Characterization of farming systems for the improvement of cropping system and farm productivity

Bir Jahangir Shirazy[1]*, ABM Mostafizur[2], ABM Jamiul Islam[1], Md. Khairul Quais[1], Amina Khatun[3], Md. Ibrahim[3]

[1]Senior Scientific Officer, Rice Farming Systems Division, Bangladesh Rice Research Institute, Gazipur, Bangladesh
[2]Scientific Officer, Rice Farming Systems Division, Bangladesh Rice Research Institute, Gazipur, Bangladesh
[3]Principal Scientific Officer, Rice Farming Systems Division, Bangladesh Rice Research Institute, Gazipur, Bangladesh

ARTICLE INFO

ABSTRACT

A baseline survey was carried out in Sreepur upazila of the Gazipur district in 2017–18 to learn more about the current farming practices used by the farmers there. The information is about the social and economic traits of farm households for the crop years 2017–2018, as well as the number of inputs and outputs. Simple random sampling was used to collect the data. According to the results of the initial survey, there were 6, 36, and 9 marginal (0.021–0.2 ha), small (0.21-1 ha), and medium (1.01-3 ha) farmers within the sample of 51 farmers. From the six main farming systems, most farmers used the solo crop system, followed by the crop+livestock+poultry+household and crop+livestock systems. During the Boro season, only HYV rice types were used at the location, as opposed to T. Both HYV and native cultivars were employed during the Aman season. In the research region, there were four main cropping patterns. Boro-Fallow-T.Aman rice was the primary crop, followed by Boro-Fallow-Fallow, Veg-Veg-Veg, and one banana. The year-round vegetable crop (Vegetables-Vegetables-Vegetables) produced the highest net returns out of the four cropping patterns, followed by banana and Boro-Fallow-T. Aman at Tk. 1,68,000, 65,360, and 26,700 Tk./ha), while the cropping technique used in Boro-Fallow-Fallow had the lowest net return at Tk. 7673/ha. only. Out of the 51 farmers in the survey, 14 were fish farmers at the FSRD site, where the average total farm gross margin from fish was TK. 8250 holding carps and other fishes. When a farm was marginal, non-farm revenue (from others) was greater than agricultural income. On the other hand, small and medium farms brought in more money than businesses and services combined. The main ways that medium, small, and marginal economies made money were through services, businesses, and other sources of income, in that order. Additionally, the greatest returns from the sector for medium, small, and marginal farmers were Tk. 27000, 22000, and 7125 for medium, small, and marginal farmers, respectively. The income from livestock was Tk. 40000, Tk. 60000, and Tk. 3000. Insect and pest attacks were found to be the primary issues facing farmers, followed by the high cost of inputs and a lack of cash. Male farmers (75.98%) outnumbered female farmers in their participation in decision-making (33.17). Medium-sized farmers consumed more meat, fish, and vegetables than small and marginal-sized farmers.

Introduction

Around 80% of the 17 million households in Bangladesh are small farms, some of which are landless (BBS, 2020). Bangladeshi agriculture is subsistence farming, so it grows a wide range of crops to meet household needs and reduce risk and uncertainty. Small farmers strive to create as many businesses as their agricultural systems permit, given the socioeconomic and agro-climatic conditions at the time, as well as the aims, preferences, and financial capabilities of their households. In this regard, the topography of the land, the makeup of the soil, the accessibility of various inputs, and environmental factors all play a role in how farmers decide which farming ventures to pursue. As a result, small farming typically has greater resource interdependence than conventional farming. This increases sustainable agriculture, which in turn raises overall production and household income (Karim et al., 2021).

The primary source of employment, income, and security of food and nutrition in the majority of developing nations, including Bangladesh, is agriculture. Because of this, a sustainable increase in food production is important for economic growth and development to reach food self-sufficiency and improve the lives of small-scale farmers in a world with a growing population (Shirazy et al., 2017). To boost food production, less land, less water, less labor, and fewer chemicals will need to be used (BINFS, 1982). Dilon et al. (1993) said that the nearby communities where research was done on farming systems have mostly accepted the new technologies. Shirazy et al., (2016) looked into how different parts of the agricultural system work together to improve farm output, protect the environment, raise the standard of living for subsistence farmers, and keep the system going. Farmers who help with research at the Farming System Research and Development site help figure out what problems need to be solved and try out possible solutions.

To determine the current state of a particular group, the population of a certain area, and/or the entire country, a baseline survey is necessary. Therefore,

the study was conducted to know the socioeconomic condition of farmers, existing cropping systems, impact of homestead vegetable production for food and nutritional security as well as rural development through women empowerment.

Materials and Methods

Location of the Study

The coordinates of Sreepur Upazila are 24.2000°N to 90.4667°E. Its entire size is 465.25 km^2, and there are 65,435 housing units. The District of Gazipur is located in central Bangladesh and is part of the Dhaka Division, one of eight divisions made up of seventeen districts. Mymensingh District is to the north, Narayanganj District is to the south, Kishoreganj & Narsingdi are to the east, and Tangail District is to the west. Eighty percent of the soil is clay-loam soil from the Banar, Shitalakkha River basin, with the remaining twenty percent being barind soil. The average annual rainfall is 2500 mm, and the temperature fluctuates from 380C to 130C. Sreepur has a total population of 4,92,792, with men making up 51.13 percent and women 48.87 percent. In Sreepur, Islam is the most common religion. The second-largest religion is hinduism. Muslim (96%) and Hindu (3.7%) populations; ethnic groups represented: Santal, Koch, Rajbanfshi, Mandi, Nunia, and Bhangar. Over all the upazilas in the Gazipur district, the literacy rate is 56 percent. In this upazila, there are 1060 residents per square kilometer. There are 46,227 ha of total land, of which 31,467 ha are used for crop production, 14,760 ha are used for non-agricultural purposes, and 30,010 ha are covered in forests.

Selection of Study Area

The choice of the study area is a crucial phase that is heavily influenced by the goals or purposes established for the investigation. According to Yang (1962), the region in which a farm survey is to be conducted relies on the survey's specific goals and the potential for farmer collaboration. From the Sreepur upazila near the Sadar thana of Sreepur, Gazipur, one village under the Telihati union was chosen.

Data

In the study of farming systems, a variety of data collection techniques are used. The nature of the research problem, the availability of research funding, time restrictions, the body of published literature, and the availability of information at the primary and secondary levels are only a few factors that influence the choice of a particular approach. In the study area, information was gathered by conducting structured questionnaire interviews with farmers.

Selection of Sample Size

In order to conduct a baseline study for an integrated agricultural research and development project aimed at improving farmers' livelihoods in plain land eco-systems, the farm accounting data of 51 farms were gathered from Tengra village in Telihati Union under Sreepur upazila. A list of all the farms in the representative village was first created, and then 51 farms from the villages were chosen at random.

Processing, Analysis and Presentation of Data

Each interview schedule was checked for consistency and completeness after the data had been gathered. The data was edited before being entered into the computer. Summary, close examination, and essential summary data has been transformed into tables. To achieve the goals of the baseline survey, tabular approaches have been employed for the analysis, interpretation, and display of data.

Results and Discussion

Family and Farm Size

The sample farmers were divided into three categories based on the type of farmer they were: marginal, small, and middle. According to the extension manual, landless farmers are those who have less than 0.02 hectares of cultivated land, marginal farmers have between 0.021 and 0.2 ha of cultivated land, small farmers have between 0.21 and 1 ha of cultivated land, medium farmers have between 1.01 and 3 ha of cultivated land, and large farmers have more than 3 ha of cultivated land. Out of 51 farmers in the sample, 36 were from small farms, followed by 9 from medium farms and 6 from marginal farms. For marginal, small, and medium farms, the average farm size was 0.13 ha, 0.46 ha, and 1.24 ha, respectively. Once more, the average family size for marginal, small, and medium-sized households was 3.8, 4.3, and 4.8, respectively (Table 1).

Age Distribution, Literacy Level and Farm Category

The age of the farmer's households varies little throughout the three categories (marginal, small, and medium). Age, literacy, and farm size all have a significant impact on decision-making processes in farming. Younger farmers are more technically efficient than older farmers, and they can easily embrace new technology, increasing their efficiency (Battese and Coelli, 1995). The average age of marginal farmers was 38 years, while the average age of small and medium farmers was 46 and 48 years, respectively.

The sample farmers' educational levels were classified into five categories: Illiterate, PSC (Primary School Certificate), JSC (Junior School Certificate), SSC (Secondary School Certificate), HSC (Higher Secondary School Certificate), and above. Among the five levels, the HSC & above HSC level had the highest percentage of farmers, while the PSC level had the lowest (Table 2). It is worth noting that marginal farmers were younger, and there were no illiterate farmers among them. Furthermore, small farmers were older and illiterate than other types of farmers.

Table 1: Family and farm size of the sample farmers, Sreepur, Gazipur, 2017-18

Farm Categories	Family size (no.)	Farm size (ha)	Number of sample farmers
Marginal (0.021–0.2 ha)	3.8	0.13	6
Small (0.21–1 ha)	4.3	0.46	36
Medium (1–3 ha)	4.8	1.24	9

Table 2: Age and educational level of different categories of farmers, Sreepur, Gazipur, 2017-18

Farmer category	Age (year)	Educational level (%)				
		Illiterate	PSC	J.S.C	S.S.C	HSC & above
Marginal (0.021–0.2 ha)	38	-	-	1	2	3
Small (0.21–1 ha)	46	10	5	8	7	6
Medium (1.01–3 ha)	40	2	-	-	2	5

Table 3: Land ownership pattern of different farm categories, FSRD site, sreepur, Gazipur, 2017-18

Farm category	Own cultivated land (ha)	Leased out land (ha)	Leased in land (ha)	Mortgage out land (ha)	Mortgage in land (ha)	Rent out land (ha)	Rent in land (ha)	Homestead area (ha)	Total cultivated land (ha)
Marginal	0.13	0	0	0.00	0.02	0	0	0.03	0.18
Small	0.46	0.01	0.05	0.01	0.007	0	0	0.07	0.56
Medium	1.24	0.03	0	0.11	0.09	0.17	0.05	0.23	1.3

Total Cultivated land = Own cultivated land + all in land–all out land

Land Ownership Pattern

Three types of land holding systems were identified at the FSRD site in Sreepur, Gazipur. These were (i) the rented in and rented out land holding system, (ii) the leased in and leased out land holding system, and (iii) the mortgaged in and mortgaged out land holding system. In the first system, landowners give one-third of their produce to the landowner. In the second method, a land holder cultivates a plot of land in exchange for a lump sum of money (non-refundable) from the land's owner. In the third system, a land holder cultivates a plot of land in exchange for a set amount of money (returnable) to

the land's owner. Own cultivated land +rented in land-rented out land+leased in land-leased out land+mortgage in land-mortgage out land+homestead land is the formula for calculating total cultivated land. Own cultivated land was 0.13 ha, 0.46 ha, and 1.24 ha for marginal, small, and medium, respectively, while total cultivated land was 0.18 ha, 0.56 ha, and 1.3 ha for marginal, small, and medium, respectively (Table 3).

Land and Soil Type

The soil type in the research region was clay, and the field was completely irrigated. The medium low land type covered the most land (14.68 ha out of 28.62 ha), followed by high land (5.38 ha) and medium land (3.92 ha) (Table 4).

Table 4: Land and soil type of the sample farmers, Sreepur, Gazipur, 2017-18

Land Type	Area (ha)		Soil Type	Area (ha) (irrigated+ non –irrigated)
	Irrigated	Non-irrigated		
High land	5.38	-	Sandy	-
Medium high land	3.42	-	Clay	28.62
Medium land	3.92	-	loamy	-
Medium low land	14.68	-	Silt	-
Lowland	1.22	-	Total	28.62
Total	28.62	-		

Table 5: Major farming systems of the sample farmers, Sreepur, Gazipur, 2017-18

Major Farming Systems	Number of households	Farm size (ha)
Crop	24	17.22
Crop + Livestock	6	2.37
Crop + Poultry	5	1.77
Crop + Livestock + Poultry	5	1.34
Crop + Livestock + Poultry + Household	8	4.09
Crop + Fisheries	3	1.84
Total	**51**	**ha**

Major Farming Systems

The FSRD site contains six different types of major farming systems. Among the six farming systems, the crop system had the most farmers, followed by Crop+ Livestock+Poultry+Household, Crop+Livestock, and Crop+Fishery. The Crop+Fishery system had the fewest farmers. On the other hand, the Crop system had the largest farm size (17.22 ha) and the Crop+Livestock+Poultry systems had the smallest (1.34 ha) (Table 5).

Major Growing Crops

In the T. Aman season, both HYV and local rice types were employed; however, in the Boro season, only HYV cultivars were cultivated in the study region. T. Aman rice (21.30 ha) took up the majority of the 28.62 hectares of land, followed by Boro rice (20.34 ha) and vegetables (7.27 ha). The yield of rice from the HYV (T. Aman) was higher per hectare than that of the local varieties. While the

local variety produced 3.15 t/ha, the HYV T. Aman variety produced 3.7 t/ha and HYV Boro variety produced 6.5 t/ha. Because of the crop variety and management techniques, the average yield of the crops was lower than their potential output (Table 6).

Time of Sowing and Harvesting

Sowing, Planting and harvesting time differs in different agro-ecological zones. Depending on the type of land and cropping patterns, Boro rice is transplanted between January and February, and Aman rice is transplanted between July and August. While Aman rice is harvested in November through December, Boro rice is harvested from May through June. Vegetables are only occasionally cultivated year-round by farmers in highlands and homesteads (Table 7). It's interesting to note that no other grain, pulse, or oil seed crops are grown by the farmers in the research area.

Table 6: Major crops grown, Sreepur, Gazipur, 2017-18

Crops		HYV		Local	
		Area (ha)	Yield (t ha^{-1})	Area (ha)	Yield (kg ha^{-1})
Rice	DSR (Aus)	-	-		
	T. Aus	-	-		
	T. Aman	21.30	3.7	4.76	3.15
	Boro	20.34	6.5		
Banana		1.02			
Vegetables		7.27	8.56	0.54	6.34
Others		0.35	-	0.21	-

Table 7: Sowing and harvesting time of major crops, Sreepur, Gazipur, 2017-18

Crops		Sowing/Planting time	Harvesting time
Rice	DSR (Aus)	-	
	T. Aus	-	
	T.Aman	July to August	Nov. to Dec.
	Boro	January to February	May to June
Wheat		-	-
Maize (Summer)		-	-
Mustard		-	-
Pulses		-	-
Vegetables		Rabi	Rabi, Kharif
Banana			

Table 8: Major cropping patterns practiced by the farmers, Sreepur, Gazipur, 2017-18

Pattern	Crop and variety in different seasons					
	Kharif-1		Kharif-2		Rabi	
	Crop	Variety	Crop	Variety	Crop	Variety
Boro -Fallow- T. Aman			T. Aman	Ranjit, Swarna, BRRI dhan51	Boro	BRRI dhan28, 29
Boro-Fallow-Fallow					Boro	BRRI dhan28, 29
Veg-Veg-Veg	Puishakh, Brinjal	Local	Bitter gourd, Sweet gourd	Local	Bottle gourd, Bean, Radish	Hybrid
Banana	Banana	Local	Banana	Local	Banana	Local

Cropping Patterns Practiced

Cropping patterns differ on lands (types of land), farms (marginal, small and medium) and AEZ due to climate, soil and farmers attention of crop production. Four major cropping patterns were observed in the study area. The main cropping pattern in the site was Boro–Fallow–T. Aman followed by Boro–Fallow–Fallow, Veg–Veg–Veg and Banana. The varieties of the different crops in the site are shown in the Table 8.

Due to climate, soil, and farmer attention to crop production, cropping patterns vary on lands (types of land), farms (marginal, small, and medium), and AEZ. In the research area, four main cropping patterns were seen. Boro-Fallow-T. Aman was the dominant cropping pattern in the area and followed by Banana, Veg-Veg-Veg, and Boro-Fallow-Fallow (Table 8).

Per Farm Input Used

The primary inputs for agricultural production are labor, seed, fertilizer, pesticide, and irrigation. The principal crops grown at the FSRD site are T. Aman rice, Boro rice, vegetables, and bananas. Banana had the highest input cost of all the crops, followed by vegetables, Boro rice, and T. Aman rice (Table 9).

Table 9: Average per farm input use for crop production, Sreepur, Gazipur, 2017-18

| Name of crops | Input use (no. or kg ha⁻¹) | | | | | | | | | | Tillage cost (Tk ha⁻¹) | Total input cost (Tk ha⁻¹) |
	Labor (Male+ Female)	Seed	Urea	TSP	MP	ZnSO₄	Gypsum	Cowdung	Pesticide (taka)	Irrig. (Tk.)		
T. Aman	80	35	190	80	120	-	78	-	3000	-	7500	55280
Boro	120	40	200	100	150	-	90	6000	4000	8000	8500	85250
Veg	150	-	120	140	120	7	50	10000	6000	5400	5210	65000
Banana	180	-	280	230	210	12	160	10000	5400	4800	5600	86000

Table 10: Homestead vegetables production and disposal pattern, Sreepur, Gazipur, 2017-18

Crop season	Vegetables produced (kg)	Vegetables consumed (kg)	Vegetables distributed to others (kg)	Vegetables sold (kg)	Market price at harvest (Tk.kg⁻¹)
Summer vegetables					
Puisak	5	4	1	-	20
Sweet gourd	4	4	-	-	20
Total	9	8	1		
Winter vegetables					
Cucumber	3	2	1		20
Lausak	6	4	2		20
Raddish	8	6		2	20
Bean	4	3	1		20
Bottle gourd	67	5	2	60	20
Total	88	20	6	62	

Table 11: Average per farm homestead fruit production and disposal pattern, Sreepur, Gazipur, 2017-18

Name of fruits	Total fruits produced (no. or kg)	Fruits consumed (no. or kg)	Fruits sold or distributed (no. or kg)	Market price of fruit at harvest (Tk/kg or piece)	Total value of fruits (Tk.)
Mango	80	60	20	40	3200
Jackfruit	69	41	28	30	2070
Banana	118	70	48	20	2360
Papaya	8	6	2	15	120
Litchi	591	254	337	80	472
Guava	9	9	0	20	180

Homestead Vegetable Production and Disposal

Producing vegetables on a homestead boosts vegetable intake per person and per family. In the homestead area, there are six to ten production units, including open sunny regions, roofs, trellises, fences, slightly swampy areas, back yards, etc. In the summer, the average farmer in the sample produced 9 kilograms of vegetables, compared to 88 kilograms in the winter. Most of the vegetables were consumed by the sample farmers (Table 10).

Per Farm Fruit Production and Disposal

The majority of the FSRD site's homesteads had four to five fruit trees, on average. The most widespread fruit trees were guava, mango, jackfruit, banana, papaya, litchi, and banana. Mango, jackfruit, banana, papaya, litchi, and guava had average production per farm weights of 80 kg, 69 kg, 118 kg, 8 kg, 591 kg, and 9 kg, respectively. Table 11 shows that the farmers consumed the majority of their produce rather than selling or distributing it.

Management Practices of Field Crops

The agronomic management comprises proper variety selection, use of the best seed rate, planting at the right time, transplanting at the right time, optimal fertilizer treatment, use of organic matter, timely weeding, water management, pesticide application, and harvesting timing. At the FSRD location, T. Aman, Boro, bananas, and vegetables were all grown as crops. The Table 12 below lists the agronomic managements applied to the cultivated crops.

Sources of Inputs

Source of inputs used by sample farmers is shown in Table 13. On an average, 22% farmers use their own seed, 46% farmer purchase from market, 24% farmer from BADC, 2% farmer from NGO and 6% farmer from other farmers. All sources of fertilizer and insecticide were obtained from market vendors. Approximately 71% of farmers utilized their own organic fertilizer (cow dung), while 29% bought it from other farmers. Similar to this, most of the labor and mechanical power used came from outside sources.

Table 12: Agronomic management practices of different field crops of the sample farmers, sreepur, Gazipur, 2017-18

Factors	T. Aman		Boro	Banana	Summer Veg.	Winter Veg.
	Local	HYV	HYV			
Variety	Ronjit, Swarna	BRRI dhan51	BRRI dhan28, 29	Sagor, Sobri, Jait	HYV, Local	HYV, Hybrid
Seed rate (kg ha^{-1})	38	35	40	5000-5500 (sucker)	-	-
Seeding date	June	June	Dec-Jan		Feb-Mar	Oct -Nov
Transplanting date	July	July	Jan-Feb	Sep -Oct	Mar-April	-
Urea (kg ha^{-1})	190	190	200	400-500		
TSP (kg ha^{-1})	80	80	100	100-150		
MP (kg ha^{-1})	120	120	150	100-150		
Cow dung (kg ha^{-1})	0	0	6000	8000		
Weeding (no.)	2	2	3	2-3		
Irrigation (no.)	-	-	10-12	4-5		
Insecticide application (no.)	1/2	1/2	2	4-5		
Harvesting date	Nov- Dec	Nov- Dec	May-June	Jul -Aug		Nov May

Table 13: Sources of inputs used, Sreepur, Gazipur, 2017-18

Inputs	% Input used from				
	Own	Market (with brand name if there is)	BADC	Other	NGO
Seeds/ Seedlings	22	46	24	6	2
Fertilizers		100			
Pesticides		100			
Organic fertilizers /FarmYard Manure	71			29	
Mechanical power	5			95	
Labour	36			64	

Per Farm Cost and Return from Livestock and Poultry

Average per farm livestock and poultry birds of the sample farmers is presented in Table 14. For livestock, the average number of cattle and goats per farm was 2-3 and 1-2, respectively. The average numbers of chicken, duck, and pigeon per farm were 8–9, 0–1, and 0–1, respectively.

Table 14: Average number and value of livestock and poultry enterprise, Sreepur, Gazipur, 2017-18

Livestock/poultry	Average Number (present)	Original value (Tk.)
Livestock		
Cattle	2.07	15000
Goat	1.78	1500
Total	**3.85**	
Poultry		
Chicken	8.6	100
Duck	0.30	150
Pigeon	0.61	180
Total	**9.51**	

Per Farm Cost and Return from Fish Culture

Table 15 shows the per farm cost and return from fish culture for the sample farmers for the years 2017–2018. 14 of the 51 sample farmers cultivate fish at the FSRD location. On an average, per farm total gross margin was Tk. 8250 containing, carps Tk. 6500 and other fishes Tk. 1750.

Per Farm Credit Received and Credit Purpose

Bangladeshi farmers are occasionally unable to afford the inputs needed for agricultural growing. As a result, they occasionally receive credit for home services and crop cultivation from the local samity, NGO (Asha, BRAC, etc.), bank (Krishi Bank, Grameen Bank, etc.), money lenders, and others (relatives, friends, etc.). The average agricultural credit obtained and the reasons for their credit are shown in Table 16.

Table 15: Cost and return of fish culture, sreepur, gazipur, 2017-18

Name of fish	Number of fishes	Area (decimal)	Production (kg)	Production cost (Tk.)	Gross return (Tk.)	Gross margin (Tk.)
Carps	250	12	210	25000	31500	6500
Other	50	3	35	3500	5250	1750
Total	300	15	225	28500	36750	8250

Farm gate price of fish 150 (Tk. kg^{-1})

Table 16: Average per farm credit received and purpose of their credit, Sreepur, Gazipur, 2017-18

Source of Credit	Amount of Credit (Tk.)	Purpose of Credit
Local Somity	500	Household service
NGO (Asha)	10000	Crop Cultivation, Business
Bank	-	-
Money lenders	1000	Household service
Others	-	-
Total	11500	

Table 17: Cost and return of existing cropping patterns, Sreepur, Gazipur 2017-18

Cropping Patterns	Total cost (Tk./ha)	Gross Return (Tk./ha)	Net Return (Tk./ha)	BCR
Boro-Fallow-T. Aman	140530	167230	26700	1.19
Boro-Fallow-Fallow	85250	92923	7673	1.09
Veg.-Veg.-Veg.	150500	318500	168000	2.11
Banana	86000	151360	65360	1.76

Table 18: Household livestock and poultry assets (no.) of sample farmers, Sreepur, Gazipur, 2017-18

Assets	Marginal	Small	Medium	Average
Cattle	1.5	1.89	3.67	2.08
Goat	0.83	0.61	0.67	1.78
Chicken	6.83	8.95	8.44	8.06
Duck	0	0.15	0.63	0.3
Pigeon	1.67	0.81	0.22	0.61

Cost and Return of Major Cropping Patterns

There were four distinct cropping patterns found at the FSRD site in Sreepur, Gazipur. Table 17 displays total cost, gross return, net return, and BCR. Out of the four cropping patterns, year-round vegetable production had the highest net returns (Tk. 1,68,000 ha^{-1}), followed by banana (Tk. 65,360 ha^{-1}), and Boro-Fallow-T. Aman (Tk. 26,700 ha^{-1}).

Livestock and Poultry Assets

Cattle, buffalo, sheep, chickens, and goats are often the most prevalent livestock species in the research region. The common poultry bird species are chicken, duck, and pigeon. Table 18 displays the average number of livestock and poultry assets per family for the sample farmers' various farm types. Medium farmers had the most livestock (3.67), followed by small (1.89) and marginal (1.5) farmers. For marginal, small, and medium farmers, the average number of hens was determined to be 6.83, 8.95, and 8.44, respectively. Interestingly, marginal farmers had the most pigeons (1-2) while having no ducks.

Per Farm Income of the Sample Farmers

Average per farm income (Tk.) of the sample farmers in the year 2017-2018 have been shown in the Table 19. Crops (field crops), vegetables, fruits (from the homestead), animals, fisheries, poultry, land rent, housing rent, services, and other sources of income including day labor, rickshaw pulling, van pulling, etc. were all identified as sources of income. Due to day labor performed by landless farmers, rickshaw and van pulling revenue was higher (Tk 1,00000) than farm income. However, a marginal group of farmers made more money (Tk. 1,000) from their various businesses. The biggest income (Tk. 2,40,000) for medium-class farmers came from a variety of services. On average, the medium farmer group earned the most from crops and fisheries (Tk. 27,000). (Tk. 8,000). For small farmers, return from cattle was the highest (Tk. 60,000) (Table 19).

Table 19: Farm income (Tk.) of the sample farmers, Sreepur, Gazipur, 2017-18

Item	Marginal	Small	Medium
Crop	7125	22000	27000
Livestock	3000	60000	40000
Fish Production	0	1000	8000
Land rent	0	0	15000
House rent	0	0	1500
Business	0	100000	1000
Service	0	0	240000
Others (Auto van, Day labour)	100000	0	0
Total	1,10,125	1,84,000	3,32,500

Services from Different Organizations

At the FSRD site, four different services were offered, including advice on agricultural production, pests and diseases, new technologies, crop production credit, and advice on crop production and credit (Table 20). The Department of Agricultural Extension, NARS Research Institutes, Bangladesh Krishi Bank, as well as other banks and non-governmental organizations, provided these services (NGO). Department of Agricultural Extension offered the highest level of service at the FSRD location (25%), and Non-Governmental Organizations supplied the lowest level of assistance (10%). The remaining farmers made their own decisions or followed advice from their neighbors. They didn't use any services provided by banks or research institutes.

Table 20: Different organizations services, Sreepur, Gazipur, 2017-18

Name of services	Service provider (name)	% of farmers
Suggestions about crop production, input, pest, diseases, etc.	Department of Agricultural Extension	25
Suggestions about New Technology	Research Institute (NARS)	-
Credit for crop production	Bangladesh Krishi Bank and other Bank	-
Credit for crop production & suggestions	Non-Government Organizations (NGO's)	10

Problem Faced by the Farmers

In the research area, agricultural production faces numerous challenges. Seven of the issues have been catalogued in Table 21. When asked about the issues, farmers listed more than seven issues. These issues are outlined in Table 21, which also highlights the principal issues with crop production. The most prevalent issue was pest and insect infestation (51%), followed by high input costs (35%), a lack of cash (6%), and poor seed quality (6%).

Decision Making Participation

The participation of male and female farmer for general decision making was 65.10% and 34.90%, respectively (Table 22). In case of crops and vegetable production, male farmers shared 71.37% over the female farmers 28.63%. In all sorts of decision-making male farmers were dominant (66.83%) over the female (33.17%) farmers.

Diet Diversity

Data on diet diversity of the sample farmer at sreepur, Gazipur during 2017-18 have been presented in the Table 23. Average diet diversity pattern of a week of the sample farmers varied according to farm category. All the farmers take sufficient rice every day in a week. Small and medium farmers are able to take vegetables on an average 6.5 days and 7 days of a week, respectively but the marginal group of farmers took lesser amount (5.72 days per week). Marginal, small and medium farmers intake meat 0.83, 1.56 and 2 days in a week, respectively. In case of fish intake this figure is 4.17, 4.17 and 5.44 days in a week for small, medium and marginal farmer respectively. Egg consumption is more or less similar among all the farmers group. Most of the farmer consume fruits from their own production and it was highest for medium farmer (3.67 days in a week) followed by small (2.81 days) and marginal farmer (2.67 days in a week).

Table 21: Major crop production challenges, Sreepur, Gazipur, 2017-18

Problems	% farmers'	Solution(s)
Training	-	-
Quality seed	6	Information/ Training, Quality seed supply
High price of input	35	Increase subsidy in agricultural inputs
Pest and insects	51	Demonstration, Training and Monitoring
Storage facilities	-	-
Lack of capital	6	Easy credit system
Marketing	2	Good marketing channel

Table 22: Man and woman participation in decision making, Sreepur, Gazipur, 2017-18

Category	Participation in decision making	
	Male (%)	Female (%)
General decision	65.10	34.90
Crop & Vegetables production	71.37	28.63
Livestock production	60.20	39.80
Fish production	70.65	29.35
Total	66.83	33.17

Table 23: Diet Diversity (day/week), sreepur, Gazipur, 2017-18

Item	Average intake (day/week)		
	Marginal	**Small**	**Medium**
Meat	0.83	1.56	2
Fish	4.17	4.17	5.44
Egg	4	4.20	4.56
Rice	6.33	7	7
Vegetables	5.72	6.5	7
Fruits	2.67	2.81	3.67

Conclusion

In a land-scarce nation like Bangladesh, efforts should be made to boost productivity through the integration of different production subsystems in agriculture for effective resource usage. The amount of diversified items that could be produced with the least amount of land would be maximized, increasing both food production and farmer revenue. In conclusion, it can be claimed that Bangladesh's integrated farming system is both technically and economically feasible. Spreading this method among farmers should be vigorously pursued.

Acknowledgements

References

Battese G.E. and Coelli T.J. (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data, Empirical Economics, Vol. 20, 325-332.

BINFS, (1982). Bangladesh Institute of Nutrition and Food Science. Nutrition survey of rural Bangladesh 1981-1982, University of Dhaka, Bangladesh.

BBS. (2020). The year book of agricultural statistics of Bangladesh. Bangladesh Bureau of Statistics (BBS), Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

Shirazy B.J., Islam A.B.M.J., Dewan M.M.R., Shahidullah S.M. (2017). Crops and Cropping Systems in Dinajpur Region. Bangladesh Rice J. 21 (2): 143-156.

Dillon J.I. and Hardaker J.B. (1993). Farm Management Research for Small Farmer Development. FAO, Agricultural Services Bulletin 41, Food and Agricultural Organization of the United Nations, Rome.

https://en.wikipedia.org/wiki/Sreepur_Upazila,_Gazipur

Yang W.Y. (1962). Methods of Farm Management Investigation for Improving Farm Productivity. Food and Agricultural Organization of the United Nations, Rome, Ital

Karim S.M.R., Ahmed M.M., Ansari A., Khatun M., Kamal T.B. and M. Afrad M.S.I. (2021). Homestead vegetable gardening as a source of calorie supplement at IshurdiUpazila, Bangladesh. *J. Food and Agril Sci.;* 10(1), 13-20

Shirazy B.J., Rashid M.H., Mahbub M.M., Somee T.A. and Goswami P.C. (2016). Farmers' Participatory Demonstration of Salt Tolerant T. Aman Rice Varieties in Saline Soils. *Acad. J. Plant Sci.*, 9 (1): 01-04.