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Agriculture census based dynamics of changes in livestock farming of Bangladesh-A review

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Abstract

The present work was undertaken to determine the dynamics of changes taken place in farm animal production system of Bangladesh transmuting gradually on a cusp of increasing feed and food competition and gaining competitive advantages in domestic production of milk, meat and eggs. The data available from livestock population of the Agricultural Census of 1960 and of 1977, Agricultural and Livestock Census of 1983-84, the census of agriculture 2008 and the livestock and poultry survey of 2009 were used to figure out quantitative changes and extrapolate inherent causes of them. During the period of 1960 to 2009 human population increased at a faster pace (55.2 million to 144.0 million) than livestock population (10.5 to 17.0 livestock units). The later may be explained by a reduction of per capita availability of bovine animals (0.38 in 1960 to 0.18 in 2009) while the same for small ruminants remained similar (0.12 to 0.12, respectively), and that of poultry increased from 0.65 to 1.07, respectively. However, over the decade dairy farming, cattle fattening and commercial poultry supported increased production of livestock products. The ratio of total cows to adult male cattle of 0.56 in 1960 increased to 0.88 in 1977 reflecting farmers` interest on dairying, and the trend was being continued till 2009. Farm animal population at medium and large farms decreased over the period significantly ($P<0.01$) but, it increased at Non-farm and small farm levels and the difference was significant ($P<0.01$) in different areas of the country. Compared to the livestock unit of 1984 the extent of its increase at Non-farm and small farm level was 228.0% and 82.0%, respectively, and the extent of decrease at medium and large farm level was 24.9% and 49.9%, respectively. Fragmentation of land reduced medium and large farm numbers resulting in an increase of non-farm and small farm households over the time, and keeping farm animals by the latter gradually increased the share of livestock by land poor peoples. The trends being continued over the decades may impact livestock productions further. This requires data generation through regular agricultural census emphasizing socioeconomic and geographical changes in livestock productions more for identification and quantification of factors dictate ongoing transformation process and driving strategic policy implications to achieve sustainable livestock production integrating measures for climate changes.

Key words: Livestock farming, dynamic changes, farm category, households, Bangladesh

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Introduction

Livestock production system of Bangladesh is on the cusp of transformation; the demand for livestock products is being increased due to population growth, urbanization, changes in income & food habits. Conventional production systems, on the other hand, are being taken over by input supported systems, in a time, when concerns for climate change and agrarian competitions are being heightened. Farm animals (cattle, buffalo, goat & sheep) and poultry (fowl and ducks), major animals for food and agriculture of Bangladesh, are kept both by farm households (have 0.05 acre or more cultivable land) and non-farm households (have less than 0.05 acre or no cultivable land). Small and Non-farm households together keep 67.1% to 82.6% (Huque & Khan, 2015) of the total 43.98 million of farm animals and 137.2 million of poultry (Agricultural Census, 2008). An inherent relation may exist between the extent of holding of land and animals under the mixed agriculture of the country but, the recent growth of commercial poultry, cattle fattening or dairy sometimes affects it. Huque, (2014) showed that even a landless farmer keep dairy animals for supporting

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his/her livelihood. Moreover, a continuous change in rural farm holding (66.2% of the total in 1996 vs 58.7% in 2008) and agri-labour household (35.9% of the total in 1996 vs 34.4% in 2008, BBS, 2012) has been affecting livestock production (Huque and Sarker, 2014) when market demand for milk, meat & eggs is on the rise. The per capita intake of milk and meat in 2010-11 was 14.3 Kg and 8.9 Kg annually, respectively (BBS, 2012), and it support only 15.6% and 20.3%, respectively of their annual requirement; and it remains far below than that of the average of the developing countries (55.0 Kg & 32.0kg, respectively, Thornton, 2010). The per capita annual egg consumption of the country is 115 (BBS, 2012) and the number is close to the average consumption of the developing countries (120 no). Nevertheless, economic and nutritional discrepancies may have an impact on food safety and security of common peoples.

The process of transformation impacts all these socioeconomic potentialities. Dynamics of changes in livestock holding among farm categories over the decades is important to determine for gaining competitive advantages in domestic production of milk, meat and eggs, especially, to have appropriate policy interventions and strategic development programmes. The present study was, thus, undertaken with the objective of determination of changes in human and livestock population, per capita availability of farm animals and poultry; and their distribution among different farm categories.

Materials and Methods

Farm animals of Bangladesh are consist of cattle, buffalo, goat and sheep. The former two animals are termed as bovine animals or large ruminants, and the later two are termed as small ruminants. Chicken and ducks, two major birds, are termed as poultry. The data of different agricultural censuses of the farm animals generated by the public sector are considered here to extrapolate any changes in livestock production system over the decades. The data of livestock population of the Agricultural Census of 1960 and of 1977, Agricultural and Livestock Census of 1983-84, the census of agriculture 2008 and the livestock and poultry survey of 2009 were used for the exploration of secondary data presented in the study. Except these census data no further data of agricultural census are published by the public sector until recently. Livestock unit (LU) was calculated converting the population of different farm animals and poultry considering the conversion factors (0.5 for Cattle, 0.5 for Buffalo, 0.1 for Goat & Sheep, 0.01 for Poultry) used by FAO (2005). The data on human population is taken from different population census of Bangladesh Bureau of Statistics (BBS 2012). The farm or non-farm holdings defined or their category according to land size classified and reported by the census of agriculture (2008) published by Bangladesh Bureau of Statistics (BBS) is followed here. According to Census of Agriculture (2008), an agricultural unit having 0.05 acres of cultivable land is qualified to be a farm holding. The farm holdings are categorized into i) small- farm holdings having minimum cultivable land of 0.05 acre but operated land more than that but up to 2.49 acres, ii) medium-farm holdings having operated land in between 2.50 to 7.49 acres and iii) large- farm holdings having operated land of 7.50 acres and above. A non-farm holding, on the other hand, is defined as being an agricultural unit which has neither cultivated or operated land or has cultivated land less than 0.05 acre.

The data were inserted in a computer using the Excel spreadsheet programme for further analysis. The population of farm animals owned by different farms and non-farm categories of seven administrative divisions of the country were expressed into per cent of the total divisional population. The difference of the later between the two census (1984 vs 2008) were compared using a univariate general linear model of SPSS x 17.0 for determining significant differences in the two census. The data are tabulated and any trend in changes is shown in figures.

Results and Discussion

The human and farm animal population of the then East Pakistan in 1960 and in different post independent census years are presented in Table 1. The human population increased from 55.2 million in 1960 to 144.0 million in 2009, and with the advancement of human population the

number of different farm animals and poultry increased during the period (Fig1).

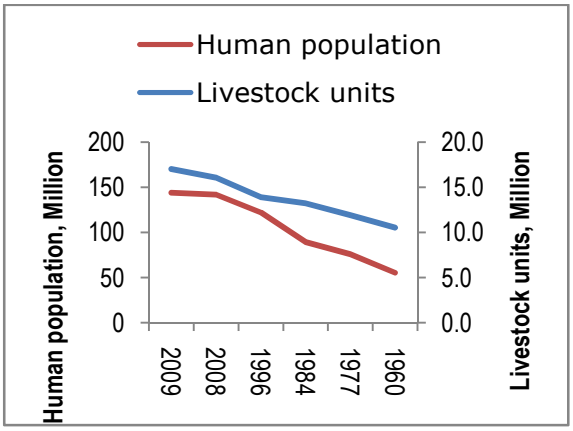

Figure 1. Trend in change in human and livestock population of Bangladesh

The total livestock unit with time increased to a total unit of 17.0 in 2009 from 10.5 units in 1960, and a significant linear relationship ($p<0.05$, $r^2=0.95$) of time and livestock unit is shown by the equation of $y = 10.5 + 0.1156x$ during the period. The population of different bovine animals and poultry increased similarly. The population of bovines increased from 19.4 million in 1960 to 27.4 million in 2009; that of small ruminants from 6.14 million in 1960 to 17.5 million in 2009 and of poultry from 20.1 million in 1960 to 154.7 million in 2009. A positive trend in the increase of human and farm animal and poultry population indicates that livestock is an integral part of food and agriculture of the people of the country. A slower growth of livestock over the period compared to human population may be found (Fig1), and it may be explained by a reduction of per capita availability of bovine animals. It was reduced from 0.38 in 1960 to 0.18 in 2009 (Table1). The annual average increase of human population (1.76 million; $Y(Population) = 55.2 + 1.76x\ (Year);\ r^2 = 0.97,\ p < 0.05)$.) was higher than that of bovine animals (0.13 million; $Y(Bovine\ animals) = 19.4 + 0.13x(Year);\ r^2 = 0.86,\ p < 0.05)$ or that of small ruminants (0.24 million; $Y(Small\ rumianats)\ 6.14 + 0.24x(Year);\ r^2 = 0.93,\ p < 0.05)$. A lower rate of increase of small ruminant kept per capita availability of small ruminants constant (0.12 vs 0.12) over the period. The per capita availability of poultry increased from 0.65 in 1977 to 1.07 in 2009, and a higher annual growth of poultry (2.59 million; $Y(Poultry) = 20.1 + 2.59x(Year)$; $p<0.05$, $r^2=0.96$) supports a higher availability of per capita poultry. Alam (1995) reported a gradual increase of poultry and small ruminant animals from 1960 to 1993/94, and decrease of bovine animal over the period.

A slower growth of livestock compared to human population during the recent decades than that of post sixties may be explained by population increase, reduction of cultivable land, rapid urbanization, and movement of rural people at home and abroad. This has continuously limiting horizontal livestock production favouring the potential of vertical improvement, and development of commercial poultry, cattle fattening and dairying are a few of the examples during the recent decades.

Table1: Human and farm animal population of Bangladesh of different census

Human/Animals		**Population, Million**					
		2009	2008	1996	1984	1977	1960
Human population (Millions)		144.0	141.8	122.1	89.4	75.88	55.2
Farm animal population							
Bovine animals	(Millions)	27.4	25.9	22.3	22.1	20.9	19.4
	Per Capita	0.18	0.18	-	0.26	0.28	0.38
Small Ruminants	(Millions)	17.5	17.3	14.6	14.2	8.94	6.14
	Per Capita	0.12	0.12	-	0.18	0.12	0.12
Poultry	(Millions)	154.7	135.1	126.7	73.7	53.6	20.1
	Per Capita	1.07	0.95	-	0.91	0.65	
Livestock units		17.0	16.0	13.9	13.2	11.9	10.5

Table 2: Change of total milking cows and the ratio of female and male

Attributes		**Year of agricultural and/or Livestock Census**			
		2009	1984	1977	1960
Total Cattle	Millions	26.8	21.5	20.5	18.9
Total Cows	Millions	8.07	5.95	6.71	4.03
	% of total cattle	30.1	27.7	32.7	21.3
Milking cows	Millions	3.87	3.33	3.55	2.23
	% of total cows	48.0	56.0	52.9	55.2
Dry cows	Millions	4.19	2.62	3.17	1.81
	% of total cows	52.0	44.0	47.1	44.8
Adult male cattle	Millions	9.60	7.69	7.61	7.00
♀:♂ (Cows to adult males)		0.84	0.77	0.88	0.56

Table 2 shows that over the past decades the number of total cattle and cows has been increasing and farmer`s interest on keeping more female compared to male cattle (30.1% in 2009 vs 21.3% in 1960) has been growing over the decades. The ratio of total cows to adult male cattle of 0.56 in 1960 increased to 0.88 in 1977, and the trend was being continued till 2009. Annual uptake of male animals, especially raised through cattle fattening, quitting of farmers from raising of draft animals, crossbreeding for dairy development over the decades, and restrictions to slaughtering of female animals may have favoured keeping of a higher number of female than male cattle. Morever, rearing of milking cows support livelihood, employment and family nutrition of farmers in addition to a source of income (Huque *et al.*, 2014).

Changes in per cent holding of different farm animals

The changes in per cent of different farm animals and poultry along the farm category over a period of 1984 to 2008 is shown in Table 3. The total changes of livestock unit (millions), their distribution among different farm categories, and their vertical change in per cent over the decades is shown in Fig2. It shows that the proportion of bovines, small ruminants or poultry owned by Non-farm (14.1%, 21.1% & 24.9%, respectively) and small farms (57.9%, 57.9% & 57.8%, respectively) increased significantly ($p<0.01$) in 2008 compared to 1984, and the extent of increase of livestock units was calculated to be 228% in Non-farms and 82% in small farms.

In contrast, the proportion of similar type of animals in medium and large farm categories reduced significantly ($p<0.01$), and the extent of reduction was calculated to be 24.9% and 49.9%, respectively (Fig2). The figure shows that 1.23 million and 0.76 million of livestock units were dropped out by medium and large farmers, while a total of 4.48 million of livestock units were increased over the decades.

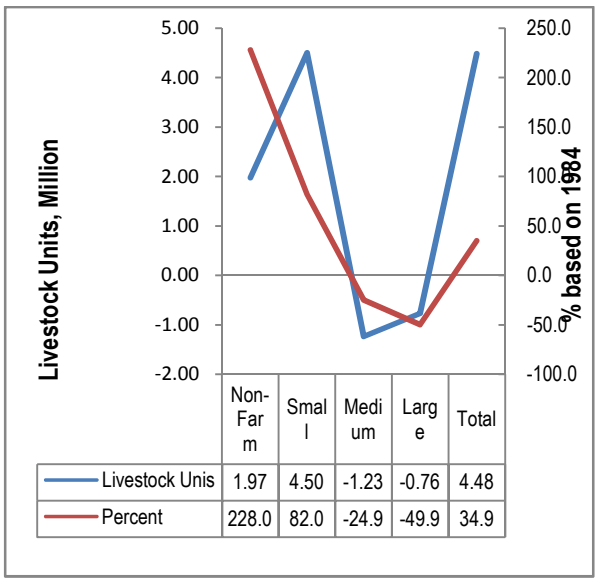

Figure 2. Changes in population during 1984 to 2008 (livestock units or % of 1984

Shifting of farm animals towards Non-farm and small farm category from medium and large category and/or population increase of farm animals at the former categories resulted in an increase of livestock unit over the period. Gradual dropping out of sight of cultivable land, shifting of

Table 3: Changes in proportional holding of farm animals over the decades (Agriculture & Livestock census, 1983/84 vs Livestock Census 2008)

Non-Farm & Farm categories	1984	2008	SE	Level of significance
		Per cent of Bovines		
Non-Farm	4.98	14.1	0.42	0.01
Small farm	40.3	57.9	2.11	0.01
Medium	40.2	23.1	1.25	0.01
Large	14.5	4.87	1.47	0.01
		Per cent of Small ruminant		
Non-Farm	14.3	21.2	1.23	0.01
Small farm	48.2	57.9	1.58	0.01
Medium	28.4	15.3	0.97	0.01
Large	9.16	2.54	0.85	0.01
		Per cent of Poultry		
Non-Farm	14.5	24.9	0.78	0.01
Small farm	47.3	57.8	1.56	0.01
Medium	28.7	15.1	1.03	0.01
Large	9.42	2.24	0.64	0.01

land rich peoples to non-agricultural services, trans-geographical movement of growing peoples for higher paid jobs, increase of labour cost, and a lower market competitiveness of crops are some of the responsible factors result in shifting of livestock resources to land poor peoples. But, the major factor dictates the gradual shifting towards and/or increase of farm animals in Non-farm and small farm categories and decrease of their number at medium and large farm categories is the increase of Non-farm and small farm households and fragmentation of land. Table 4 shows that during the same period the total number of farm households was increased by 51.2% (10.04 million in 1983/84 to 28.67 in 2008) resulting in 81.3% increase of small farm households (7.07 million in 1983/84 to 12.8 in 2008). Medium and large farm households was decreased from 2.48 to 2.14 million (-14.0%) and 0.49 million to 0.23 million (-52.7%) during the time between the two census.

Two dimensions of change in livestock farming, i) gradual transformation of subsistence to input supported systems for supporting livelihood of the land poor farmer and ii) raising of farm animals by Non-farm and small farmers are noticed here. Huque *et al*. (2014) reported that the non-farm and small farm households keep 73.9% of the cattle, and they earn 75.0% to 85.0% of their annual income from dairying with a profit share of 10.0% to 30.0%. The authors also showed that the raising of a dairy farm of 28.0 total cattle including 11.0 milking cows is sufficient to support monthly income of a family at a level higher than that of a country average, may daily create an average 1.9 man days additional employment, and allows an average 1.40 litre of milk daily for its family consumption. Female farmers lead 8.82% of the total dairy farms and share 45.7% of dairy activities with their male counterparts (54.3%).

Table 4: Changes in household number in different farm category (1984 vs 2008)

Agriculture/Livestock Census	**Farm categories**				**Total Farm Holdings**
	Non-Farms	**Small**	**Medium**	**Large**	
1983/84, Millions		7.07	2.48	0.49	10.04
2008, Millions	13.5	12.8	2.14	0.23	28.67
Per cent change		81.3	-14.0	-52.7	51.2

Conclusion

It may be concluded that the number of different species of livestock increased over a period of more than two decades. The increased number of livestock is shared by non-farm and small farms using most of animals to support their livelihood. On the other hand, medium and large farms have been opting out from livestock farming. Agricultural census should be continuous and regular activities emphasizing more on generating socioeconomic and geographical data on livestock production help strategic planning for harvesting livestock potentials of the country.

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