Working Paper
Productivity of Livestock and Poultry in Bangladesh

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The productivity of livestock and poultry is consistantly reported to be very low in Bangladesh. Poor nutrition is listed as the number one cause of this low productivity. The purpose of this paper is to draw together the statistics available to better define this "low productivity of livestock" and the "poor nutrition" and discuss the possible interactions among the many factors involved.

First, we can see from Table I that livestock only accounts for 6.5% of the GDP compared to 36.8% for crops. It should be noted that only the value of meat, milk, eggs and possible skins are included in the livestock portion of GDP. However, there are several other very valuable products of livestock which are not counted in the GDP but are none-the-less extremely important to the Bangladesh national economy. The interactions of livestock and crops will be the main topic of this discussion, while forestry and fisheries interact significantly with both.

The Bangladesh livestock industry is made up mainly of cattle, buffalo, goats, sheep, chickens and ducks. The products from these species are shown in Table II along with their relative market value. While one tends to think only of the food products, meat, milk and eggs, other very important animal products in Bangladesh are draft power, dung and hides. When the value of these is added to food the portion of GDP nearly doubles.

To most effectively plan research or development activities it is essential to know the relative importance of these products and the natural resources of feed and fodder necessary for their production.

Table I.

• Livestock and Poultry Share of Bangladesh GDP

	Percent of GDP
Total Agricultural Production	50%
Crops	36.8%
Livestock	6.5%
Fisheries	3.6%
Forestry	3.1%

Source: 1981 Statistical yearbook of Bangladesh.

Table II

Bangladesh Livestock Industry Components

Major Species: Cattle
Buffalo
Goats & Sheep
Chickens
Ducks

Products	Percent of Gross Value of Products
Food	57%
a) Meat	26%
b) Milk	22%
c) Eggs	9%
Dung	27.7%
a) Fuel	25%
b) Fertilizer	2.7%
Draft Power	13.1%
a) Cultivation	9.1%
b) Transportation	4.0%
Hides (13% of Export)	2.7%
	100

With this goal in mind the following tables of statistics, calculations and some estimates are presented with brief discussion to create "food for though", suggestions and corrections. These data to be presented are from published Bangladesh sources and personal communication have been projected to 1982 and rounded to facilitate calculations. Prices used for estimating value are as current and accurate as was practical to collect on a short informal basis. Since this is a working paper it will be revised as better data and your suggestions and corrections are received. Your contribution will be appreciated.

Table III presents the number of livestock and poultry in Bangladesh along with the food produced by each species. T facilitate calculations and comparisons all animal numbers were converted to Animal Units (A.U.) equal to 200 kilograms of liveweight. To get one total for food production, the milk and eggs were converted to a meat equivalent basis for summation with true meat production.

The total of 18,600 A.U. is broken down by percent of animal biomass maintained for each species. This can be compared with the last column where percent of the total food produced by each species is listed. As you see, both cattle and buffalo produce only 63% and 3% of the food with 87% and 4% of the animal biomass, respectively. While, the small ruminants and poultry produce a total of 34% of the food with 7% of the animal biomass. Therefore, if one stopped at this point he would probably conclude that poultry and small ruminants are much more efficient than the large ruminants.

Before we accept such a conclusion let us look at the other products of these animals and fix an estimated value to each for a common comparison among all products as given in Table IV. The food value was calculated at Tk. 30/kg of meat equivalent; hides and skins were calculated at the current price reported in The New Nation Daily;

Table III Animal Population in terms of Animal Units (AU) 1/ and Productivity of Food.

Statistic / Species	Animal NO (000hd)	Animal Units (000)	% Animal Biomass	Carcass Meat (Tons)	% 2/ Meat Yield
Cattle	22,000	16,500	87	182,500	11.0
Buffalo	550	720	4	8,000	11.0
Goats & Sheep	10,000	1,000	5	51,800	52.0
Ducks	22,000	110	0.6	22,000	130.0
Chickens	54,000	270	1.5	54,000	130.0
Total	-	18,600	100	318,300	16.9

Statistic / Species	Milk & Egg Yield (000hd)	Milk & Egg in Meat Equiv. (000kg)	% 3/ Milk-Egg Yield	Total Protein Food (Meat Eq.)	% 4/ Protein Food Yield	% Produced by Species
Cattle	717,000	239,000	15	421,500	26	63
Buffalo	33,000	11,000	15	19,000	26	3
Goats & Sheep	No Est.	No Est.	No Est.	51,800	52	8
Ducks	764,800	47,800	290	69,800	420	10
Chicken	811,000	50,700	125	104,700	260	16
Total	-	348,500	18.5	666,800	36	100

1/ A.U. = 200 kg. Live Animal Weight.

2/ % Meat Yield = weight of carcass meat divided by live animal biomass (A.U.S. x 200 kg) for the species x Dressing %.

3/ % Milk-Egg Yield = weight of meat equivalent of milk and eggs divided by live animal biomass (A.U.s x 200 kg) for the species x Dressing %.

4/ % Protein Food yield = weight of the total meat equivalent (meat, milk and eggs) divided by live animal biomass (A.U.s x 200 kg) for the species x Dressing %.

Table IV. Value of Food and Other Livestock Products in Bangladesh in 1985.

Species \ Statistic	Food Value (Tk.000,000)	Hide Value (Tk.000,000)	Draft Cultivation Value (Tk.000,000)	Draft Transport Value (Tk.000,000)
Cattle	12,650	650	3,050	1,340
Buffalo	570	30	150	60
Goats & Sheep	1,554	260	-	-
Ducks	2,094	-	-	-
Chickens	3,141	-	-	-
Total	20,000	940	3,200	1,400
% of Value	57%	2.7%	9.1%	4.0%
% GDP	6.5%	0.3%	1.0%	0.5%

Table IV (Cont)

Species \ Statistic	Dung Fertilizer Value (Tk.000,000)	Dung Fuel Value (Tk.000,000)	Total An. Prod. Value (Tk.000,000)	% of Value	% of GDP
Cattle	825	8,200	26,700	76.1	8.7
Buffalo	38	400	1,248	3.6	0.4
Goats & Sheep	47	-	1,860	5.3	0.6
Ducks	9	-	2,100	6.0	0.6
Chickens	30	-	3,170	9.0	1.0
Total	950	8,600	35,090	100	11.4%
% of Value	2.7%	25%	100%	-	-
% GDP	0.3%	2.8%	11.4%	-	-

draft cultivation was calculated at Tk. 100/acre cultivated (low estimate by Gill 1983); draft transportation was assumed to be 30% of total draft power or 43% of cultivation; dung for fertilizer was valued at Tk. 5 per kg of chemical fertilizer equivalent for 20 kgs per ton of half the production; and dung for fuel was valued at one taka per kg dry weight of 25% of the production. Subsequently we will look at the input feeds and fodder required by each species to evaluate relative cost of production.

As can be seen in Table IV the food products make up only 57% of the total value of animal products. Next in importance is dung at 27.7%, draft power 13.1% and hides 2.7%. Looking at the column before the last in Table IV we find now that cattle and buffalo are producing 76.1% and 3.6%, respectively, of the total value compared to 20.3% from the small ruminants and poultry. There is still a slight efficiency advantage for the small ruminants and poultry over the cattle and buffalo when calculated on the basis of production per unit of animal biomass maintained.

We must now look at the feed and fodder availability and the requirements of each animal species for particular feed types. Table V gives an estimate of the major groups of feedstuff available in Bangladesh adapted from Madamba, 1985 expressed in terms of Dry Matter (DM),Total Digestable Nutrients (TDN), and Digestable Crude Protein (DCP). These estimates are slightly higher than those by Tareque, 1985, but within the same magnitude when compared to the demand. Both estimates were calculated from the 1981 Bangladesh Statistics using slightly different assumptions and parameters. In addition to the dry matter calculations it is important to compare the TDN and DCP available from each type feed. Only the large and small ruminants can use large quantities of roughage, while the poultry require primarily a concentrate diet which provides a high percentage of high quality energy and protein. As can be seen in Table V only 5% of the total DM available comes from

Table V. Nutrient Components of Animal Feed & Fodder Supply in Bangladesh

Type Feedstuff \ Statistic	Dry Matter (000 Tons)	% of Total DM	TDN (000) (Tons)	% Total TDN	DCP (000) (Tons)	% Total DCP
Green Roughage (Stubble, regrowth, fallow, waste land, forest) 45% TDN, 4.0% DCP	18,850	53	8,483	55	754	74
Dry Roughage (Straw, Hay, etc) 38% TDN 0.3% DCP	14,960	42	5,685	37	45	4
Concentrates (Industrial & Farm by-products and Harvest waste) 75% TDN, 12% DCP	1,852	5	1,390	9	222	22
Total Feedstuff 44% TDN, 3.0% DCP	35,662	100	15,558	100	1,021	100

concentrates, therefore this may be an important constraint to increasing poultry production. Competition for human foods must be considered when searching for sources of poultry feed.

Before going to the specific requirements for livestock let us look at Table VI to see the source of these feedstuffs and the importance of the cultivated crop land to this supply. Looking at the bottom of the table we see that 87% of all the animal feeds of Bangladesh comes from cultivated land. Only 13% comes from non-cultivated land such as embankments, road sides, forest, and low land which is usually used in common, therefore not practically available for managed forage production. It should be noted that this green roughage obtained from the non-cultivated land is very important because of its higher quality in digestibility and protein content. These green grasses tend to balance the diets of the ruminants which are eating a high proportion of dry straw. It also provides much of the grazing-browse needs of small ruminants (Goats and Sheep).

Total requirements of the animal population in terms of DM, TDN and DCP must be known to judge the adequacy of the feed supply. Table VII presents these estimates as calculated from the number of livestock in Bangladesh and the nutritive requirements needed for each species as indicated in Mahatab, 1982 and Tareque, 1985. These requirements are calculated for maintenance of the typically small Bangladesh animals,plus the low level of milk and egg production, and draft power production. Therefore, this level of nutrition is for present production, not high level production. One will note that the cattle and buffalo comsume only about 2.5% of their body weight in DM per day compared to 4% for goats and sheep and almost 10% for poultry. As a result of the high consumption the small ruminants and poultry demand a higher proportion of the nutrients than may be expected. Furthermore, they require even a higher proportion of the TDN and DCP as shown in Table VII under percent of total TDN and DCP required for goats and sheep and for poultry. Refering back to Table III we see that while goats and sheep make up only 5% of the animal biomass they require 10% of the TDN and DCP, while poultry makes up on 2.1% of the animal biomass and requires 15% of the TDN and 27% of the DCP requirements.

Table VI. SOURCE and TYPE of FEED & FODDER

(000 Tons Dry Matter)

Source / Type Feed Stuff	Cultivated Land: Crop Residue regrowth Weeds	Cultivated Land: fallow land	Cultivated Land: Ag. Indust. Farm by-product feed	Non-Cultivated: Waste land Roadside Lowland Forest	Total	% by Type Feed
Green Roughage	12,250	2,000	-	4,600	18,850	53%
Dry Roughage	14,960	-	-	-	14,960	42%
Concentrate Feeds by-prod.	-	-	1,526	-	1,526	4%
Concentrate Harvest Waste	326	-	-	-	326	1%
Total	27,536	2,000	1,526	4,600	35,662	100%
% by Feed	77%	6%	4%	13%	100%	-
Source		87%		13%	100%	-

Table VII. Annual Nutrient Requirement for Bangladesh
Domestic Animal Population of 18,600,000
Animal Units 1/

Nutrient / Species	Total Dry Matter 2/	% of D.M.	TDN (000 TONS)				
			Main tenance	Milk Prod.	Draft	Total	% Total
Cattle	33,000	82	9,997	227	350	10,574	69
Buffalo	1.450	4	879	10	15	900	6
Goats & Sheep	2,900	7	1,570	-	-	1,570	10
Poultry	2,775	7	2,220	-	-	2,220	15
Total	40,125	100	14,666	237	365	15,268	100

Nutrient / Species	DCP (000 Tons)				
	Main tenance	Milk Prod.	Draft	Total	% Total
Cattle	891	32	90	1,013	61
Buffalo	39	2	7	48	3
Goats & Sheep	158	-	-	158	10
Poultry	444	-	-	444	27
Total	1,532	34	97	1,663	100

1/ A.U. = 200 kg. Live Animal weight.

2/ Annual Consumption is calculated as a percent of weight of live biomass per day at the following rate for each species: Cattle and Buffalo 2.5%; Goats and Sheep 4.0% and Poultry 10.0%.

Now when we reconsider our earlier assumption that small ruminants and poultry were more efficient than large ruminants we have to reverse in favor of the large ruminants. That is, according to Tables IV and VII the cattle and buffalo produce 79.7% of the total value with 74% of the TDN and 65% of the DCP, the goats and sheep produced 5.3% of the value with 10% of both TDN and DCP; while poultry produced 15% of the value with 15% of the TDN and 27% of the DCP. The added value of draft power and dung fuel is a great advantage of cattle and buffalo plus the fact that they can utilize the major available feed source, low quality forage.

These comparisons are not made to promote one species or the other, rather, they are made to point out the competition for the limited feed resources and to remind us of the special requirements of some speices. The farmers will decide what species are most advantageous to him based on his feed supply and the products he values most from those animals. Just as the farmer does, we researchers must consider all factors when measuring cost and benefits in an attempt to identify more profitable livestock production methods.

Now that we have discussed the feed supply and the demand let us look at the two together in Table VIII. Using the total estimated nutrients available and the total requirements we see that only 89% of the DM requirement is met, 102% of the TDN and only 61% of the DCP if no loss occurs and none of the straw is used as fuel. Tareque. 1985 estimates that 48% of the feedstuff supply is not utilized, while Madamba, 1985 estimates a loss of 40%. If these estimates are correct the animals are getting only 53 to 61% of their required TDN and only 32 to 37% of DCP.

What are the actual facts and what can be done to improve the situation? Does the animal population actually require the nutrients determined by many nutrition experiments? Are there as many animals as stated in the statistics? Is feed and forage supply and/or quality higher than estimated? Or, is the utilization more efficient than stated? These are some of the questions we need to answer to be able to search for improved management practices for the farmer.

Table VIII. Bangladesh Feed and Fodder Nutrient Supply and Demand Balance.

Nutrient Character	Dry Matter (000 Tons)	TDN (000 Tons)	DCP (000 Tons)
Supply	35,662	15,600	1,021
Demand	40,125	15,300	1,663
Balance	- 4,463	+ 300	- 642
% Need Met 1/	89%	102%	61%

1/ Consumption of Woody Plants, insects and kitchen waste may help the Balance.

Returning to the value of the total livestock production and how it relates to the feedstuff Table IX gives the gross return credited to each animal product for each kilogram of feedstuff available for consumption. The total gross return for each kilogram of feedstuff is only Tk. 0.9 which is less than prices quoted in the markets for fuel.

Is this the true relative value? Can the farmer sell his straw for more than it's worth to feed his livestock?

These are questions we must research with the farmers in the Farming Systems Research Program.

While the low productivity of livestock is still apparent and the feedstuff is inadequate, we find that livestock production makes up a larger portion of the GDP than is conventionally reported. If the dung used for fuel and fertilizer and the draft power value were counted as a part of the total GDP, and if they were both credited to livestock this "Non-conventional Breakdown of GDP" would be as shown in Table X. Giving full credit to all livestock products the sector makes up 11.5% of the GDP compared with the normally reported 6.5%.

Looking at livestock productivity per unit area presents a completely different picture. When only meat production per hectare is the measure, Bangladesh is equal to or higher than most countries including the developed countries. If the other products,which are not normally utilized in the developed countries are counted the total productivity per unit land would be relatively high.

Regardless of how the Bangladesh Livestock Industry compares with others, we as researchers are interested in maximizing the productive value of livestock for the particular farming conditions of your country. First, where is the greatest potential?

Table IX. Gross Return to Feed & Fodder
Fed to Bangladesh Livestock (Ks/Kg)

Use / Nutrient	Food	Hides	Cultivation	Transport	Fertilizer	Fuel	Total Value
Dry Matter	0.5	0.02	0.1	0.03	0.03	0.2	0.9

Table X. Non-Conventional GDP Breakdown Compared to Standard.

	Standard % of Total GDP	Non-Conventional Calculation % GDP
Agriculture GDP	50%	53.0%
Crops	36.8%	35.0%
Livestock	6.5%	11.5%
Fisheries	3.6%	3.5%
Forestry	3.1%	3.0%

Figure I list the subject areas of nutrition, health, management and selection in that order of importance. The first three can be classified as environmental factors and the last as genetic. Since much of this paper has been devoted to classifying and quantifying resources to be able to identify potential areas of improvement, we should now look at the major reasons for variation in individual animal production. Looking at the two big catagories of environment and genetic Figure I shows the relative importance of the two in ideal conditions, and next, in high stress conditions such as in Bangladesh. Under the ideal conditions environment accounts for at least 60 to 80% of the variation of most production tracts, while the genetic influence is no more than 20 to 40%. The environmental effects increase to 85 to 95% under stress conditions and genetics accounts for only 5 to 15%. Therefore, one should conclude that our major efforts in livestock research should be in the fields of nutrition, health and management. Only after these environmental conditions are significantly improved such as may be found on a research station or an occasional urban area farm should genetic change be considered. For most cases of FSR the environmental factors should get most of the attention.

Table XI list the potential areas of research to reduce the imbalance of the supply and demand of animal feed and fodder. As you can see they are nearly all related directly to cropping practices to either increase or improve the forage resulting as a residue to the major crop production of food or cash product. The livestock and crop scientists must work together to measure the value of both crop and livestock management changes to the production of each component.

In Bangladesh as in most other countries crop research has received much more attention than livestock research, especially at the farmer's level. The livestock researchers have a big challenge to make up for lost time, however, since the benefits will be mutual, all researchers should be challenged to include both crop and livestock components in their FSR to help identify the total economic effect of any intervention of either component.

We in the livestock field welcome this challenge and the cooperation with the crop scientists.

Figure I. Relative Importance of Subject for Increasing Animal Productivity.

Subject:	Rating	Catagory
Nutrient	1	
Health	2	Environmental
Management	3	
Selection	4	Genetic

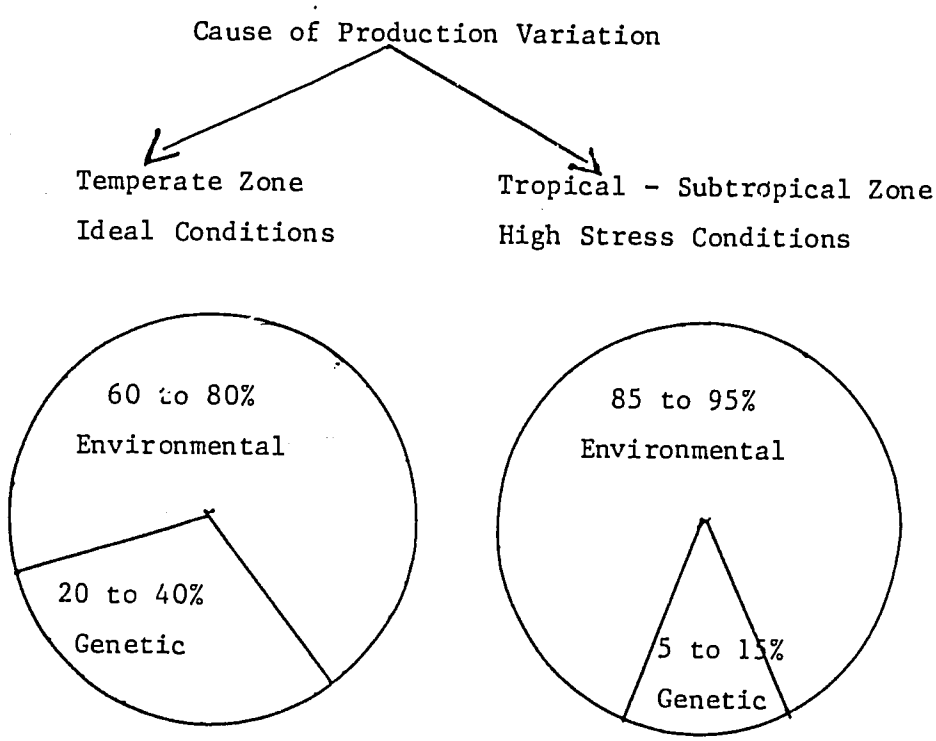

Table XI. Potential Areas of Research to Reduce Imbalance of Supply and Demand of Animal Feed and Fodder

Increase Feed Supply	Improve Feed Quality	Reduce Demand
1. Increase crop residue by increasing total crop production.	1. Straw Treatment	1. Increase efficiency of draft animals.
2. Selection of high straw yielding crops & varieties.	2. Intercropping and relay cropping with legumes.	2. Minimize tillage.
3. Relay cropping.	3. Selection of grain crops and varieties with higher quality forage.	3. Produce same output with fewer efficient animals through improved nutrition, health and management.
4. Inter cropping.	4. Plant woody legumes on waste land.	4. Selection of most productive local animals, then consider exotic breeds only when the environment is significantly changed.
5. Use of waste and forest land for forage production if not presently used more economically.		

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