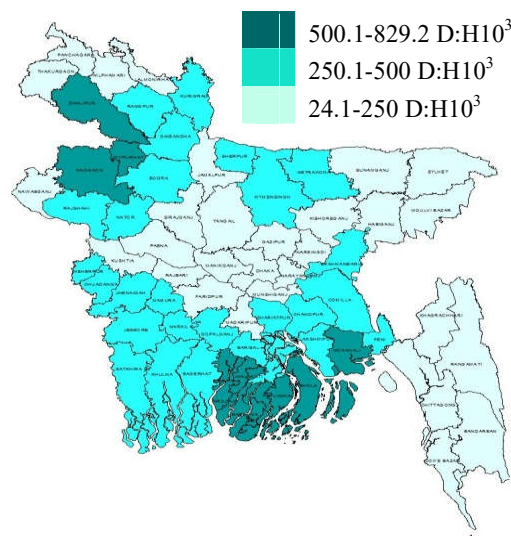


### Geographic profile

According to the availability of ducks compared to 1000 human population ( $D:10^3H$ ) in different regions, the total area was classified into three duck production zones (Zone A of 500.1 to 829.2  $D:10^3H$ , Zone B of 250.1 to 500  $D:10^3H$ , and Zone C of 24.1- 250  $D:10^3H$ ). The average range and the average of  $D:10^3H$  in three productive zones, varied from 503 to 829 with 655, 257 to 479 with 353 and 24.1 to 244.6 with 155, respectively. The same for a human population range with an average number of the production zones, varied from 477 to 966/ $Km^2$  with 744/ $Km^2$ , 373 to 1712/ $Km^2$  with 1006/ $Km^2$ , and 86.7 to 8229/ $Km^2$  with 1347/ $Km^2$ , respectively; and that of ducks varied from 323 to 606 with 471, 149 to 746 with 354, and 6 to 357 with 169/ $Km^2$ , respectively. The number of ducks per 1000 households or per cent households keep duck in different production zones is also presented in Table 11. It ranged from 704 to 9242 with an average number of 3372, 274 to 8963 with 2601, and 53.4 to 1810 with 836, respectively; and 32.3% to 66.5% with an average of 45.5%, 23.1% to 59.8% with 36.4%, and 2.37% to 31.6% with to 17.0%, respectively. The list of districts under three productive zones and their social characteristics is given in Table 12. The ratio of ducks kept by the Farm and Non-Farm households varied from 3.40:1 in production zone C to 4.78:1 in a production zone A. The Farm households keep 74.8% to 82.1% of the total ducks, of which 53.6% to 61.5% is kept by the small, 15.5% to 19.0% is kept by the

medium and 1.90% to 3.40% by the large farmers; and the rest 17.9% to 25.2% is kept by the Non-Farm households.

**Map 6.** Geographic distribution of duck

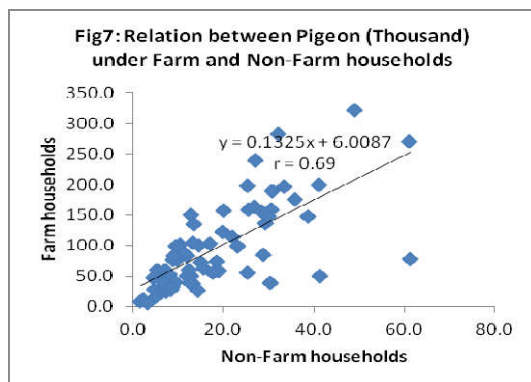


### Socio-geographic distribution of Pigeon

#### Country profile

The pigeon of various genotypes, usually reared as a pet or provided with shelters at house corners, keeping them as flying scavenger, is growingly becoming important at household level in providing food and economic support to different categories of farmers. The growing interest of the people in rearing of different types of pigeon for squab production have made them as a specialized type of poultry, and their number kept by different households is 7.48 lakh in the country (Agricultural Census, 2008). The range and the average number of Pigeon owned by different households is 1.5 to 190/ $Km^2$ , and 61/ $Km^2$ , respectively; while they're available number for 1000 people and in 1000 households ranged from 8.9 to 198 with an average of 64.4 and 18.2 to 1802 and 340, respectively in different districts of the country (Table 13 and Table 14). On average, 3.50% of the total households rear pigeon, and it ranged from 0.5% to 8.80%. Both Farm and Non-Farm households rear pigeon and the ratio of sharing is 5.7:1 (Table 13). Fig 7 shows that the sharing of a pigeon number between the two types households in different districts is linear ( $p < 0.01$ ,  $r = 0.69$ ) related, and the equation  $y = 0.1325x +$

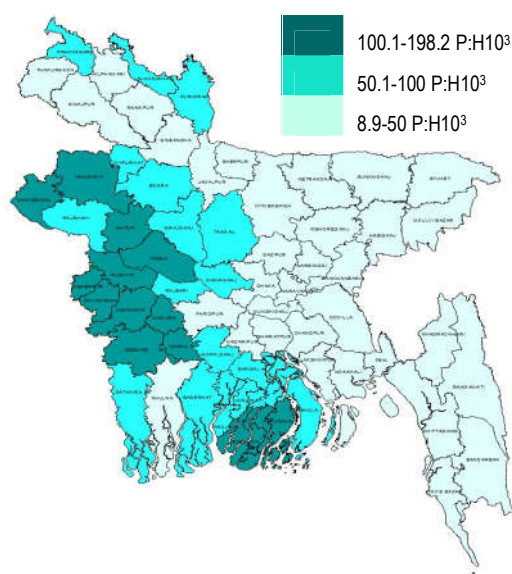
6.0087 shows that Farm households (y) always rear a higher number of pigeons than the Non-Farm households (x). Table 13 shows that 82.2% of the total pigeon reared by the former, and the rest 17.8% is kept by the latter. The small, medium and the large farmer rear 52.5%, 24.0% and 5.60%, respectively, of the total pigeon reared under different household levels.



### Geographical profile

The total districts of the country based on the number of pigeons owned by households and shared by each 1000 peoples of the area ( $Pg:H10^3$ ) were classified into production Zone A having 100.1 to 198.2 pigeons, Zone B having 50.1 to 100 pigeons, and Zone C having 8.9 to 50 pigeons (Map 7). The three production zones having 477 to 1210, 373 to 1290 and 86.7 to 8229 human population/ $Km^2$ , respectively, had 59 to 190, 30 to 99 and 1.5 to 101 pigeons/ $Km^2$ , respectively; and their average number was 126, 61.5 and 36 pigeons/ $Km^2$ , respectively (Table 13). The number of pigeons owned by households for every 1000 households in different production zones, varied from 151 to 1802, 70 to 1179 and 18.2 to 588, respectively, and the average number was 613, 380 and 21, respectively. The percent household rear pigeon also varied according to region, and it ranged from 4.1% to 8.80% in Zone A, 2.0 to 5.8% in Zone B, and 0.5 to 4.6% in Zone C (Table 13). The average per household reared pigeon was 6.30%, 3.80% and 2.20%, respectively (Table 13). The districts under different production zones and their characteristics are shown in Table 14.

**Map 7.** Geographic distribution of pigeon



The ratio of pigeon number shared by Farm and Non-Farm household varied from 4.5:1 to 7.1:1 in different production Zones. The owner of the former varied from 78.3% to 86.8% of the total pigeon and of the latter varied from 13.2% to 21.7% irrespective of the production zones. Of the Farm households, 51.2% to 54.5% of the total pigeon is kept by the small, 21.4% to 27.4% of the medium, and the rest 5.20% to 6.0% is kept by the large households.

### Conclusion

Cattle, Buffalo, Goat, and Sheep are the farm animals, and Chicken, Ducks and Pigeons are the poultry; important to food and agriculture of the country. All kinds of livestock and poultry are owned by different households which were enumerated during the agricultural census of 2008 (BBS, 2010). The total population of cattle, buffalo, goat, sheep, chicken, duck and pigeon were 25.67, 0.54, 16.3, 1.29, 97.8, 39.43 and 7.48 million, respectively in the census year that were reported according to districts and farm categories, and all these data were used to determine socio-geographic distribution of farm animals and poultry of Bangladesh.

## Distribution of livestock in Bangladesh-A review

**Table 14.** Pigeon distribution in respect to area and the number of population and population in different production zones

Production Zone	Social Characteristics		Districts
Zone A	Pigeons/KM <sup>2</sup>	59-190	Barguna, Chuadanga, Jessore, Jhenaidah, Kustia, Magura, Meherpur, Naogaon, Narail, Natore, Nawabganj, Pabna and Patuakhali
	P:10 <sup>3</sup> H	109-198	
	P:10 <sup>3</sup> HH	151-1802	
Zone B	Pigeons/KM <sup>2</sup>	30-99	Bagherhat, Barisal, Bhola, Bogra, Gopalganj, Jhalokati, Joypurhat, Kurigram, Lalmonirhat, Manikganj, Panchagarh, Pirojpur, Rajbari, Rajshahi, Satkhira, Sirajganj and Tangail
	P:10 <sup>3</sup> H	51-98	
	P:10 <sup>3</sup> HH	70-1179	
Zone C	Pigeons/KM <sup>2</sup>	1.5-101	Bandarban, Brahmanbaria, Chandpur, Chittagong, Comilla, Cox's Bazar, Dhaka, Dinajpur, Faridpur, Feni, Gaibandha, Gazipur, Hobiganj, Jamalpur, Khagrachari, Khulna, Kishoreganj, Lakshmipur, Madaripur, Moulvibazar, Munshiganj, Mymensingh, Narayanganj, Narsingdi, Netrakona, Nilphamari, Noakhali, Rangamati, Rangpur, Shariatpur, Sherpur, Sunamganj, Sylhet and Thakurgaon

The average or range of distribution of the above animals and poultry per square kilometre was 188.5 and 19.7 to 361.7, 3.77 and 0.39 to 15.4, 126.5 and 12.4 to 359, 8.8 and 0.3 to 43.0, 722 and 105 to 1212, 287 and 6 to 746 and 61 and 1.5 to 190, respectively compared to that of human population of 1124 and 86.7 to 8229/Km<sup>2</sup>. The farm animals and poultry are reared for the socio-economic benefit of the people, and their geographic distribution compared to human population may show a rational distribution by avoiding non-habitable land to farm animals and poultry in the above estimation. Thus, the average range of different farm animal and poultry available to each 1000 people in the country was estimated to be 21 to 464, 0.28 to 32.3, 8.9 to 412, 1.4 to 46.6, 72.8 to 1875, 24 to 829, and 1.5 to 190, respectively, and the range of each of the animal and poultry along the districts was used for individual distribution map development. Four production zones for cattle (Zone A, Zone B, Zone C and Zone D), and three zones (Zone A, Zone B, and Zone C) for each of the rest of the farm animals and poultry were identified based on their concentration, and each production zone was characterized using the socio-economic attributes (population of human or farm animals and poultry/Km<sup>2</sup> or their availability to 1000 households, % of the household keep them, ratio of animals or poultry shared by Farm and Non-Farm households, % of the total farm animals and poultry keep by the Farm and Non-Farm households etc) of their geographic distribution estimated using the database of Agricultural Census (2008).

The farm animals, having a variation in the geographic distribution, were mostly concentrated in the north and north-west, the west and south-west, in the south-east and in a few districts in the centre of the south delta. The poultry of different types, on the other hand, were mostly concentrated in the north, south-west, east and in the central south-delta. The Farm holdings rear 85.6%, 81.0%, 75.6%, 75.8%, 75.5%, 77.5%, and 82.2%, respectively; of the total population of the farm animals and poultry and the rest 14.4%, 19.0%, 24.4%, 24.2%, 24.5%, 22.5%, and 17.8% of them are kept by the Non-Farm households. The share of the Non-Farm households and the small households in the total farm animals and poultry stands to 73.9%, 67.1%, 82.6%, 79.9%, 82.2%, 80.2%, and 70.3%, respectively; and the rest 26.1%, 32.9%, 17.4%, 20.1%, 17.8%, 19.8%, and 29.7% of the animal and poultry are kept by the medium and large households. The socio-economic and geographic distribution reported here would help in policy development for resource based production system and to address food security and livelihood of the country. However, the database of animal sourced foods (ASF) produced by them in different regions, their consumptions, wet marketing and the extent of value additions, availability of feeds and fodder, and health problems in addition to regional planning for mitigation of climate pollution of animal origin are utmost concerns for doubling of livestock and poultry production and productivity by 2030.



**References**

- Bangladesh Bureau of Statistics (BBS) 2012. Statistical Year Book of Bangladesh, Statistics Division, Ministry of Planning, the Govt. of Bangladesh.
- Bangladesh Bureau of Statistics (BBS) 2010. Census of Agriculture 2008, Structure of agricultural holdings and livestock population, Volume 1, Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, The Govt. of Bangladesh.
- FAO 1999. Poverty alleviation and food security in Asia, Role of livestock. RAP Publication 1999/4, Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, P:4-10.
- FAO (2005). Livestock sector brief Bangladesh Food and Agricultural Organization and Livestock Information, Sector Analysis and Policy Branch-AGAL, Rome, Italy, P1-18.
- FAO (2000). FOREST resources of BANGLADESH, Country report, Forest Resources Assessment Programme, Working Paper 15, Forestry Department, Food and Agriculture Organization of the United Nations, Rome, Italy; p:36.
- Huque KS and NR Sarker (2014). Feeds and feeding of livestock in Bangladesh: performance, constraints and options forward. The paper is accepted for publication in the Animal Science Journal of Bangladesh.
- Jahan N and H Rahman (2003). A Case Study, Livestock Services and the Poor in Bangladesh. An Initiative by Danida, IFAD and The World Bank. Danish Agricultural Advisory Centre, Udkaersvej 15, Skejby, DK-8200 Aarhus N, Denmark, p:9-10.
- Mia MAR (2013). Final Draft, National Livestock Extension Policy, Submitted to Director, PIU-NATP-DLS, P:5.