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FARM POWER PROBLEM AND LIVESTOCK DEVELOPMENT STRATEGIES IN BANGLADESH

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Introduction

Considerable attention is currently being given to increasing agricultural production in Bangladesh. Farm power plays a significant role in agricultural production but, limited importance has so far been given to its development. The farm power situation deserves a closer look since the success of new technology as epitomized by various biological and hydrological innovations depend on the timely availability of all inputs including those of farm power. Furthermore, the agricultural sector has been undergoing a transformation in terms of spread of HYVs, intensification of irrigation and usage of other modern inputs, all of which may impact on the supply and demand for farm power.

The report constitutes a very preliminary investigation of the present conditions associated with farm power in the agricultural sector and should be viewed only as indicative.

The results are based on surveys conducted in 24 Upazilas of Bogra, Chittagong and Noakhali districts. A total of 51 farmers interviews (14 from Bogra, 25 from Chittagong, and 12 from Noakhali) were taken for analysis (table 1). Information was gathered (1) from farmers(both animal owners and renters)on crops grown,area cultivated, varieties grown and cropping patterns; (2) from animal owners on ownership, prices, area and hours ploughed, feed availability; (3) from animal renters on rental rates, queueing periods, yield losses, etc. Two different time frameworks differentiated by use or nonuse of irrigation were considered. The information related to the period of nonuse of irrigation was collected by 'recall' method. Selection of respondents for each Upazila was not systematic or statistically determined. Therefore, no attempt should be made to generalize from survey results.

SURVEY FINDINGS

Uneven Distribution and Rising Costs of Cultivation

Farm power was found to be unevenly distributed among different classes of farm households. Small farms with area less than 2 acres were found to possess one-tenth the number of animals of medium farms (2-8 acres) and one-twentieth the number of animals owned by large farms with areas above 8 acres (Table 2). The distribution of farm power seems to be more unequal than the distribution of farm-sizes among households so that acre/animal ratio generally falls as we move from small to medium and from small to large farm sizes.^{1/} This implies that on average each animal owned by

1/ The acre/animal ratio rises as we move from medium to large farms and reflects that animals of large farms are used more intensively than those of medium farms.

Table 1: Distribution of farmers by size-classes and animal rental services

<u>Farm-sizes in Acres</u>	<u>Category</u>	<u>Number of Farms</u>	<u>Number of Farms renting in animals</u>
Bogra District			
0-2	Small	3	3
2-8	Medium	9	1
8 and above	Large	2	0
Chittagong District			
0-2	Small	12	6
2-8	Medium	9	0
8 and above	Large	4	0
Noakhali District			
0-2	Small	4	3
2-8	Medium	5	0
8 and above	Large	3	0

Table 2: Relationship between farm-size, animal ownership and bullock/cow ratio.

<u>Farm-size in Acres</u>	<u>Animals owned per farm</u>	<u>Acre/Animal</u>	<u>Bullock/Cow Ratio</u>
Bogra District			
0-2	0.33	3.76	0
2-8	3.11	0.99	1.0
8 and above	6.00	1.80	1.4
Chittagong District			
0-2	1.33	1.40	1.29
2-8	2.44	1.15	0.83
8 and above	4.00	2.45	1.29
Noakhali District			
0-2	0.75	1.98	1.00
2-8	3.40	0.86	1.42
8 and above	5.00	1.96	1.50

small farms plough nearly twice the area of those owned by medium size farms and somewhat greater the area of those owned by large farms. Small and medium farms generally own a larger proportion of cows and large farms own greater proportion of bullocks. Furthermore, as Table 1 shows, small farms are mainly the renters of animals. Survey findings reveal that the rental rates per acre have risen by around 138 percent over the last two years (Table 3). Given the fact that the small farm owners are mainly the renters of animals the increase in cultivation cost resulting from supply pressure must be worsening their budgetary position and thereby affecting growth in agricultural productivity. Cultivation cost paid by the animal renter includes not only cost of animal but also of labor. Labor is hired as a part of the complete ploughing team. This is done because the animals respond best to the ploughman whom they know and the owners of animals do not wish to run the risk of their animal being maltreated by a stranger. Thus a small farmer is forced to hire labor as the price of having to hire the animals.

Table 3: Cultivation Cost with Animal Per Acre

	<u>Rental rate per day</u>	<u>No. of ploughings per cultivation per acre</u>	<u>Rental rate per acre</u>	<u>Percentage Increase</u>
Bogra				
1981	14	5.4	227	-
1983	24	5.4	389	71
Chittagong				
1981	23	5.6	386	-
1983	52	5.6	876	126
Noakhali				
1981	12	5.4	194	-
1983	41	5.4	664	241
Weighted average				
1981	18	5.5	297	-
1983	42	5.5	693	138

Delay in Cultivation and Adverse Effect on Yield

One of the impacts of irrigation has been to increase the cropping intensity from around 130 percent to 190 percent (Table 4) in the sample area. This increase in the cropping intensity has been accompanied by reduced turnover periods between successive crops so that the farmers' competition for animals to cultivate land during the shortened turnover periods have

Table 4: Irrigation and Changes in Cropping Patterns

<u>Cropping patterns</u>	Farmers' Patterns	
	<u>Before Irrigation</u> <u>% of Farmers</u>	<u>After Irrigation</u> <u>% of Farmers</u>
Bogra		
Aus followed by Aman	50	-
Jute followed by Aman	21	-
Other	29	-
Aman followed by Boro	-	36
Aus followed by Aman f.by wheat	-	29
Other	-	35
Cropping Intensity	151%	205%
Chittagong		
Aus followed by Aman	43	-
Aman followed by Boro	26	-
Other	31	-
Aman followed by Boro/Pulse/Veg.	-	46
HYV Aus followed by Aman	-	23
Aus followed Aman f. by Boro/Pulse	-	10
Other	-	21
Cropping Intensity	130%	194%
Noakhali		
Aman	82	-
Other	18	-
Aman followed by Boro	-	36
Aus followed by Aman	-	40
Other	-	24
Cropping Intensity	106%	184%

resulted in farmer queues. The animal renters who are mostly the small farmers are affected by queueing. The owner farmers cultivate their land first and then rent out to those who do not have animals. The owner-farmers are usually on time and can maintain their usual schedule provided they have access to needed inputs. On the other hand the animal renters are mostly delayed in farming their fields, firstly, because they being poorer farmers face a greater difficulty in securing inputs in time; secondly, they have to queue-in for animals, and thirdly, they have a greater demand (relative to supply) for draft power on account of their relatively higher cropping intensity in their fields. The decline in yields averages around 10-12 percent of total yield (Table 5). Revenue losses are calculated to be around Taka six hundred and sixty six per acre per season, and considering high cropping intensity of small farmers (245 percent), the annual losses appear to be substantial (Tk. 1,632).

Deteriorating Fodder Supply Situation

Intensive agriculture has also resulted in the decrease of animals' grazing land and feed supply. Prior to having irrigation, most of the farmers' fields remained fallow during the Rabi and Aus season due to lack of water. The fallow lands used to be grazed by animals and some of the fields were used to grow animal fodders like mashkalai and khesari. These high producing legumes used to provide very good grazing to the animals. With irrigation HYV rice or wheat began to be grown in lands previously remaining fallow or cultivated with low yielding mashkalai or khesari. Though the total volume of paddy production has increased with increase in HYV varieties under irrigation, the availability of paddy straw, the main roughage may not have increased at the same rate. This has probably happened because, firstly, the straw output per unit of land is lower for HYVs compared to local varieties that used to be grown before irrigation; secondly, the fact that Aman paddy harvested at the beginning of dry season are only used as animal feed as straws of HYVs grown in dry seasons (Boro and Aus) and harvested in the monsoon seasons usually get rotten and become unsuitable for animal consumption; thirdly the HYV varieties have poor digestibility and are not usually eaten by animal as they are often sprayed with chemicals and insecticides.

Declining Dairy Production and Dependence on Imports

Increased use of cows for land ploughing combined with lower supply of fodder have caused milk outputs to decline. Of the total sample animals used for cultivation, 54 percent were bullocks and the remaining 46 percent were cows. Most farmer reported that proportion of crops used for cultivation increased over the last few years. Cows observed in the sample hardly yield an average production of one Kg. per day compared to some rare samples of fairly good cows yielding more than five Kg. of milk per day. The country, therefore has to

Table 5: Length of Queue for Animal Renters in days; and Farmers' Perception of Yield Losses. 1/

	<u>Summer</u>	<u>Monsoon</u>	<u>Winter</u>
Bogra			
Delays in Days: Range	3-15	7-20	2-14
Average	7	10	8
Yield losses (Md/Acre)	4	5.5	5.5
Revenue losses (Taka/Acre)	576	792	792
Chittagong			
Delays in days: Range	2-20	2-24	2-20
Average	9	10	10
Yield losses (Md/Acre)	4	4.5	4
Revenue losses (Taka/Acre)	576	648	576
Noakhali			
Delays in days: Range	7-15	10-20	4-15
Average	10	12	9
Yield losses (Md/Acre)	5	6	4.5
Revenue losses (Taka/Acre)	720	864	648
Weighted average (Revenue loss)	610	738	652

1/ Length of queue and reported yield losses refer to those arising from animal shortages alone.

spend a large sum of foreign exchange for importation of milk powder and baby food from abroad (Tk. 520 million in 1981-82). To provide every citizen in Bangladesh 200 gm of milk a day (minimum level recommended by nutritionists), every cow in the present herd would have to give 2 Kg. of consumable milk. This rate would be 100 percent higher than the present milking rate and its achievement would require measures to release pressure on cows for ploughing.

Summary of Survey Findings

The above findings reveal that the farm power situation in Bangladesh is besieged with several problems. The problems can be identified as those pertaining to (a) poor farmers, (b) livestock sector, and (c) consumer population.

Problems relating to poor farmers refer to the draft powers' uneven distribution. Animals belonging to the poor farmers are worked rather excessively relative to their quality. Furthermore, their cost of cultivation has increased dramatically since the beginning of intensive agriculture. Current institutional practice is such that small farm owners who want to rent animals also have to hire labor. Finally, the animal renters who are mostly the poor farmers have to 'queue-in' for animals and the length of queue has risen to level that is adversely affecting yield.

The problems of livestock sector are low availability of fodder. With increasing population pressure and shortage of food for human beings, there is practically no culture of fodder. The animals have to rely on crop residues like straw for bulk of their food supply. Concentrate feed are very expensive and beyond the reach of most animal owners in Bangladesh. The availability of rice straw which is the main roughage for animals has not increased at the same rate as the growth of HYVs of rice.

The problems of consumer population relate to the nonavailability of dairy products in sufficient quantities. Increased use of cows rather than bullocks for land preparation is adversely affecting milking and calving rates which again is affecting the growth of livestock population. According to the Livestock Directorate the current death rate of animal population is 15 percent and it implies financial loss of around one thousand and five hundred crore taka.^{2/} The birth rate of animals is around 11 percent, implying that net yearly loss is 3 million animal heads (e.g. 4 percent). The country, therefore has to spend a large sum of foreign exchange for importation of milk powder and baby food from abroad.

2/ Meat has a positive income elasticity of demand.

Suggested Solutions

Previous section has revealed that the problems of livestock sector are of two kinds: those relating to uneven distribution of farm power and those relating to low quality of animals arising from feed shortage. Solutions are suggested to solve each of the above two problems. Priority areas emerging from discussions with officials of Livestock Directorate are the following:

1. Livestock feed
2. High breed of cattle
3. Prevention of livestock diseases
4. Technological development in harnessing plough
5. Power tiller cultivation

Livestock Feed

Cattle feed of short growing period and appropriate forages should find places in the farmers' cropping patterns. Sound cropping patterns should be evolved by incorporating such feeds and forages, which also improve the fertility of land. Such crops are various legume crops which improve the nitrogen content of the soil by fixing atmospheric nitrogen through their nodule bacterial. Fodder trees whose foliages are good cattle feeds and their wood have timber or fuel value should be selected to suit different regions. All agro-industrial wastes such as sugar cane bagasses, cotton wastes, rice hulls, etc. should be converted into good semi-concentrate feed-mix after properly being mixed with urea. All slaughter house wastes such as blood meal, bones, meat offals should be scientifically processed and properly utilized as livestock feed. Finally, treatment of straw with urea should be popularized among the farmers. Such treatment generally increases the rate of fiber digestion, which can help increase productivity of animals.

High breed of Cattle

Livestock sector can be improved by devising better breeding principles. Village people, on account of ignorance or poverty generally impregnate their cows by using scrub bulls and their results are weak genetic production. Here suggested strategies are (a) setting up of demonstration dairy-cum-breeding center at each upazila and union level; (b) technicians should be trained to practice artificial inseminations and; (c) setting up of research farms at regional level so as to evolve right type of breeds of cattle suitable for the climate.

Prevention of Livestock Diseases

Present measures of curing livestock disease are quite inadequate. The availability and production of vaccines is too insufficient to meet the country's need. Here the strategies needed are: (a) production of effective vaccines in sufficient quantities to meet the country's need; (b) distribution of veterinary medicines in every village and unions of the country; and (c) as there is extreme shortage of trained practitioners of veterinary medicines a large number of village mid-level veterinary practitioners may be produced by giving short time training to mid-level educated villagers.

Technological Development and Management of Animals

Besides the above three strategies, another area where technological changes are needed relates to the farm power resources through livestock output. The full potential of even the healthy draft animals can not be realized without efficient implements, including harnessing systems. The traditional wooden ploughs of various shapes and sizes are considered inefficient. Such ploughs do not move steadily at a uniform depth and therefore yield poor tillage. The present harnessing system of keeping the yoke on the hump of the animal is also inefficient and harmful to animals. It causes hump sores, which prevent animals from exerting maximum thrust and thus results in lesser power output from animals.

Increasing farmers' knowledge and management are also important variables for development of the livestock sector. Farmers should be educated about the availability of feed, quantity and composition to be given to animals of different type, size and age groups; diseases and their medicines etc.

Power Tiller Custom Service

The above four measures are designed to improve the quality of animals or implements and thereby to increase the supply of farm power for meeting the growing demand. These measures would take some time before the benefits would be forthcoming and power tiller cultivation can be recommended to meet the immediate shortage of draft power. Mechanization by power tillers would reduce cultivation cost both for small and large farmers, remove yield-losses of small farmers and restore a segment of the cow population to its traditional role of supplying milk. An economic analysis on the custom services of power tillers show that for annual operation of 1600 hours, total variable cost becomes Tk. 12,720, which when added to total fixed cost of Tk. 11,380 give average cost per acre of Tk. 291 (table 6). With assumed 15 percent profit rate charged by owners, power tiller custom rate per acre should become Tk. 335. Survey results reveal that present average rental charges for animals per acre are Tk. 380 (table 7). Therefore cost saved by substituting animals with power tillers are Tk. 45 per acre. Availability of power tillers to small farmers would also eliminate delays in ploughing. Per acre return gained by ploughing and in time is calculated to be Tk. 606 per acre per season. Therefore net gain with power tiller cultivation becomes

Tk. 1742 per year per acre for small farm holders having cropping intensity of 245 percent. Large farm holders would also be benefited from reduced cultivation cost with power tillers as well as from performing custom service. For 1600 hours annual operation comprising land preparation in large farmer holders own fields (average cropped area of 16.7 acres) plus custom service on remaining 66.2 acres net yearly gain from power tiller ownership becomes Tk. 3664.

Conclusion

The two major problems that were identified to stand in the way of the development of the livestock sector are (1) uneven distribution of farm power among different classes of farmers and (2) low availability of draft power arising from poor quality of animals. Both problems are serious enough to deserve policy actions from appropriate authorities. Suggested policies fall into three groups: the first group aim at improving the quality of animals by developing livestock feed, generating high breeds of cattle and preventing livestock diseases; the second type attempt to improve the present harnessing system of keeping the yoke on the hump which is inefficient and harmful to animals; and the third type recommends cultivation by power tillers. Mechanized cultivation may result in lower employment opportunities as compared to animals. Survey findings reveal that each pair of animal generate 4.05 man-months of employment per year and that a power tiller displaces 12.2 pairs of animals ;per year so that over 49 man-months of labor becomes unemployed over the year (table 8). This adverse distribution effect can be circumvented by providing tillers to landless and marginal farmers. The economic analysis on the custom service with power tillers reveal that power tillers can complete with animals.

Table 6: Cost and Returns for Power Tiller
(Experimental station data)

Cost of imported power tiller	Tk. 45,000
Year of service	10 years
Hours operated in a year	1600 hours
Salvage value (10% of purchase price)	Tk. 4,500
Acres cultivated in a year	82.9
Interest rate	15%
Diesel cost per acre	Tk. 95.3
Diesel consumption per acre	2.83 gallon
Hours needed to cultivate an acre	19.3 hours
Lubricant cost per acre	Tk. 9.5
Repair and maintenance cost per year	Tk. 3,735
Fixed Cost Per Year	
Depreciation	Tk. 4,050
Interest on investment	Tk. 3,712
Repair and maintenance	Tk. 3,618
Total	Tk.11,380
Variable cost for 1600 hournul opration	Tk.12,720
Average total cost per acre	Tk. 291
Power Tiller custom rate assuming 15% profit	Tk. 335

Source: Agricultural Engineering Department
Bangladesh Rice Research Institute, Joydebpur, Dhaka

Table 7: Cost of Animal Ownership and Cultivation (Survey Data)

Cost of average bullock (a pair)	Tk. 4,932
Years of normal service	Tk. 10.9 years
Days operated in a year	122 days
Salvage Value	Tk. 1,020
Acres cultivated in a year	7.4 acres
Interest rate	15 percent
Fixed Cost Per Year	
Depreciation	Tk. 352
Interest on investment	Tk. 452
Feed cost (opportunity cost	
Rice straw	Tk. 580
Rice bran	Tk. 95
Oil cake	Tk. 60
Cost of maintenance labor	Tk. 675
Other incidental expenses	Tk. 250
Total Fixed Cost Per Acre	Tk. 2,464
Total cost per acre	Tk. 333
Rental rate charged per acre for animal (Survey data)	Tk. 380
Profit rate	14 percent

Table 3: Man-Days Generated by Animal Cultivation System.

<u>Number of ploughings made per acre per cultivation*</u>	<u>Area cultivated by animals per year (acre)</u>	<u>Man-months of labor employed per animal per year</u>
Bogra		
5.4	6.7	3.63
Chittg		
5.6	8.8	4.93
Noakhali		
5.4	5.1	2.76
Weighted average		
5.5	7.4	4.05

* 1 ploughing per acre requires three animal-days.