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Socioeconomic Survey On Small-Scale Rural Mixed Farming (Crop/Livestock) of Bangladesh With a View to Introducing Fodder Legumes in Their Cropping System

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SOCIOECONOMIC SURVEY ON SMALL-SCALE RURAL MIXED FARMING (CROP/LIVESTOCK) OF BANGLADESH WITH A VIEW TO INTRODUCING FODDER LEGUMES IN THEIR CROPPING SYSTEM

A LIVESTOCK PRODUCTION PROGRAMME

BANGLADESH AGRICULTURAL UNIVERSITY
MYMENSINGH, BANGLADESH

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EXECUTIVE SUMMARY

A survey was conducted on the farming systems and socioeconomic condition of the rural farmers in two Thanas (small administrative unit) namely, Trishal and Muktagacha about 17 and 20 km (respectively) away from the Mymensingh town. In each site, a total of ten villages, each having ten farmers (five small + five medium) were selected for the study. The average family size and literacy rate of all farmers in two survey sites were higher compared to the national average. The farmers (earning members) of both categories are occupied with farming, mainly crop farming. A few percentage (9-13%) of them are principally occupied with business and salaried jobs.

The average farm income earned by medium farmers was considerably higher than that of small farmers, however, the overall per farm income is, to some extent, higher than the national average. Contribution of cereal crops to this income is the highest and livestock rearing contributed 15% of the income. Non-farm income was also higher in medium than small farmers. Above all, the farm size is the key factor which influence significantly to determine the income of farm household. The average size of farm area for small farmers is 0.70 hectare and for medium farmers, it is 1.80 hectares. Homestead and fallow area were higher in medium farmers than in small farmers. This land can be utilized for growing fodders to feed their livestock. The predominating land type in both survey areas is medium land (74%) followed by high land (18%) of which major portion is irrigated land and brought under cultivation of boro rice. The major cropping pattern in high land is Jute/Aus rice-Transplant Aman rice-Fallow. In medium land there are 6 different major cropping patterns of which the predominating one is Transplant Aman rice - Boro - Transplant Aus rice. In the low land the major cropping pattern is Boro - Fallow - Fallow.

Small farmers, irrespective of area, have an average of 0.61 hectare of cultivable land per farm, whereas, the medium farmers possess 1.64 hectares. Similar picture is evident as regards total livestock holding; medium farmers have more livestock (22.3 heads per farm) than do have small farmers (15.9 heads per farm). The relationship between land holding and livestock holding is reciprocal. However, between the categories, irrespective of sites, the relationship is positive. The farmers produce only rice straw and rice polish that are by-products of paddy harvest and rice milling, respectively. Green grass and unconventional items are not produced by farmers as animal feed, rather these are procured and collected from crop field (as weed), homestead or as waste. Irrespective of area,

medium farmers produce higher amount (4%) of leguminous green roughage than that by small farmers (1%). The major source of leguminous green roughage is crop land and only 5% of the interviewed farmers cultivate it in the field occasionally when the situation permits. However, the major sources of non-leguminous roughage are road sides and field plot boundaries as well as weeds of crop land. The main problem of livestock rearing are shortage of feed, particularly green roughage, and lack of high yielding animals.

In almost all the small farm households the farm activities are performed by the family labours, however, in the medium farmers, family members can afford only fraction of their labour to perform farm activities, since some of them are engaged in jobs and businesses. As regards labour use, during the pick season of farm activities, medium farmers hire more labour than small farmers.

According to the farmers' opinion, straw alone cannot satisfy the requirement of their animals and it should be added with green grass and concentrates of which the former item can be grown in road sides, plot boundaries of crop land, homestead areas and fallow land. Because of the high demand of cultivation of boro rice, the farmers are loosing interest in cultivating legume crops.

Almost all the farmers are interested to produce legume fodders if there are ways and means. The majority (70%) of farmers, irrespective of categories and study areas, supported the intervention of legume fodders in their cropping system with its minor change.

1. INTRODUCTION

The present livestock population of Bangladesh is 23.7 million cattle, 0.8 million buffaloes 14.0 million goats, 0.7 million sheep and 73.5 million heads of poultry (FAO, 1992). The vast majority (82%) of this population is located in the rural areas and reared by the small holders (BBS, 1994). Shortage of feed is the major constraint to the improvement of livestock in this country.

The major roughage source for ruminants throughout the country is rice straw, which is deficient in digestible protein and micronutrients essential for microbial growth and subsequent utilization of feed by the animal. Of the various methods used for improving the digestibility of straw, urea treatment was the mothod experimented with most widely. Howevre, there has been no adoption of this method by the rural farmers (Doyle *et al.*, 1986; Akbar, 1992). The method is tedious and urea treatment makes no contribution to the supply of micronutrients. Evidence suggests that the efficient utilisation of poor quality roughages by ruminants, requires dietary supplementation with suitable feed ingredients that supply sufficient fermentable and bypass protein, as well as micronutrients (Preston, 1986; Saadullah, 1990; Devendra, 1990). Thus, straw diet must be supplemented with fermentable nitrogen, highly digestible forages or bypass protein (Preston, 1986).

In Bangladesh, particularly in the rural areas, livestock are kept in smallholder mixed crop/livestock farming systems. Here, crop production is the main agricultural activity and livestock are kept as the secondary or supportive service to land cultivation. The production of feed for livestock is not given much importance because of the shortage of land for fodder cultivation. Straw is the main feed for ruminants in the rural areas, except in rainy season, when some poor quality grasses are supplied from roadsides in a cut and carry system. In the rural areas, livestock production is constrained by the wide fluctuations in quality and quantity of feed resources throughout the year. There is a serious shortage of fodder legumes in Bangladesh, that are rich in digestible protein and micronutrients (Saadullah, 1990), that can be used as efficient supplement to straw-based rations for ruminants (Khan *et al.*, 1990) and as a source of nitrogen for non-legume food crops for human consumption (Haque, 1992).
Given the above circumstances, alternative systems for the production of legume and other fodders must be found out. These include the introduction of legumes into existing cropping systems of farmers so that the same land may be used for food crop cultivation for humans as well as for legume fodder cultivation for feeding livestock. This may necessitates minor alterations in the existing systems of crop production.

1.1 Background

Rice straw constitutes the major feed for ruminant animals in Bangladesh. The farmers use very little or no concentrates in the rations of animals. Because of the scarcity of cultivable land, farmers do not grow fodder specifically for livestock. A small quantity of roadside grasses is supplied to the animals in the rainy season. However, the roadside grasses are very poor in nutritive value (Khan, 1993). Therefore, a shortage of feed particularly green fodder, is the most important constraint to improving the productivity of cattle in the rural areas of Bangladesh.

Preliminary study on levels of milk production, as affected by different diets based on urea-treated straw, suggested that even high quality rations containing fishmeal responded well when supplemented with green grass (Khan *et al.*, 1990). Of the green fodders, legumes are of good quality and contain high level of protein and micronutrients.

There are a number of leguminous fodders available in the country such as khesari (Lathyrus sativus), cowpea (Vigna unguiculata) sunhemp (Crotalaria juncea), Leucaena leucocephala and species of Sesbania. Of these, Sesbania is of particular important because of its special qualities. It is a tree legume used for soil fertility regeneration and also for fire wood. There is now growing interest in the use of Sesbania as a supplement to low quality diets for ruminants. Khan *et al.* (1990) found that supplamentation in straw-based diets with Sesbania increased production of milk in local cows. There are two varieties of Sesbania available in the country: *Sesbania aculeata*, which is indigenous, and *Sesbania rostrata,* which is recently introduced exotic one. Studies have shown that *S. rostrata* produces more dry matter and has a higher crude protein content than S. aculeata (Akbar., 1993). It is also well eaten by ruminants (Akbar *et al.*, 1994). Moreover, it can be propagated vegetatively and can stand waterlogging in the field. The possibilities for integration of this legume into the cropping systems of rural farmers have been reported by several authors. It has been suggested that there are some advantages in using *S. rostrata* as green manure to improve soil fertility and structure in lowland rice production. Haque (1992) also reported the use of legumes as intercrops, enhancing both crop yield and providing high quality feed for livestock.

Considering the above situation, it was felt that *S. rostrata* and other suitable legume fodders could be introduced into the existing cropping systems used by rural farmers in Bangladesh, without interfering with traditional production practices.

1.2 Objectives

From the discussions in the above section, it is evident that legume fodders can be used as supplements in straw-based rations for ruminant livestock. The nutritive value of legume fodders, including *S. rostrata*, for productive animals has been evaluated and reported. In addition, there are reports that *S. rostrata* and other fodder legumes can be integrated into crop production practices and rice yields increased. However, the integration of legume fodders, including *S. rostrata*, into crop production systems would be a new technology for resource poor farmers. Accordingly, the on-farm development and transfer of this technology will form the basis for a three year project submitted to the ODA Livestock Production Programme for financial support. Before the establishment of the programme, it was necessary to undertake a field survey with the following objectives.

1 To study the socioeconomic conditions, existing cropping systems and livestock management practices of the smallholder mixed farmers in the rural target areas.

2 To assess the awareness of farmers regarding the importance of legume fodders and their interest in cultivation of these fodders as animal feed.

3 To develop suitable means of introduction of legume fodders into existing cropping systems.

4 To modify the project memorandum submitted to the NRI, in the light of the findings of the survey.

2. METHODOLOGY

2.1 Sample Selection

A great majority (75%) of farm households in Bangladesh are small farmers owning land between 0.02 to 3.03 hectares. Only 4% are large farmers and the remaining 21% are either landless or have land less than 0.02 hectare (BBS, 1994). The present study targeted and selected only small farmers in two Thanas (sub-district or small administrative unit), namely Trishal and Muktagacha in Mymensingh district.

The main objective of the present survey was to document the socioeconomic conditions of small farmers, their cropping patterns, interest in legume production etc., with a view to finding suitable systems of integration of legumes into the present farming systems, with/without minor changes in the present cropping pattern. For simplicity, sample farmers were categorized into two groups according to their size of land holdings, small (0.02 to 1.01 ha) and medium (1.02 to 3.04 ha). Small and medium farmers who owned at least two and four cattle, respectively, were selected as sample farmers.

Several visits were made in the study areas and 10 villages selected from each Thana. A list of farmers was then prepared for each village in the two Thanas. From each village, five small and five medium farmers were selected randomly from the list. In total 200 farmers were selected, of which 100 were small and 100 were medium farmers (Table 2.1).

Table 2.1 Sampling design and distribution of sample farmers

Sample areas	Selected Villages (No.)	Small farmers (No.)	Medium farmers (No.)	Total farmers (No.)
Trishal	10	50	50	100
Muktagacha	10	50	50	100
Trishal and Muktagacha	20	100	100	200

2.2 Data Collection

For this study, data and information were collected from the heads of the farm households. The information was collected by direct interviews through the field investigators.

Following the objectives of the study, a structured questionnaire was developed and used for the survey. The questionnaire was pretested in the field and necessary changes made before the final survey was undertaken. The main information collected were socio-demographic characteristics of farm households, household income from farm and non-farm sources, size of land holdings, cropping systems and land use patterns, livestock rearing and management practices, animal feed production and requirements, effects of shortage of green roughage supply, involvement of household members in farm and non-farm activities and farmers attitudes to the introduction of legumes into existing farming systems. Data were collected covering one production period during 1994-95.

2.3 Analytical Framework

Farm operator or owner of households were taken as the unit for analysis. The data and information so collected were reduced to tabular form, which included classifications of tables into meaningful results by using arithmetic mean, percentage and ratio.

Most of the analyses were done by categorizing the respondent households into two land ownership groups, small (0.02 to 1.01 ha) and medium (1.01 to 3.03 ha). Although sample households were drawn on the basis of land holding and number of cattle owned, the analysis was done by land ownership groups, as socioeconomic status and livestock rearing are directly related to the total size of land. Farmers were selected from 20 villages in two locations (Trishal and Muktagacha Thanas) within one district, but the analysis was done on a location basis not on a village basis, as there is no significant difference in topography and socioeconomic conditions of farmers living different villages in the same location.

3. SOCIODEMOGRAPHIC AND HOUSEHOLD ECONOMICS OF SMALL FARMERS

3.1 Demographic Profile of Households

The family and its composition are related to occupation and income. Table 3.1 shows that family size is related to the size of land holdings. Medium farms had larger family sizes (8.86) than do small farms (6.19). The average family sizes of small farms in Trishal (6.19) and medium farms in Muktagacha (9.36) were larger than those of the other groups of farmers in Muktagacha and Trishal. However, considering both the areas, the average family size of all farms was 7.52 persons, with 32% of males and 22% of females in the 15 to 60 years age bracket and considered as working members. It may be noted here that the numbers of working members, including both males and females were slightly higher for the two categories of farms than the family members aged below 15 years. The average family size of all farms (7.52) appears to be higher than the national average of 5.6 members (BBS, 1994).

Among the sample farmers 32% had no education. Illiteracy rates were almost the same for both small and medium farmers. Only 37% of small farmers and 29% of medium farmers had primary education (Table 3.2). Twenty-five and 10% of farmers from both categories were educated to secondary and above secondary levels. However, as the study areas were near to the peri-urban areas, literacy rate was considerably higher than the national average of 32.4% (BBS, 1994).

3.2 Household Occupational Profile

Irrespective of size of holding, the overwhelming majority (82%) of the sample farmers had farming as principal occupation (Table 3.3). Farming here included crop production, livestock rearing and, to some extent, fish-farming. Livestock rearing is often a supplementary activity for small-scale farmers. Only 9% of small farmers and 13% of medium farmers in the two areas were principally occupied with business. Considering both categories, 7% of farmers were engaged in salaried jobs.

Table 3.3 also shows the occupational structure of other family members of the sample farms. It may be noted here that, in the case of both small and medium farmers, 24-34% of household members (irrespective of gender) were student at different levels of education. Many of them were < 15 years of age and were not involved in income generating activities.

Almost all wives were engaged in housekeeping. However, when both males and females were taken into consideration, only 18-24% of family members were found to be engaged in this activity. Very few household members were engaged in activities such as farming and trading or in salaried jobs. However, for both types of farm households, some under-aged members were engaged in either farming or other works.

Table 3.1 Family size and age distribution of household members of farm families

Categories of farmer	Family members (No.)	< 15 years		15-60 years (working members)	
		Male (No.)	Female (No.)	Male (No.)	Female (No.)
Small farmers:					
Trishal n = 50	6.46	1.56 (24)	1.60 (25)	1.98 (31)	1.32 (20)
Muktagacha, n = 50	5.92	1.04 (18)	1.66 (28)	1.76 (30)	1.46 (24)
Trishal-Muktagacha, n = 100	6.19	1.30 (21)	1.63 (26)	1.87 (30)	1.39 (23)
Medium farmers:					
Trishal n = 50	8.36	2.14 (26)	1.88 (22)	2.64 (32)	1.70 (20)
Muktagach, n = 50	9.36	1.82 (19)	2.08 (22)	3 16 (34)	2.30 (25)
Trishal-Muktagacha, n = 100	8.86	1.98 (22)	1.98 (22)	2.90 (33)	2.00 (23)
All farmers, n = 200	7.52	1.65 (22)	1.80 (24)	2.38 (32)	1.69 (22)

Figures within parentheses indicate percentage of total family members.

Table 3.2 Educational status of sample farmers

Education	Small farmers			Medium farmers			All farmers n = 200 (No.)
	Trishal n = 50 (No.)	Mukta-gacha n = 50 (No.)	Trishal and Mukta-gacha n = 100 (No.)	Trishal n = 50 (No.)	Mukta-gacha n = 50 (No.)	Trishal and Mukta-gacha n = 100 (No.)	
No education	18 (36)	16 (32)	34 (34)	14 (28)	17 (34)	31 (31)	65 (32)
Primary level	21 (42)	16 (32)	37 (37)	13 (26)	16 (32)	29 (29)	66 (33)
Secondary level	7 (14)	15 (30)	22 (22)	17 (34)	10 (20)	27 (27)	49 (25)
Above secondary level	4 (8)	3 (6)	7 (7)	6 (12)	7 (14)	13 (13)	20 (10)

Figures within parentheses indicate percentage of total

3.3 Household Income

3.3.1 Farm Income

The average annual incomes for sample farm households are shown in Table 3.4. Level of farm income depends mainly on farm size and farm enterprises. Table 3.4 also revealed that there was a large variation in farm income earned by small and medium farmers. Since the size of land holding was very low for small farmers, the average farm income was only Tk 39,767. On the other hand, the average farm income of medium farmers was Tk 101,936. This is more than 250% higher than that of small farmers because their farm size was about 2.5 times higher. Average farm size, distribution of cultivable land for cropping and annual production for the two categories of farmers are shown in Table 3.5. The overall farm income in the study areas seems to be considerably higher than in other areas of the country. There are two reasons for this. Firstly, Trishal and Muktagacha are rice-growing areas and most of the farmers produced 2-3 crops of rice in a year. Therefore, their total production was relatively high. Secondly, the price of rice recently increased from Tk 8,000 to Tk 9,500 per ton.

3.3 Distribution of principal occupation of farmers and other family members

Occupation	Small farmers			Medium farmers			All farmers
	Trishal	Mukta gacha	Trishal + Mukta-gacha	Trishal	Mukta-gacha	Trishal + Mukta-gacha	
Respondent	n=50 %	n=50 %	n=100 %	n=50 %	n=50 %	n=100 %	n=200 %
Farming	90	84	87	76	80	78	82
Petty trading	6	12	9	8	18	13	11
Service (salaried job)	4	4	4	16	2	9	7
Other family members	n=273 %[a]	n=246%[a]	n=519%[a]	n=368%[a]	n=418%[a]	n=786%[a]	n=1305 %[a]
Farming	12	13	13	8	13	11	11
House keeper	21	24	22	18	18	18	20
Petty trading	3		2	3		2	2
Service	2			3	3	3	2
Student	24	30	27	34	27	30	21
Others (Doctor; Driving)	-	-	-	-	2		

[a]The sum of percentage may not equal to 100 because some family members do belong to these occupation as indicated in this table.

Table 3.4 Average annual farm income (Taka) of sample farm households

Sources of income	Small farmers						Medium farmers						All farmers n=200	
	Trishal n=50		Mukta-gacha n=50		Trishal + Muktagacha n=100		Trishal n=50		Mukta-gacha n=50		Trishal + Mukta-gacha n=100			
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Crops:														
Cereals	25336	77.4	32449	69.4	28893	72.7	86097	81.7	75614	76.8	80856	79 3	54875	77.4
Jute	377	1 2	467	1.0	422	1.1	933	0.9	1515	1.5	1224	1.2	823	1.2
Legumes and oil seeds	92	0.3	598	1.3	345	0.9	644	0.6	3821	3.9	2233	2 2	1289	1.8
Fruits	652	2.0	[illegible]	[illegible]	326	0.8	1800	1.7	[illegible]	[illegible]	900	0.9	613	0.9
Vegetables	1045	3.2	1498	3.2	1272	3.2	3632	3.4	1782	1.8	2707	2.7	1990	2.8
Livestock.														
Value added from livestock	370	1.1	3904	8 3	2137	5.4	5206	4.9	5400	5.5	5303	5.2	3720	5 3
Milk	4072	12.7	3373	7.2	3723	9.7	5858	5 6	4751	4.8	5303	5.2	4514	6.4
Poultry birds and eggs	502	1.5	2691	5.7	1597	4.0	638	0.6	3006	3.1	1822	1.8	1710	2.4
Pond fish	304	0.9	1800	3.8	1052	2.6	612	0.6	2560	2.6	1586	1 5	1319	1.9
Total	32750	100	46780	100	39767	100	105420	100	98449	100	101936	100	70853	100

(Exchange rate; 1 £ = 62 Taka)

Table 3.5 Distribution of cultivable land for different crops and annual production

Indices	Small farmers			Medium farmers			All farmers n = 200
	Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	
Average farm size (hectare)	0.68	0.72	0.70	1.75	1.86	1.80	1.25
Rice:							
Area (ha)	0.51	0.61	0.56	1.48	1.62	1.55	1.05
Production (Kg)	3194	3907	3550.5	10418	10010	10214	2286
Income (Tk)	24943	31384	28163.5	84915	74761	79838	54001
Wheat:							
Area (ha)	0.04	0.07	0.05	0.09	0.06	0.07	0.06
Production (Kg)	54	137	95.5	158	116	137	116.9
Income (Tk)	393	1064	729	1382	853	1118	791
Jute:							
Area (ha)	0.03	0.02	0.03	0.04	0.08	0.06	0.04
Production (Kg)	36	44	40	79	173	126	83
Income (Tk)	377	467	422	933	1515	1224	823
Oil Seed & Legume:							
Area (ha)	0.01	0.06	0.04	0.05	0.23	0.14	0.09
Production (Kg)	5.63	30	17.81	38.3	195	116.65	67.2
Income (Tk)	92	598	345	64.4	3821	2232.5	1289
Vegetables:							
Area (ha)	0.02	0.03	0.02	0.03	0.03	0.03	0.03
Production (Kg)	323	218	270.5	346	269	307.5	289
Income (Tk)	1045	1498	1271.5	2595	1782	2188.5	1730
Fruits:							
Income (Tk)	652	-	652	1800	-	1800	1226

Cereal crops (rice and wheat), livestock and pond fish production are the main enterprises contributing to farm income. Cereal crops, mainly rice, contributed 72.7% and 79.3% to the farm income of small and medium farmers, respectively. For both categories of farmers, livestock and their products (milk and eggs) contributed about 14% to farm income. This was followed by vegetables, aquaculture, and legume and oilseed production. The distribution of income by farm size category shows that small farmers in Muktagacha and medium farmers in Trishal earned higher level of farm income (Tk 46,780 and Tk 105,420 respectively) compared to the same group of farmers in the same area. This was because the production of cereal crops and livestock was higher than that of other farmers in the same category.

3.3.2 Non-farm Income

Like farm income, the average non-farm income of medium farm households (Tk 28044) was higher than the income of small farm households (Tk 10281). The most important components of non-farm income were petty trading, wage and salaries from non-agricultural sources (Table 3.6). Medium farmers gained larger share of income from wages and salaries, as more family members were employed with government office and NGO programmes. Earnings from small trading for medium farmers was twice than that of small farmers. In addition, some of the members of medium farm households in Muktagacha drove tractors or power tillers, and a few of them were village doctors who earned a good salaries. Income from all these activities increased the level of non-farm income of medium farmers compared to that of small farmers.

3.3.3 Total Household Income

The average household income earned by the respective categories of farmers are shown in Table 3.7. Average household income is the summation of farm and non-farm income of farm families, and it was estimated to be Tk 50,048 and 129,980 for small and medium farmers, respectively. For both categories of farmers, farm income contributed more than 70% to total household income. However, it seems that the overall socioeconomic status of medium farmers was better and the per capita income (US $ 442) was higher than the national average of US $230 (World Bank, 1994). On the other hand, the average household income for the small farmers was less than half of the medium farmers, since small farmers had little access to resources. However, the results indicate that farm size is the key factor which influences significantly the income of farm households.

Table 3.6 Average annual non-farm income (Taka) of sample farm households

Indices	Small farmers						Medium farmers						All farmers n = 200	
	Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100			
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Petty trading	9684	73	4416	61	7050	69	16660	51	12660	49	14660	52	10855	57
Wages and Salaries (Services)	3631	27	2831	39	3231	31	15696	49	8937	35	12316	44	7774	40
Driving	-	-	-	-	-	-	-	-	2952	11	738	3	369	2
Village Doctor	-	-	-	-	-	-	-	-	1320	5	330	1	165	1
Total	13315	100	7247	100	10281	100	32356	100	25869	100	28044	100	19163	100

(Exchange rate; 1 £ = 62 Taka)

3.4 Expenditure Pattern and Surplus Income

3.4.1 Expenditure

Table 3.8 shows annual expenditure in the two categories of farm households. The expenditures were divided into five categories, of which three are related to basic human needs of food and clothing, education and medication. The small farmers used 70% of their expenditure on basic items, while medium farmers, whose income was relatively higher, spent 63% of income on the basic items. Food and clothing was the most important item of expenditure. The information revealed by the study confirmed Engel's Law that expenditure on food increases with a decrease in income. Medium farmers used 37% of their expenditure for agricultural production, compared to 29% for small farmers.

Table 3.7 Summary of total income of sample farm households

Categories of farmers	Farm income		Non-farm income		Total income
	Taka	% of total income	Taka	% of total income	Taka
Small Farmers:					
Trishal, n=50	32750	71	13315	29	46065
Muktagacha, n=50	46780	87	7247	13	54027
Trishal + Muktagacha, n=100	39767	79	10281	21	50048
Medium Farmers:					
Trishal, n=50	105420	77	32356	23	137776
Muktagacha, n=50	98418	79	25869	21	124318
Trishal + Muktagacha, n=100	101936	78	28044	22	129980
All farmers, n=200	70853	79	19163	21	90016

(Exchange rate; 1 £ = 62 Taka)

3.4 2 Surplus Income

Table 3.9 shows family and per capita surplus incomes for small and medium farm households on annual and monthly basis. The table shows an interesting picture of surplus income differences in the two categories of households. Since the medium farmers' households earned a higher level of income, they also generated substantial surplus incomes compared to the small farmers.

The annual surplus income on the medium farm households was estimated to be Tk 45,460 or Tk 5,112 on a per capita basis. On the other hand, the small farmer households had an annual surplus income amounting to only Tk 11,515 or was Tk 1,860 on a per capita basis.

3.8 Average annual expenditure (Taka) of sample farm households

Categories of farmers	Heads of expenditure						
	Food and Clothing	Education	Health care	Sub-total	Agril. Production	Others	Total
Small Farmers:							
Trishal, n = 50	25089 (60.5)	2286 (55)	2557 (62)	29932 (72.2)	10778 (26.0)	750 (1.8)	41460 (100)
Muktagacha, n = 50	20078 (56.4)	1942 (55)	1784 (5)	23804 (66.8)	11604 (32.6)	197 (0.6)	39605 (100)
Trishal + Muktagacha, n = 100	22584 (58.6)	2114 (55)	2171 (56)	26869 (67.7)	11191 (29.1)	473 (1.2)	38533 (100)
Medium Farmers:							
Trishal, n = 50	44847 (50.4)	7536 (59)	5258 (59)	57641 (64.8)	29580 (33.2)	1796 (2.0)	89017 (100)
Muktagacha, n = 50	37461 (46.8)	6438 (80)	4082 (52)	47981 (60.0)	31690 (39.6)	352 (0.4)	80023 (100)
Trishal + Muktagacha, n = 100	41154 (48.7)	6987 (83)	4670 (55)	52811 (62.5)	30635 (36.2)	1074 (1.3)	84520 (100)
All farmers, n = 200	31867 (51.7)	4551 (74)	3421 (56)	39841 (64.8)	20913 (34.0)	774 (1.3)	61527 (100)

(Exchange rate; 1 £ = 62 Taka)
Figures within parentheses indicate percentage of total

Monthly and per capita incomes of medium farm households were respectively Tk 3,788 and Tk 316. On the other hand, comparable values for small farm households were Tk 960 Tk 155, respectively. Table 3.9 shows that the annual surplus income of medium farm households was 395% higher than that of small farmers. On a per capita basis (both annually and monthly), surplus income of medium farm households was 275% higher than that of small farmers. This was due to the family size of medium farmers being relatively larger than that of small farmers, which decreased the surplus income on a per capita basis. While there was a small variation of surplus incomes within medium farm households in the two study areas, the income difference was larger in the case of small farmers in the same area.

Table 3.9 Surplus income (Taka) of sample farm households

Income	Small farmers			Medium farmers			All farmers n = 200
	Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	
			Annual				
Family	4605	18422	11515	48759	44295	45460	28489
Per capita	713	3112	1860	4732	4732	5112	3788
			Monthly				
Family	384	1535	960	4063	3691	3788	2374
Per capita	59	260	155	486	394	426	316

(Exchange rate; 1 £ = 62 Taka)

4. LAND HOLDING AND EXISTING FARMING SYSTEMS

4.1 The Small Farm Setting

Bangladesh is one of the most densely populated countries in the world and as a result, per capita arable land is very low. In Section 2 it was mentioned that, of the 17 million households in Bangladesh, 75% are small farmers and some of these farmers are landless. Due to its subsistence nature, agriculture in Bangladesh is characterized by diversified farming to meet the household requirements and to minimize the risk and uncertainty. Dillon and Hardaker (1993) stated that small farmers have two characteristics, their small size of land in terms of resources and their low level of income.

Almost everywhere, the agricultural sector is being developed and advanced through the adoption of improved technology. However, this advancement has provided little benefit to the resource poor small farmers because most of them are unable to purchase the required inputs. In addition, they are unable to apply inputs in a timely manner and as a result, yields are low. For whatever reason, the development of new technologies sometimes leaves small farmers worse off than before (Shaner et al., 1982). This happens when large farmers adopt new technologies and small farmers do not. However, in recent years, policy-makers have been paying more attention to the problems of small farmers in food production for human consumption and feed for animals.

There is an interrelationship between crops produced and livestock reared in crop-livestock mixed farming systems. Accordingly, a major objective of this study is to examine the existing farming practices so that legume fodders can be introduced in small farmers agriculture.

4.2 Small Farmers and Farming Systems

Most small farmers have similar objectives. These include the development of more farm enterprises, the generation of more agricultural products and income throughout the year, and the reduction of risk. Small farmers try to develop as many enterprises as their farming system (FS) allows within the present socioeconomic and agroclimatic condition, and in accordance with household goals, preference and resources (Islam and Bakshi 1992). In small farming in Bangladesh, there are three main components, crops, livestock and fisheries. However, within a given component, farmers produce different types of enterprises such as cereals, oilseeds and vegetables within the crop component; cattle, goats, sheep and poultry in the livestock component. Therefore, on the basis of enterprise combination, many types of FS are found in Bangladesh. Almost all the enterprises are interrelated

and interdependent. Sometimes the products of one enterprise are used directly for another enterprise. The household provides labour and management, crops provide opportunities for increasing production and the standard of living. In this regard, more national and international research organisations are directing their attention to the problems of small farmers. Considering these circumstances, a major aim of the present study is to generate more appropriate technologies to increase the productivity of the farming system so that changes can be made for the benefit of small farmers.

4.3 Land Ownership and Size of Holding

Land is the most important asset for farm household because farm families depend mainly on the land. Table 4.1 presents the ownership pattern and tenurial arrangements for the different categories of sample farmers. Average farm size varied widely between small and medium farmers, but there was only small variations within the same group of farmers in the two study areas. Usually, small farmers are resource poor with small land holdings (0.61 ha). For medium farmers, the average cultivable land was 1.65 ha, which was about 2.7 times higher than that of small farmers.

In each category, some farmers increased their crop land through purchase or met the household needs through tenurial arrangements. Since small farmers owned small areas of land, they rented in more land (0.08 ha) compared to medium farmers (0.06 ha). This might indicate that small farmers have surplus manpower for crop production. Some of the small and medium farmers rented out land, but the average size of rented land of medium farmers was above 3 times larger than that of small farmers. Again, the homestead area was larger for the medium farmers (0.15 ha) than for the small farmers (0.08 ha) which is due to the greater total area of land on which the medium farmers built their houses compared to small farmers. Moreover, some portion of homestead areas were used by farmers to produce vegetables and fruits or kept for stall feeding of animals. However, with such limited areas of land, both small and medium farmers kept only a small portion of land as fallow. This could be utilised either for crop production or to produce fodder to feed their livestock.

4.4 Land Topography and Agroecosystem

On the basis of the topography, arable land in the study areas was divided into three categories, high, medium and low land (Table 4.2). Of these categories, medium land occupied most of the area (74%), followed by high land (18%) and low land (8%).

Table 4.1 Ownership pattern of land (hectare) and tenurial arrangement of sample farmers

Farmers category	Own	Rented in	Rented out	Fallow	Total Culti-vated land	Home-stead area	Total land
	1	2	3	4	5 = 1 + 2 + 3 + 4	6	7
Small farmers:							
Trishal, n = 50	0.51	0.07	0.01	0.02	0.59	0.09	0.68
Muktagacha, n = 50	0.59	0.08	0.04	0.004	0.63	0.08	0.72
Trishal + Muktagacha, n = 100	0.55	0.08	0.03	0.01	0.61	0.08	0.70
Medium farmers:							
Trishal, n = 50	1.58	0.05	0.09	0.05	1.58	0.17	1.75
Muktagacha, n = 50	1.68	0.08	0.08	0.03	1.72	0.14	1.86
Trishal + Muktagacha n = 100	1.63	0.06	0.09	0.04	1.65	0.15	1.80
All farmers n = 200	.09	0.07	0.06	0.03	1.13	0.12	.25

The soil in the homestead area was a sandy loam, in which different kinds of fruit were planted. Cattle, buffalo, goats and poultry were also raised in the homestead. On the high land, and even in the homestead upland area, crops such as rice, jute, wheat and potato, and some vegetables were grown.

Medium land was used mainly for producing rice of rainfed summer variety known locally as T. Aman, T. Aus, and also other cereal crops, oilseeds and pulses. In low land areas, only irrigated winter variety known locally as Boro

rice is produced However, in all types of lands, legumes could be introduced.

Table 4.2 Topographical distribution of cultivable land in the sample areas

Types of land	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
High land	17	24	20	14	19	17	18
Low land	8	8	8	9	8	9	8
Medium land	75	68	72	77	73	74	74
Total cultivable land	100	100	100	100	100	100	100

4.5 Rainfed and Irrigated land

Total cultivable land is again categorised as rainfed or irrigated lands (Table 4.3). On average, in both areas, the irrigated land area was more than the rainfed land area. As a result, more of the area was brought under cultivation of HYV Boro rice. However, irrespective of category, the farmers in Muktagacha had slightly more rainfed land than irrigated land. Small farmers had more irrigated land in the Trishal area (68%) than in Muktagacha (45%). This is also true for medium farmers in both the areas. When all the farmers were considered, irrigated areas were larger than rainfed areas (57% versus 43%, respectively).

Table 4.3 Distribution of cultivable land under rainfed and irrigated systems

Types of land	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
Rainfed	32	55	44	34	51	42	43
Irrigated	68	45	66	66	49	58	57
Total cultivable land	100	100	100	100	100	100	100

4.6 Cropping Systems

The major cropping patterns existing in the localities are shown in Table 4.4. In the high land area, the major cropping patterns are Banana --, Jute/Aus rice - Transplant Aman rice - fallow, Jute/Aus rice - Mustard/Blackgram. Banana is grown as a single crop pattern in high land in both areas. Major cropping patterns in high land include Jute/Aus rice - Transplant Aman rice - fallow. Fodder legumes can easily be grown in this system during the fallow period. Six different cropping patterns were observed in medium land. They were -(1) Transplant Aman - Boro - Transplant Aus, (2) Transplant Aman - Fallow - Boro, (3) Transplant Aman - Oilseed - Boro, (4) Transplant Aman - Wheat - Transplant Aus, (5) Jute - Transplant Aman - Boro and (6) Transplant Aus - Transplant Aman - Rabi crops. Among them Transplant Aman -Boro - Transplant Aus is the major cropping system in medium land area. In this system, the land is occupied by crops throughout the year. In the existing pattern of medium land utilisation, fodder legumes can be grown as intercrop or relay crop. In the low land, three major cropping systems were observed. Boro - Fallow - Fallow was the dominant system here. Most of the year land remains inundated and, in dry season boro rice is cultivated. In the Transplant Aman - Boro -Fallow system some legume fodder can be cultivated during the fallow period.

Table 4.4 The major cropping systems followed by the farmers in the sample areas

Cropping systems	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
High Land:							
1. Banana	14	6	10	14	6	10	10
2. Jute/Aus-T. Aman-Fallow	12	14	13	22	12	17	15
3 Jute/Aus-Mustard/Mashkalaj	2	6	4	2	2	2	3
Medium Land:							
1. T. Aman-Boro-T. Aus	34	24	29	68	48	58	49
2. T. Aman-Boro-Fallow	18	22	20	20	46	33	27
3. T. Aman-Oil seeds-Boro	2	24	13	-	52	26	20
4. T. Aman-Wheat-T. Aus	8	4	6	10	8	9	8
5. Jute-T. Aman-Boro	10	14	12	12	30	21	17
6. T. Aus-T. Aman-Rabi crops	-	4	2	2	4	3	3
Low Land:							
1. T. Aman-Boro-Fallow	2	10	6	6	18	12	9
2. T. Aman-Mustard-Boro	-	2	1	4	4	4	25
3 Boro-Fallow-Fallow	20	18	19	28	42	35	27

5. LIVESTOCK REARING AND MANAGEMENT SYSTEMS

Rural farmers in Bangladesh practice mixed farming. Farmers, both small and medium, keep livestock for different purposes. There is usually a positive relationship between size of land holding and livestock ownership. Virtually no scientific management system is followed in rearing livestock. Emphasis is given to the production of crops, particularly rice, for human consumption. However, the farmers do realise the importance of the supply of green fodder to their animals, but cannot spare land exclusively for fodder production.

The livestock sector in Bangladesh has been neglected for many years. However, more recently people are becoming more interested in rearing livestock, particularly in the urban areas. It is expected that the effects of this response will be reflected in rural areas, where the majority of the livestock population is concentrated. It is essential that improvement in the productivity of livestock be achieved in the rural areas in order to bring about the significant development of the national livestock sector.

5.1 Size of Land Holding and Livestock Ownership

Land is the main asset of the rural farmers of Bangladesh. The primary activity is the cultivation of land for crop production while livestock playing a secondary role. The average size of land holding in the Muktagacha area, irrespective of the farmer category, was slightly higher than that in the Trishal area (Table 5.1). On average, among all the categories of farmers and between the areas, the land holdings per farm was 1.13 ha. Small farmers, irrespective of area, had an average of 0.61 ha. of land per farm, whereas, the corresponding figure for medium farmers was 1.65 ha.

One important feature evident from table 5.1 is that, within the medium farmers group, the average size of livestock holding per farm in the Muktagacha area (19.8) was considerably lower than that of the Trishal area (24.8). However, in case of small farmers, the size of livestock holding between the areas are almost similar. Again, irrespective of the region, the medium farmers had more livestock (22.3) than small farmers (15.9), which could be due to the greater ability of the medium farmers to rear livestock compared to small farmers.

The ownership of livestock by the farmers in both areas highlighted two things. Firstly, the farmers are almost equally interested in rearing cattle and goats but not buffalo. Secondly, the higher number of cross-bred cows and calves compared to bulls indicates that the farmers are interested in improving genetically their cattle for milk production, rather than draught power.

The relationship between land holding and livestock holding is reciprocal. Within the category but between the sites, with the increase in land holding there is a decrease in livestock holding. This is true for both categories of farmers. However, between the categories, irrespective of sites, the relationship is positive.

Table 5.1 Size of land holding and livestock ownership of farming household

Ownership of land and livestock	Small farmers						Medium farmers						All farmers n=200	
	Trishal n=50		Mukta-gacha n=50		Trishal + Mukta-gacha n=100		Trishal n=50		Mukta-gacha n=50		Trishal + Mukta-gacha n=100			
	Total	Av	Total	Av	Total	Av	Total	Av	Total	Av	Total	Av	Total	Av
Cultivated land(ha)	29.4	0.59	31.6	0.63	61.1	0.61	78.9	1.58	85.8	1.72	164.8	1.65	225.9	1.13
Cattle:	174	3.5	160	3.2	334	3.3	255	5.1	275	5.6	530	5.35	864	4.3
Cow	66	1.3	62	1.2	128	1.3	84	1.7	94	1.9	178	1.3	306	1.5
Indigenous	57	1.1	56	1.1	113	1.1	63	1.3	74	1.5	137	1.4	250	1.3
Cross	9	0.2	6	0.1	15	0.2	21	0.4	20	0.4	41	0.4	56	0.3
Calf	47	0.9	43	0.9	89	0.9	57	1.1	59	1.2	116	1.2	206	1.0
Indigenous	41	0.8	40	0.8	81	0.8	43	0.9	43	0.9	86	0.9	167	0.8
Cross	6	0.1	3	0.1	9	0.1	14	0.3	16	0.3	30	0.3	39	0.2
Bull	29	0.6	29	0.6	58	0.6	74	1.5	88	1.8	162	1.6	220	1.1
Indigenous	27	0.5	29	0.6	56	0.6	58	1.2	76	1.5	134	1.3	190	0.9
Cross	2	0.04			2	0.01	16	0.3	12	0.2	28	0.3	30	0.2
Heifer	32	0.6	26	0.5	58	0.6	40	0.8	34	0.7	74	0.7	132	0.66
Indigenous	29	0.6	21	0.4	50	0.5	29	0.6	26	0.5	55	0.6	105	0.52
Cross	3	0.1	5	0.1	8	0.1	11	0.2	8	0.2	19	0.2	27	0.13
Buffalo			4	0.08	4	0.04	2	0.04	8	0.2	10	0.01	14	0.07
Goat	63	1.3	40	0.8	103	13	58	2	71	1.4	129	.3	232	15
Poultry:	562	11.2	583	11.7	1143	11.4	926	18.5	634	12.7	1560	15.6	2703	13.51
Chicken	474	9.5	463	9.2	937	9.35	795	15.9	554	11.0	1349	13.45	2286	11.4
Duck	88	1.8	120	2.4	206	2.1	131	2.6	80	1.6	211	2.1	417	2.08
Total Livestock	799	16.0	787	15.7	1586	15.9	1241	24.8	988	19.8	2229	22.30	3815	19.1

5.2 Purpose of Livestock Rearing

All farmers, regardless of region, rear livestock for dual purposes (54%), milk (41%) or draught (38%) (Table 5.2). Meat production is the 3rd preferred purpose of farmers in these categories.

Table 5.2 Percentage distribution of farmers reporting the purpose of livestock rearing

Purposes	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
Milk	40	42	41	34	48	41	41
Meat	6	2	3		6	3	3
Draught	32	40	36	32	48	40	38
Dual	58	48	53	64	46	55	54

5.3 Livestock Feed Production and Supply

In Table 5.3 the availability of feed for livestock per farm is shown. In both Trishal and Muktagacha areas, the common feeds are rice straw, green grass, wheat bran, rice polishings and some unconventional feeds. The farmers produced rice straw and polishings, by-products of the paddy harvest and milling, respectively. Green grass and unconventional feeds are not produced by the farmers, but collected from fields, roadsides homesteads or from wastes. Wheat bran and oilcakes are also not produced by farmers. They supply these feeds to their animals in very small amounts after purchasing them from the market. It is important to note that the small farmers in both areas are in negative balance in terms of production and supply of rice straw, whereas, the medium farmers are in the positive balance. This could be explained by the fact that the medium farmers have more land for rice cultivation than small farmers. It is also evident from Table 5.3 that the medium farmers had greater ability to purchase feeds than had by the small farmers. Small farmers, because of their low purchasing ability and shortage of conventional animal feeds, are compelled to use higher amounts of unconventional feeds compared to the medium farmers.

Table 5.3 Farmers statements regarding livestock feed production (Kg) and supply (Kg) per year per farm

Livestock feeds	Small farmers						Medium farmers						All farmers n = 200	
	Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Trishal n = 50		Mukta gacha n = 50		Trishal + Mukta-gacha n = 100			
	Prodn	Supply	Prodn	Supply	Prodn	Supply	Prodn	Supply	Prodn	Supply	Prodn	Supply	Prodn	Supply
Rice straw	3558	4108	3730	4060	7288	8165	9958	8835	8070	6570	18028	13411	25316	21576
Green grass	1609	1609	1875	1875	3484	3484	3130	3130	3315	3315	6445	6445	8925	8929
Wheat bran	-	47	-	53	-	100	-	127	-	90	-	-	-	317
Rice polishing	182	182	78	78	240	240	221	3221	3985	289	320	210	1560	560
Oilcakes	-	22	-	41	-	63	-	78	-	82	-	320	-	203
Unconventional*	120	120	95	95	215	215	80	80	50	50	130	130	345	345

*Tree leaves, fruit wastes, rice gruel.

5.3.1 Annual Production of Green Roughage as Feed for Livestock

Green roughage fed to the animals are mainly of two types, legumes and non-legumes. Tree leaves have been considered here as non-leguminous green roughage. Leguminous green roughage production, as shown in Table 5.4, by medium farmers in Muktagacha was higher than that of Trishal. However, in small farms, there were no differences. Irrespective of the area, when categories of farmers were compared, legume production was higher in the medium farms (4%) than in the small farms (1%). This could be due to the larger land holdings of the medium farmers. In contrast, the quantity of green grass procured by small farmers was higher than that of medium farmers. The lower amount of tree leaves procured for feeding livestock by medium farmers compared to small farmers could be due to the higher amount of green roughage collected from crop fields as weeds by medium farmers. The overall figures for legume to non-leguminous green roughage production shows that the farmers production of leguminous roughage was very small, 0.5-3.0% of the total roughage, which, would not satisfy the needs of their livestock.

Table 5.4 Farmers statements about the annual production of green roughage for their animals

Green roughage	Small farmers						Medium farmers						All farmers n = 200	
	Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Kg	%
	Kg	%	Kg	%	Kg	%	Kg	%	Kg	%	Kg	%		
Legumes				0.5			88.6		102.1		190.7			
Non-legumes:														
Grass/weeds	3628.		3952.9		7581.0		4188.4		5409.1		9597.6		17178.6	
Tree leaves	76.5		50.8		127.3		64.6		36.6		101.2		228.5	
	3704.6	99.5	4003.7	99.5	7708.3	99			5445.8	97	9698.8	96	7407.1	
Total(legumes + non-legumes)	3734.8	100	4041.1	100	7778.9	100	4341.6	100	5547.9	100	9889.5	100	17668.4	100

5.3.2 Sources of Green Roughage as Livestock Feed

The main source of green roughage in rural areas is grass cut from roadsides and field plot boundaries. Other important sources are weeds of cropland, grasses in pond sides and tree leaves. Table 5.5 shows that the major source of leguminous green roughage is croplands. However, very few farmers (5%), irrespective of category, cultivate legumes such as Khesari and Matikalai to feed their animals. The major sources of non-leguminous roughages are plot boundaries and weeds of cropland. The percentage of farmers in both categories using croplands (58%) and plot boundaries (60%) as the source of non-leguminous roughage, were similar. However, there was a large variation between the area of survey regarding the utilisation of tree leaves as animal feed. In the Trishal area, irrespective of the category of farmers, higher amounts of tree leaves were used as animal feed than in the Muktagacha area.

Table 5.5 Farmers statements about the types and sources of green roughage fed to their livestock

Types of green roughage	Sources of green roughage	Small farmers			Medium farmers			All farmers n = 200	
		Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	No.	%
Legumes	Croplands	4	8		4	4			5
Non-legumes	Plot boundaries	60	58		58	70	64	123	62
	Croplands		62			54			59
	Road side/ pond side/ fallow	32	34			48	39		36
Tree leaves		60	52		30	34	3	88	44

5.4 Methods of Feeding Livestock

There are basically four methods of feeding livestock being followed by the farmers as shown in Table 5.6. The majority of the farmers (94%) chopped straw and grass and soaked them in water in a earthen chari (large bowl)

before allowing the animals to eat. Some farmers (17%) added concentrates, more commonly rice polishings or oilcakes and salt to the chopped straw and grass in water. A considerable number of farmers (67%) fed their animals with only concentrates in water in the chari. Very few farmers fed their livestock by tethering them to the large stacks of straw.

Table 5.6 Percentage distribution of farmers reporting the methods of feeding their livestock

Feeding methods	Small farmers			Medium farmers			All farmers n=200 %
	Trishal n=60 %	Mukta gacha n=50 %	Trishal + Mukta gacha n=100 %	Trishal n=50 %	Mukta-gacha n=50 %	Trishal + Mukta-gacha n=100 %	
Chopped straw and grass in water	95	100	98	96	96	96	97
Animals tied to the straw heap	5	12	9	-	17	7	8
Chopped straw, grass and concentrates in water	6	20	13	8	34	21	17
Concentrates in water	70	64	67	72	60	66	67

5.5 Farmers Possession of Livestock for Milk and Egg Production

One of the purposes of rearing cows and female goats is for milk production, and hens for egg production. From table 5.7, it is evident that the total annual milk production in medium farms, irrespective of area, was higher (46365 l) than that in small farms (31846 l). The trend was similar for egg production. The reason for this trend could be the larger number of animals possessed by the medium farmers compared to the small farmers. Alternatively, the medium farmers possessed a higher number of cross-bred animals than the small farmers (see table 5.1), consequently could be more milk and eggs produced. It may be mentioned here that the table 5.7 shows no data for milk production from buffaloes. The reason is that the buffaloes in the study area are kept mainly for draught purpose

Table 5.7 Farmers possession of livestock and their production (milk/egg, l/No.)* per year

Species	Small farmers						Medium farmers						*All farmers n = 200	
	Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100			
	No.	Prodn.	No.	Prodn.	No.	Prodn.	No.	Prodn.	No.	Prodn.	No.	Prodn.	No.	Prodn
Cow	66	17485	62	14361	128	31846	84	24525	94	21840	178	46365	306	78211
Goat	63								80		129	80	232	80
Buffalo							2		8		10			
Poultry	562	34963	583	41216	1145	76179	926	58661	634	45891	1560	104552	2705	80731

l = litre and No. = number

5.6 Age at Puberty and Conception Rate of Animals

Age at puberty and conception rate are the two important factors determining the profitability of livestock. Table 5.8 shows that the indigenous cows, that are dominant in number in the rural areas, are late reaching puberty (3.08-4.05 years) than the cross-bred heifers (2.75-2.97 years). A similar trend was observed for conception rate (number of services per conception). Indigenous buffaloes come to first heat at the age of 3.00-3.75 years, with conception rates of 1.0. The reason for this could be a lower incidence of reproductive diseases in buffaloes compared to cattle. The average age at puberty in Black Bengal goats is 0.84 year and the conception rate 1.29.

5.7 Calving Interval and Lactation Period of Animals

Mean calving interval of cows in both the Trishal and Muktagacha areas, as shown in Table 5.9, was longer (16.08 months) in indigenous cows than in cross-bred cows (13.43 months). On the other hand, the length of the lactation period showed the opposite trend. Calving intervals and length of lactation period in buffaloes were, on average, 22.00 months and 8.25 months, respectively. Black Bengal goats had a calving interval of almost 6.00 months with a lactation period of 2.63 months.

Table 5.8 Percentage distribution of farmers reporting the age at puberty (years) and conception rate (number of services/ conception) of their livestock

Breeds of animals	Age at puberty and conception rate	Small farmers			Medium farmers			All farmers n = 200
		Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	Trishal n = 50	Mukta-gacha n = 50	Trishal + Mukta-gacha n = 100	
Indigenous cows	Age at puberty	3.08	4.05	3.57	3.10	3.51	3.31	3.44
	Conception rate	1.53	1.76	1.64	1.62	1.77	1.69	1.66
Cross-bred cows	Age at puberty	2.75	2.88	2.82	2.97	2.92	2.95	2.88
	Conception rate	1.50	1.25	1.37	1.42	1.28	1.35	1.36
Indigenous buffaloes	Age at puberty	-	3.00	3.00	-	3.75	3.75	3.60
	Conception rate	-	1.00	1.00	-	1.00	1.00	1.00
Black Bengal goats	Age at puberty	0.88	0.83	0.85	0.91	0.79	0.85	0.84
	Conception rate	1.14	1.44	1.30	1.37	1.23	1.30	1.29

Table 5.9 Percentage distribution of farmers reporting the calving interval (months) and lactation period (months) of their livestock

Breeds of animals	Age of puberty and conception rate	Small farmers						Medium farmers						All farmers n = 200	
		Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100		Trishal n = 50		Mukta-gacha n = 50		Trishal + Mukta-gacha n = 100			
		No.	Av	No.	Av	No.	Av	No.	Av	No.	Av	No.	Av		
Indigenous cows	Calving intvl.	44	16.22	42	15.28	86	15.76	46	17.24	39	5.43	85	16.41	171	16.08
	Lactation period	44	8.22	42	7.16	86	7.70	46	7.78	39	8.28	85	8.01	171	7.65
Cross-bred cows	Calving intvl.	2	12.50	4	13.5	6	13.16	5	14.40	6	12.00	11	13.7	17	13.43
	Lactation period	1	9.00	4	8.4	5	8.40	4	11.00	4	7.25	8	9.12	13	8.84
Indigenous buffaloes	Calving intvl.	-		1	16.00	1	16.00	-		3	24.00	3	24.00	4	22.00
	Lactation period	-		1	9.00	1	9.00	-		3	8.00	3	8.00	4	8.25
Black Bengal goats	Calving intvl.	14	6.00	18	5.44	32	5.68	16	6.43	17	6.00	33	6.20	65	5.94
	Lactation period	14	2.78	18	2.47	32	2.60	16	3.06	17	2.29	33	2.66	65	2.63

5.8 Insemination Method Used for Servicing the Animals

In Bangladesh, ruminant livestock are inseminated either naturally or artificially (Table 5.10). Artificial insemination is popular in urban areas and in relatively large farms. In rural area, natural insemination is the principal method. However, because of the increased efforts of the extension workers in rural areas, farmers are becoming interested in artificial insemination of cattle. On average, 72% of the rural farmers in both the study areas used natural insemination compared to only 10% for artificial insemination (Table 5.10). When the category of farmers was considered, the percentage of small farmers using natural insemination was higher than medium farmers (77% versus 68%).

Table 5.10 Percentage distribution of farmers reporting the insemination method used for their animals

Species of animals	Insemination method	Small farmers			Medium farmers			All farmers n=200 %
		Trishal n=50 %	Muktagacha n=50 %	Trishal + Muktagacha n=100 %	Trishal n=50 %	Muktagacha n=50 %	Trishal + Muktagacha n=100 %	
Cow	Natural	79	76	77	64	71	68	72
	Artificial	9	9	9	13	10	11	10
	Both	12	15	14	23	19	21	18
Goat	Natural	100	100	100	100	100	100	100
	Artificial	-	-	-	-	-	-	-
Buffalo	Natural	100	100	100	100	100	100	100
	Artificial	-	-	-	-	-	-	-

5.9 Prevalence of Livestock Diseases

The prevalent diseases of cattle, buffaloes and goats are, foot and mouth disease (FMD), black quarter (BQ), diarrhoea and anthrax (Table 5.11). Parasite problems are common in all species. In cattle, FMD is the most frequently occurring disease, followed by BQ and diarrhoea. On the other hand, in goats and buffaloes diarrhoea and BQ were the most common

diseases. It appears from Table 5.11, that the incidence of diseases was higher in Trishal than Muktagacha area. The reasons for this are unknown.

Table 5.11 Percentage distribution of livestock diseases

Species of animals	Name of the diseases	Small farmers			Medium farmers			All farmers n = 200 %
		Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
Cattle:	1. FMD	68	60	64	82	56	69	67
	2. Black quarter	58	52	55	48	58	53	54
	3. Diarrhoea	44	32	38	58	30	44	41
	4. Anthrax	14	8	11	18	16	17	14
	5. Worm	10	10	10	14	14	14	12
	6. H. S.	6	4	5	8	4	6	5
	7. Pox	-	2	1	-	8	4	3
	8. No diseases	14	16	15	2	16	9	13
Goat:	1. FMD	2	2	2	2	2	2	2
	2. Black quarter	12	4	8	12	4	8	8
	3. Diarrhoea	22	10	16	22	22	22	19
	4. Anthrax	2	-	-	2	-	1	1
	5. No diseases	4	-	2	10	2	6	4
Buffalo	1. Diarrhoea	14	6	10	10	8	9	10
	2. Black quarter	4	-	2	2	-	1	2
	3. Anthrax	20	10	15	18	12	15	15

5.9.1 Treatment Facilities Used for Diseased Animals

Table 5.12 shows that, irrespective of the area or category, farmers (47%) used the registered veterinary services for treatment of diseases of their livestock. Some of them (12%) used unqualified veterinarians, whilst others (10%) used *Kabiraj* (herbal medicine specialists) for treatment to their animals. Some farmers used all of the above services, as and when they were available.

5.10 Problems in Rearing Livestock

The problems of rearing livestock in rural area are manifold. A shortage of feed and the lack of high-yielding breeds are the most important ones and

were reported by 61 % and 64 % farmers, respectively. The shortage of rice straw was not a problem for medium farmers, and only for small farmers during certain times of the year (February and March). A major problem within feed resources, is the shortage of green roughage throughout the year which has been reported by some 51% of the interviewed farmers (Table 5.13). Table 5.13 also shows that this is more acute for small farmers who had less land for growing leguminous fodders such as *Khesari* and *Matikalai*. Many farmers (64%) reported the lack of improved breeds of cattle as another problem in rearing livestock(Table 5.13). This indicates that farmers are interested in obtaining improved breeds for milk production. A shortage of capital was only 9% of farmers indicating that this is not a mojor constraint.

Table 5.12 Percentage distribution of the use of veterinary services

Treatment facilities	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
1. Nonqualified veterinarian	12	8	10	16	10	13	12
2. Registered veterinarian	52	40		48	46	47	47
3. *Kabiraj*	6	12		14	8		10
4. All	16	26	21	20	24	22	21
5. No response		4		2	12		10

Table 5.13 Percentage distribution of farmers reporting problems in rearing of livestock

Problems	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal + Mukta-gacha n = 100 %	
Shortage of straw in February-March	58	46	52	28	20	24	38
Shortage of good quality feed	18	8	13	10	4	7	10
Shortage of green grass or legumes	56	56	56	46	48	47	51
Lack of improved breeds	70	62	66	48	78	62	64
Lack of capital	12	4	8	8	10	9	9

6. PARTICIPATION OF HOUSEHOLD MEMBERS IN FARMING ACTIVITIES

6.1 Resource Availability and Uses

The conventional resource base of small farmer households in Bangladesh consists of land, labour and capital. It is common for a farm to make use of these resources to produce a wide range of food crops, vegetables, fruits, livestock, poultry and fish. Furthermore, many of the outputs and by-products of one sub-system are used as inputs to other sub-systems on the farm. Farm households allocate the resources over different farm enterprises, on the basis of their existing knowledge, to generate the needed outputs and income. It is widely believed that, in small farming practices, most of the farm activities are performed by family labour. However, due to the seasonality of agricultural operations, farm household members can only work full time for a few months of the year. Usually, landless farmers hire out labour to large and medium farmers and to some extent, small farmers. Labour employment does not follow a uniform trend due to the seasonality of farm production. Accordingly, in the peak period, even the small farmers also bring in labour to perform farm activities on time. This study attempts to examine the availability and uses of family and hired labour for different farm activities and the participation of women in livestock rearing.

6.2 Labour Availability and Use

This section provides a broad overview of the supply of and demand for labour at the household level in the study areas. For the purpose of this study, a worker was defined as a person who claimed to be engaged in income-generating activities during the survey period. On this basis, the proportion of the household members participating in the labour force was estimated. The estimation included members who were above 15 years of age, which is deviation from the conventional estimation, because farm households in Bangladesh use their children (above 15 years of age) as labour. Another issue which needed to be addressed was whether or not the services of women should be treated as gainful employment or not. The estimation method took this into consideration, and female labour participation in income-generating activities was estimated separately.

The information obtained from farm households on the use of labour in different farm enterprises is shown in Table 6.1. Cereal crops, mainly rice, absorbed 63% and 57% of total labour per farm for small and medium farm households, respectively. Livestock was the next major enterprise in

terms of labour, absorbing 23% on small farms and 12% on medium farms of the total labour force. On both small and medium farms, only a small amount of labour was required for producing wheat, jute, pulses, oilseeds, fruits and vegetables, as little land was used for the production of these crops. Aquaculture utilised very little proportion of labour, only 2% on small farms and 1% on medium farms.

The relative proportion of labour used for different farm enterprises varied widely with the farm size groups. Since the farm size was larger for medium farmers, more labour (531 man-days) was utilised compared to that for small farmers (235 man-days).

Table 6.1 shows that labour use in the crop sector was 152% higher in the medium compared to small farm households. Labour use was also higher for livestock rearing and management on the medium farms. For livestock, labour was used mainly for stall feeding, the collection of green grass and the control of grazing of livestock in the fallow land. However, where stall-feeding was practiced female members of small and medium farm households also participated both casually and regularly (Table 6.2).

The labour of women was used for livestock rearing more in small farm households than in medium farm household. However, many of the medium farmers and some small farmers reported that they do not like women participating in livestock rearing as because they think that women working in livestock rearing is a downgraded position as far as the social status is concerned.

Table 6.1 Availability and utilization of labour (man-days) per household[3] for different farm enterprises by farm size groups

Farm enterprises produced	Small farmers			Medium farmers		
	Labour demanded	Labour supplied		Labour demanded	Labour supplied	
	%	Own %	Hired %	%	Own %	Hired %
Rice (total)	63	34	66	57	21	79
Aman rice	27	34	66	25	21	79
Aus rice	14	36	64	11	25	75
Boro rice	22	33	67	21	21	79
Wheat	2	60	40	1	70	30
Jute	3	50	50	2	67	33
Pulses	1	100	-	1	71	29
Oilseeds	2	100	-	2	67	33
Fruits	1	100	-	1	100	-
Vegetables	2	100	-	2	80	20
Livestock	23	73	27	12	76	24
Aquaculture	2	100	-	1	100	-
Total	100	50	50	100	38	84

Table 6.2 Women participation (person-days) per household in livestock rearing and management

Women Participation	Small farmers			Medium farmers			All farmers n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	
Casual	52	64	58	36	56	46	52
Regular	32	30	31	18	28	22	26
No participation	16	6	11	46	8	32	22

7 FARMERS ATTITUDES TO INTRODUCING LEGUME FODDER INTO THEIR CROPPING SYSTEMS

It was mentioned in the introductory section that farmers in the rural areas, particularly those in the medium and small categories, do not have enough land to spare for fodder production. However, from sporadic conversation with them on different occasions, it was understood that they were interested in feeding their animals with green roughage as this increased milk production of cows, the growth of calves, and the work rate of draught animals. Since this survey is principally targeted to the introduction of legume fodder in the farmers cropping system, it was felt necessary to find out the attitude of rural farmers to the introduction of a new technology of introduction of fodder cultivation into their cropping systems.

7.1 The Major Roughage Fed to the Animals

The farmers in the study area use straw as the major feed for their animals. On average, more than 90% of the interviewed farmers (Table 7.1) reported that they used straw as the chief roughage source for ruminants. This is mainly due to the scarcity of green grass in the locality. The land is cultivated very intensively, and therefore, no fallow land is available for exclusive cultivation of forages. Amongst the two categories of farmers, a larger number of medium farmers used straw as the chief roughage for their animals. This might be due to the higher amounts of straw produced by the medium farmers.

Table 7.1 Farmers statements about the major roughages fed to their animals

Major roughage feed	Small farmers			Medium farmers			All farmers, n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	
Straw	90	92	91	98	92	95	93
Green grass	10	8		4	6	5	7

7.2 Farmers Views on Satisfying the Nutrient Requirements of Animals on Straw Diets

All farmers interviewed were aware that straw alone could not satisfy the needs of the animals. In both locations a majority of farmers (51%) reported that green grass, oilcake and rice polishings should be added to straw diets to fulfill the requirement of animals (Table 7.2). Some 29% of medium farmers and 21% of small farmers were interested in using green grass as well as legume fodder to improve straw-based diets. This suggests the possibility of farmers accepting the introduction of legumes in their cropping systems, particularly on the medium farms.

Table 7.2 Farmers suggestions to satisfy nutrient requirements of animals on straw diets

Farmers suggestions	Small farmers			Medium farmers			All farmers, n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	
1. Using green grass with straw		28	28	4	8	21	
2. Using green grass, oil cake and rice polish with straw		54			4		
3. Using green grass and legume fodder with straw	24	18		40	18	29	

7.3 Reasons for Losing Interest in Cultivation of Legume Crops in the Field

In the present cropping systems, the farmers rarely cultivate legumes in their plots. The interviewed farmers stated that the main reason for this was the shortage of land due to the cultivation of rice two to three times a year. However, some of the farmers (20%) reported that, as a result of the high demand for cultivation of boro rice, they lost interest in cultivating legume crops (Table 7.3).

Table 7.3 Farmers statements about the reasons for losing interest in cultivating legume crops in their fields

Reasons	Small farmers			Medium farmers			All farmers, n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	
1. Shortage of land	26	42	34	22	30	26	30
2. Cultivation of boro rice	18	18	18	18	26	22	20
3. Waterlogging stegnation	18	10		12	20	16	15
4. More benefit from paddy rice		10	12	4	10	12	12
5. Lack of interest amongst other farmers	4	6	5	4	4	4	

Some of the farmers (12%) reported that waterlogging of the soil was another important reason for not cultivating legume crops. However, this situation may be suitable for cultivating *S. rostrata* since this legume fodder can grow well in soils with a high water-table.

7.4 Farmers Views on Increasing the Production of Legumes and Other Fodder Crops for Animals

Almost all the interviewed farmers were interested in producing legumes and other fodder crops if the technology was available. They mentioned that legumes could be grown on the boundaries of the croplands, fallow land (if available), road/pond sides, homestead areas, the banks of irrigation channels, and in the crop field without major changes to the cropping systems. Table 7.4 shows that the majority of the farmers (46%) think that plot boundaries would be the best place for cultivating fodder. A significant number (20%) of farmers stated that fodder could be intercropped with food crops, without major problem. A similar number of farmers (20%) also suggested that road/pond sides might be another site for fodder legume cultivation.

Table 7.4 Farmers statements on ways of increasing the production of legumes and other fodder crops to feed their animals

Farmers statement	Small farmers			Medium farmers			All farmers, n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal-Mukta-gacha n = 100 %	
1. Boundaries of crop lands	42	40	41	26	50	51	46
2. Fallow land	34	48	41	48	46	47	44
3 Road/pond sides	20	10	14	30	22	26	20
4. Cultivation grass and legumes with food crops	24	22			14	17	20
5. Banks of the irrigation channels	10	16	13	24	14	19	
6. Technological support and supply of seeds	10	8	9	8	26	17	13
7. Homestead areas	18	8	13	28	14	21	12

7.5 Farmers Options for Introducing Legume Fodder into Existing Cropping Systems

Irrespective of category or study area, farmers were interested in growing legume fodder through introduction into their cropping systems. However, there was a difference in opinion regarding the method of intervention among the farmers. On average, 70% of the total interviewed farmers supported intervention with minor changes in their cropping systems, whereas 30% supported legume introduction without changing the systems (Table 7.5). A higher number of small farmers (33%) supported intervention without change in the cropping systems, whilst more of the medium farmers accepted intervention with minor changes in the cropping systems.

Table 7.5 Farmers statements about their options to introduce legume fodder into the existing cropping systems

Farmers options	Small farmers			Medium farmers			All farmers, n = 200 %
	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal Mukta-gacha n = 100 %	Trishal n = 50 %	Mukta-gacha n = 50 %	Trishal Mukta-gacha n = 100 %	
Without changing cropping system	26	40	33	22	30	26	30
With minor change in cropping system	74	60	67	78	70	74	70

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Although the sample farmers were classified into two categories for study purpose they are basically small farmers since the size of land holding and livestock holding per farm is not large. In almost all farm households, the activities are performed by family labour, in which the females participate. Farming is the principal source of income for the farm household. Cereal crops contribute most to household income, whilst livestock contributes only 15%. The reason for the low contribution of the livestock sector to the total farm income is the less emphasis on this sector by the policy makers.

Feed shortage and the lack of high-yielding animals are two major constraints to the development of the livestock sector. Undernutrition of livestock is one of the reasons for delayed puberty and low birth rates.

There is tremendous shortage of green roughage as animal feed. The only green roughages available are poor quality roadside grasses and weeds in crop-land, that are available only in the rainy season. The farmers do realise the benefits of feeding green roughage to their animals, but cannot spare land for its production because of the pressure for production of cereal crops. In the past, leguminous fodders such as *Khesari* and/or *Matikalai* were cultivated in fallows for feeding to animals during the winter. However, in the present cropping systems they have no other choice but to cultivate cereal crops, specially rice.

The predominant land type in both survey areas was medium land followed by high land. Each type of land has different cropping systems. Land remains fallow in both the high and low land at least once during the cropping systems. Legume fodders can be grown in these fallows. Medium land is intensively used for cereal crop production. However, there is scope for fodder legume production as intercrops or relay crops in cereals.

8.2 Recommendations

1 Medium farmers are better educated and more interested in new technologies than small farmers. In addition, they have more land, providing more options for the choice of new technology. Therefore, this group should be selected as target farmers for the legumes on farm trials.

2 The major cropping systems in high land (at both sites) may be suitable for fodder legume introduction, since part of the land remains fallow.

3 The medium land, which is the predominant land type at both survey sites, has the major cropping system of T. Aman rice-Boro rice-T. Aus rice. Since there is no fallow period in this system, fodder legumes could be grown as intercrops or relay crops.

4 In the low land areas, the cropping systems have two successive fallow periods, but the land is inundated with water. Therefore, *S. rostrata* could be grown here because of its tolerance to waterlogging.

5 Since the majority of the farmers showed interest in cultivating fodders, even with minor changes in the cropping systems, the introduction of fodder legume in the cropping systems is possible in these areas.

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Appendix

Questionnaire for survey on mixed farming system (crop/livestock) of 200 small-scale rural farmers of Bangladesh.

1. General information:

   (a) Name of the farmer:
   Village:
   (b) Educational qualification:
   (c) Social status:

2. Family size: Total Male Female

   Family members (No):
   Workable persons (No):
   (Age. 15-60 years)

3. Area of land under possession.

Types of land	Area (hectare)	Crops grown (hectare)	Total (hectare)
Cultivable	.....	.....	.....
i) Own	.....	.....	.....
ii) Rented in	.....	.....	.....
iii) Rented out	.....	.....	.....
Fallow	.....	.....	.....
Homestead	.....	.....	.....

4. Types of land: (a) High land .....
   (b) Low land .....
   (c) Medium land .....
   (d) Rented .....
   (e) Irrigated .....

5. **Use of cultivable land:**

Crops/others	Area (hectare)	Annual prodn (quintals)	Price (Tk.)
Rice			
Wheat			
Jute			
Sugarcane			
Legumes & oil seed			
Fruits & vegetable			
Fodders			
Others			

6. **Cropping systems followed:**

(i) High land:
(ii) Medium land
(iii) Low land:

7. **No. of livestock under possession:**

Species	Breed	Sex M	Sex F	Cow-Calf-Bull-Heifer	Total
Cattle	Local				
	cross				
Buffalo	Local				
	cross				
Goat	Local				
	cross				
Sheep					
Poultry	Chicken				
	Ducks				

8. Daily milk yield/egg production

Species	Yield (litre/No.)	Total (litre/No
Cattle		
Buffalo		
Goat		
Sheep		
Poultry		

9. Feed production and supply to animal per farm

Types of feed	Production/year (kg)	Ammount supplied/day (kg)
Rice straw		
Wheat straw		
Green grass		
Wheat bran	.....	
Rice polish	.....	
Oil cake/meal		.....
Unconventional		.....

10. Types and sources of green roughage fed to animals:

Roughage	Sources	Quantity obtained/year (kg)
Legumes		
Non-legumes		
Tree leaves		

11. Methods of feeding:

Feeds	Feeding method
Grass/forage	
Straw	
Hay	
Concentrate	
Others	

12. Age at puberty and conception rate:

Animal		Age at puberty (years)	Conception rate
Cattle:	(i) Indigenous	.....	.....
	(ii) Cross	.....	.....
Buffalo	(i) Indigenous	.....	.....
	(ii) Cross	.....	.....
Goat:	(i) Black Bengal	.....	.....
	(ii) Jamnapari	.....	.....
Sheep:		.....	.....

13. Calving interval and lactation period:

Species		Calving interval (months)	Lactation period (months)
Cattle:	(i) Indigenous	.....	.....
	(ii) Cross	.....	.....
Buffalo	(i) Indigenous	.....	.....
	(ii) Cross	.....	.....
Goat:	(i) Black Bengal	.....	.....
	(ii) Jamnapari	.....	.....
Sheep:		.....	.....

14. Insemination method being followed:

Cattle: Buffalo :
Goat : Sheep :

15. Diseases prevalent:

Cattle :
Buffalo :
Goat :
Sheep :

16. **Treatment facilities available**

17. **Contribution of females in rearing livestock**

18. **Problems in rearing livestock:**

Problems	Description of problems
Feed	
Breed	
Disease	
Others	

19. **Farmers attitude in introducing legume fodders in the present cropping system:**

(a) What is the major roughage feed for your animals ?

(b) Do you think that straw alone can satisfy the need of your animals? If not what is your suggestion ?

(c) Do you think your animals are getting sufficient good quality feeds? If not what is your suggestion for mitigating the problems ?

(d) Do you cultivate legume crops in your field ? If not, why ?

(e) Are you interested to increase the production of legume and other fodder crops to feed your animals ? Suggest some ways and means.

(f) Do you feel that legume fodders should be introduced in the present cropping system ? If yes, how ?

Without changing the cropping system ?

With minor changes in the cropping system ?

20. **Gross annual income from livestock (to be estimated by the enumerator):**

21. **Average annual expenditure (Taka)**

(i) Agricultural production Tk
(ii) Food & clothings : Tk.
(iii) Education : Tk. .....
(iv) Health care : Tk. .....
(v) Others : Tk..... .....