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Research Article

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EXISTING CROPPING PATTERN AND ADOPTION OF NEW FARMING TECHNOLOGY IN THE PLAIN LAND ECOSYSTEM OF PHULPUR UPAZILA OF MYMENSINGH

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Abstract: The participatory rural appraisal (PRA) was conducted at Phulpur Upazila of Mymensingh district of Bangladesh during April 2018 to May 2019 to know the existing farming system and new techniques in plain land area. The analysis shows a profit gap between traditional mono/double crop cultivation and integrated farming and the gap benchmarking indicates that integrated farming has two times greater income feasibilities than present cultivation system. Authors strongly recommend the application of model integrated farming to minimize the input cost and maximize the agricultural outputs in order to establish the better economic feasibility for decent livelihood and rural development.

Keywords: Adopted technology, Farming system, Plain land and Phulpur upazila.

INTRODUCTION

Participatory rural appraisal (PRA) is an approach used by non-governmental organizations (NGOs) and other agencies to incorporate the knowledge and opinions of rural people in the planning and management of development projects and programs. The PRA represents a group of approaches and methods that will encourage the community of a village to actively participate in raising and analyzing their knowledge of their life conditions in order to create the correct action plan (Mamun *et al.*, 2009). In PRA, the community is facilitated by outside party such as researchers, donor or officials to analyze their life conditions that consists of existing potentials and problems in their villages. The people are facilitated to develop a program based on existing potentials and also the potentials available outside of their villages. They can solve the problems of that community with the help of above analysis. (Mandal and Singh, 2020) also performed more or less similar type of studies and reported the effects of climate change on farmers' practices.

Authors conducted a PRA analysis in the Phulpur Upazila under Mymensingh district of Bangladesh during April 2018 to May 2019 to understand the

existing cropping system of plain land areas and possible techniques to enhance the agriculture production. The people of PRA sites were very much interested to cultivate different crops but they faced various problems and lack of irrigation facilities (Ali and Rahman, 1986).

MATERIALS AND METHODS

Study Area: The study site was Phulpur Upazila under Mymensingh district of Bangladesh (Fig.1). It is bounded by Haluaghat Upazila in the north, Mymensingh, Sadar Upazila in the south, Gauripur and Purbadhala Upazilas in the east and Nakla Upazila in the west. It is one of the most common, oldest and well known fish market in Mymensingh district. The Phulpur Upazila of Mymensingh District is located in between 24°44' and 25°02' North latitudes and in between 90°13' and 90°33' East longitudes.

Fig. 1: Location of the study area.

The historical timeline of Upazila has its own significance in acquiring knowledge about trends of development through periodical events. This is to know the sequences of changes in the Upazila with respect to social, economic, agricultural and other aspect of a living situation (Sayer, 2001). It reveals the trends of periodical developments for which elderly persons of the Upazila are witnesses by the virtue of the experience and age (BBS, 2018). According to the opinion of the selected sampled farmers, it was observed that 78% of the survey plots were medium high land, 12% were high land and 10% were low land (Ahmed, 2003).

Procedure: For conducting PRA, a team (Photo 1) was formed with multi-dimensional personnel of different disciplines, Socio-economists, Fisheries Scientists, and local 30 male and 20 female farmers. They surveyed about 2500 households in the Phulpur Upazila. In the actual course of PRA, a checklist was made according to objectives. Observational techniques such as transect development, developing sketch maps,

Photo 1: A part of PRA team.

crop calendar, data on existing condition, climatic condition, socio-economic data, price structure, institutional facilities, existing cropping pattern, fresh water sources etc. were recorded which largely covered environmental and socio-economic situations in the study areas (Mahbubullah, 1986). The PRA team also collected secondary data from Upazila Agriculture Office. In the preparatory stages, the team developed a set of tools and techniques that were used during the actual course of PRA. Those included were structured interviewing forms, information of crop production, farmers and direct observations (observational techniques, such as transect development and spending whole day with block level people), physical and social map, check list, crop calendar, time related data on native crop production, climatic information, socio-economics data like family size, annual income, labor and inputs use level, price structure, institutions at Upazila level and credit facilities etc. The PRA team used appropriate interviewing techniques including six questions (what, when, why, where who and how) and group discussion (Tomer *et al.*, 1982). In PRA analysis, sufficient adjustments were made whenever necessary so that the respondents groups could respond correctly (Ellis, 2000). After conducting PRA analysis, all data were arranged using tabular techniques and interpreted in logical manner accordingly.

Data Collection: The official survey of study area was done to collect the primary data by using questionnaire, interview and direct observation. The team also checked the standards in term of fish availability, production system, and livelihood of local farmers (Bangladesh Agricultural Research Council, 1999). In order to compare, the secondary data from Department of Fisheries (DoF), Government of Bangladesh were used.

Questionnaire Interviews: Local 30 male and 20 female farmers were chosen through careful inspection for the questionnaire interviews. Questionnaires were checked in the field before interviews (Azucena *et al.*, 2001). The local people were interviewed through a formal conversation for this purpose. Information about soil type, existing cropping pattern and adoption of new technology, natural calamities and livelihood status of people were collected during the interviews.

RESULTS AND DISCUSSION

Age Categories, Literacy Level and Farm Category:

The result of the survey showed that the average age of landless farmers were higher than others farmers. Table 1 show that farmers of all categories were not highly educated. Most of them were educated up to SSC. Table 1 also shows that landless and medium farmers have comparatively higher family size than other categories of the farmers and average farm size of the landless farmers was 0 decimal and large farmers average farm size was 710.00 decimal.

Table 01: Average age, educational level, family composition and farm size of farmers.

Farmer category	Age (year)	Educational level (%)					Family size (no.)	Farm size (decimal)	Number of sample farmers
		Illiterate	Class V	S.S.C	H.S.C	> H.S.C			
Landless	52	32.33	65.67	2.00	-	-	6.3	0	11
Marginal	41	14.29	75.72	-	-	-	4.5	44.28	13
Small	42	18.18	68.18	4.55	9.09	-	3.6	147.27	15
Medium	47	-	38.58	53.14	7.14	8.14	6.3	346.07	19
Large	55	-	40.00	52.00	-	-	5.2	710.00	15

Farming System:
The table 2 shows that different types of farming systems. Crop + Fisheries were practiced by 17% of sample farmers followed by Crop + Livestock + Poultry + Fisheries 16% and then by Livestock + Fisheries 9%. There were no farmers who practiced only agro-forestry, orchard and nursery.

Table 2: Major farming systems recorded.

Farming Systems	Households No.	Percentage (%)
Crops	3	4
Crop + Livestock + Fisheries + Poultry	6	16
Crop + Livestock + Poultry	4	6
Crop + Livestock	3	7
Crop + Livestock + Fisheries	7	8
Crop + Fisheries + Poultry	3	6
Crop + Poultry	1	7
Crop + Fisheries	8	17
Livestock + Fisheries + Poultry	4	5
Livestock + Poultry	2	7
Fisheries + Poultry	5	8
Livestock + Fisheries	4	9
Total	50	100

Major Crops:
Table 3 shows that production of Boro rice per hectare was higher than yield of Aman per hector.

Table 3: Major crops grown in the study area.

Crops		HYV		Local		Planting time	Harvesting time
		Area (ha)	Yield (kg/ha)	Area (ha)	Yield (kg/ha)		
Rice	DSR (Aus)	4	120	1.5	72	-	-
	T. Aus	5	60	3	60	-	-
	T. Aman	3	140	43.427	1458	July-August	November - December
	Boro	42.42	3500	2	70	October-December	March-April
Potato		2.5	30-35 ton			November-December	February-March

Cropping Patterns:
Mainly Aman and Boro rice were grown by sampled farmers. Mukta and BR 21 variety of aman rice was the common which the farmer grows. Main variety of Boro rice which farmer grows was BRRI dhan 28, BRRI dhan 29, Gazi and hybrid rice.

Table 4: Major cropping patterns.

Cropping System	Cropping variety in different seasons			
	Kharif		Robi	
	Crop	Varieties	Crops	Variety
Boro-fallow-T. Aman	T. Aman	Kironmala, Mukta, BR 21	Boro Rice	BRRI 28, BRRI 29
Fallow-Fallow-T. Aman	T. Aman	Kironmala, Mukta, BR 21		
Vegetable-Fallow-T. Aman	T. Aman	Kironmala, Mukta, BR 21	Potato, Bottle gourd, Bean, Cabbage	Local, Imported

Average Input:
The average input used for crop production of the sample farmers are shown in the table 5.

Table 5: Average input used for crop production.

Name of crops	Input use (no. or kg/ha)										Total input cost (Tk/ha)	Tillage cost (Tk/ha)
	Labor (Male+ Female)	Seed	Urea	TSP	MP	$ZnSO_4$	Gypsum	Cow dung	Insecticide (Tk)	Irrigation (Tk)		
Aman	23	35	73	50	50	-	-	-	1352	1234	13840	4446
Boro	15	33	230	73	71	-	78	-	4210	11115	34232	4446
Potato	12	900	250	120	220	8	120	10	1318	1235	17450	1320

Per Farm Fruit Production and Disposal
Average per farm homestead fruit production and disposal pattern are shown in table 6

Table 6: Average per farm homestead fruit production and disposal pattern.

Fruits Type	Total fruits produced (no. or kg)	Fruits consumed (no. or kg)	Fruits sold (no. or kg)	Value of fruit (Tk/fruit /kg)	Market price (Tk./ pice/kg)	Total (Tk.)
Banana	95	30	70	30	40	3800
Jackfruit	50	15	3	50	45	250
Mango	110	45	50	45	25	300
Papaya	25	15	8	20	20	320
Guava	15	12	20	45	4	160
Total	295	117	151	190	134	4830

Cost and Return of Fish Culture:
Fish culture was profitable that was in practice since long ago in the study area where baseline survey was conducted (Jayanthi, 2000). Table 7 shows the net gain or return by fish culture practices.

Table 7: Per farm cost and return of fish culture.

Name of fish	Number of fishes	Area (decimal)	Production (kg)	Production cost (Tk.)	Gross return (Tk.)	Net return (Tk.)
Tilapia	5000	20	1000	20000	90000	70000
Others Carp fish	6000	40	1500	30000	150000	120000
Total	11000	60	2500	50000	240000	190000

Cost and Return of Major Cropping Patterns
Table 8 shows the cost and return of major existing cropping patterns in the study area. The farmers of the study area cultivated mostly Aman and Boro rice.

Table 8: Cost and return of major existing cropping patterns.

Cropping Patterns	Total cost (TC) (Tk./ha)	Gross Return (GR) (Tk./ha)	Net Return (NR) (Tk./ha)	BCR (GR/TC)
Boro-fallow-T. Aman	5000	147440	55630	1.69
Fallow- Fallow-T. Aman	18000	35340	15160	2.83
Vegetable-Fallow-T. Aman	60000	5	60000	4.52

Livestock and Poultry Assets:
The average per household livestock and poultry assets of sampled farmers are shown by the following table 9.

Table 09: Livestock and poultry assets (in number) in household

Assets	Landless	Marginal	Small	Medium	Large
Ox	2	3	1	1	1
Cow	1	1	2	1	2
Calf	1	2	1	2	1
Goat	3	1	2	1	3
Chicken	11	8	3	2	4
Duck	2	4	1	4	2
Total	20	19	10	11	13

Farm Income of the Sample Farmers:
Average income of the farmers per farm is shown by table 10.

Table 10: Average income (Tk.) per farm of the farmers.

Item	Landless	Marginal	Small	Medium	Large
Crop	0	2600	23010	85050	215360
Livestock	20000	18400	15700	16680	25600
Fisheries	5000	42940	93350	83128	73000
Poultry	3000	5500	3400	6450	2540
Off-farm	25080	30700	22000	25000	15000
Non-farm	16000	15000	10470	1050	2000
Total	69080	115140	167930	217358	333500

CONCLUSION

The introduction of crop diversification in the agriculture sector has created awareness among the farmers to grow and consume a variety of crops like pulses, oilseeds, vegetables, fruits, spices, etc. Certain pulses such as chickpea, field pea, mung bean and lentil produce reasonably good yields with better management including irrigation, fertilization and weed control. The profit from these crops is higher than that of HYV rice and wheat. The farmers' awareness about the production of fish in recent years is better (Chakraborty *et al*., 2019) than in the past decades because of the provision of promotional support to produce fish. The crops with moderately improved varieties have showed good response. The high yielding varieties of crops like potato, tomato, beans, mustard, sunflower, watermelon and banana can impart maximum yield when provided with irrigation, fertilization and better management.

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