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**CHANGE IN CROPPING PATTERNS AND ITS IMPACTS ON FARMERS'
LIVELIHOOD IN SOME SELECTED AREAS OF MYMENSINGH
DISTRICT**

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CHANGE IN CROPPING PATTERNS AND ITS IMPACTS ON FARMERS' LIVELIHOOD IN SOME SELECTED AREAS OF MYMENSINGH DISTRICT

ABSTRACT

The study analyzes the change of cropping patterns and its impacts on farmer's livelihood using farm level survey data. The study reveals that four cropping patterns such as P1 (Boro rice – Fallow - T. Aman rice); P2 (Brinjal -T. Aman rice – Fallow); P3 (Boro rice - T. Aman – Fallow) and P4 (Bean – Fallow - T. Aman rice). It was evident from the study that the cropping pattern P2 (Brinjal - T. Aman rice – Fallow) earned the highest profit among the selected cropping patterns. The results also indicate that the human capital increased 59.33, 68.00 and 65.33 percent; social capital increased 48.88, 52.22 and 57.77 percent as well as physical capital increased 48.00, 67.78 and 86.11 percent of the marginal, small and medium farmers respectively due to change in cropping patterns and their productivity. This study also reports that natural capital and financial capital also increased for marginal, small and medium farmers.

I. INTRODUCTION

Bangladesh is an agricultural country. The growth and stability of the economy largely depends on growth of agriculture. About 70 percent of the total population lives in the rural area who are directly involved in agricultural activities (BBS 2014). It has an area of 1, 47,570 km² (square kilometers) and population nearly 153 million with the density of about 1036 people per square kilometer. Among the total area of Bangladesh, 66 percent is cultivated, 15 percent is utilized for forest land and rest 19 percent is covered by homesteads, rivers, ponds, road etc. Thereby, there is a little scope left to increase agricultural output by bringing new land under cultivation. The total cultivated area of country is 7.81 million hectares of which about 2.85 million hectares of cultivated land are single cropped, 3.98 million hectares are double cropped and 0.95 million hectares are tripled cropped areas with a cropping intensity of 190 percent (BBS 2014). There is no alternative but to develop agriculture sector, provision of food security, improvement of living

standard and employment opportunity of the huge population of the country are directly linked to the development of agriculture.

Realizing the importance and demands for the improvement of nutritional status and livelihood status of the people, the government of Bangladesh has taken a Crop Diversification Programme (CDP) in the Sixth Five-Year Plan (2011-2015). Under the CDP strategy, emphasis was placed to increase production and consumption of nutrient rich foods. In this situation, a change in cropping pattern and increases crop production can help to improve the livelihood condition of farmer and to obtain food security in Bangladesh. Crops selected in each season are based on soil, climate and productivity of crops. With a favorable climate for the cultivation of a wide variety of crops, nearly 100 different crops are presently grown in Bangladesh. Crop production in Bangladesh in recent years has some changes in terms of yields as well as crop distribution. Nevertheless, rice is still the most important food crop and jute, potato, pulse and oilseeds are found amongst other as important cash crops in Bangladesh.

Cropping pattern means the distribution of the area of a farm to various crops grown in the course of one year. It includes the allocation of area to various crops in different seasons. The cropping pattern of a farm actually indicates the relationship between the different crops and the area used under each for production purposes. Cropping pattern may be defined as the arrangement of crops in a piece of land in a year (Gaffar *et al.* 1996). In other words, cropping patterns defined as the yearly sequence of crop production in an area or the way the crops in a piece of land is grown in the course of a year (Alim, 1974).

The objectives of this paper, therefore, are: to document the socioeconomic characteristics of selected farmers, to assess the level of changes of cropping patterns over the year and to examine the impact of changing cropping patterns on livelihood improvement of the farmers.

II. METHODOLOGY

Data used for the study were collected during the March 2015 to April 2015. The locations for the study were selected purposively in Fulbaria and Gouripur Upazilas under Mymensingh district.

For this study, three villages namely Kaladaha, Hatilet under Fulbaria, and Telihati under Gouripur Upazila where multiple crops are grown following different cropping patterns were selected. Data were collected from 90 farmers. Farmers were classified into three categories marginal, small and medium and each of the categories had 30 farmers. Marginal farmer were those who cultivated below 0.50 ha of land, small farmers cultivated 0.50 to 1.00 ha of land and those who cultivated 1.01 to 3.00 ha of land were indicated as medium farmer (BBS 2011). The sample farmers were selected through stratified random sampling technique. The information for the study was collected in local units, after that it was converted into standard international units. Descriptive technique of analysis is generally used to find out the crude association or difference between two variables. In this study descriptive technique was used to illustrate the whole picture of analysis. Here equation is used to compare the actual return from the cropping patterns.

$$\text{Actual return} = \frac{\text{Current net return} \times \text{Base year CPI}}{\text{Current CPI}}$$

CPI= Consumer price index

Consumer price index is used to measure the change in constant price.

A livelihood comprises the capabilities, assets and activities required for means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (DFID 2000). The concept of sustainable livelihoods is a reference point for a wide range of people involved in different aspects of development policy formulation and planning. The sustainable livelihood framework includes the asset pentagon, which composed of five types of capital, social capital, natural capital, physical capital. The livelihood framework identifies five core assets or capital upon which livelihoods are built.

III. RESULTS AND DISCUSSION

Socio-economic Profile of Respondents

The age of the sampled farmers was examined and classified into five groups. These groups are less than 30 years, 30-40 years, 40-50 years, 50-60 years, and above 60 years. The age distribution of the respondents living in the three sampled villages of Mymensingh district reveals that for marginal farmers, 33.33 percent farmers are less than 30 years old and about 10 percent farmers are 40 to 50 years old. In case of small farmer, about 30 percent farmers are 30 to 40 years old and about 13.34 percent farmers are 40 to 50 years old. In case of medium farmers, about 33.33 percent farmers are between 40 to 50 years and the lowest 10 percent is 60 years and above (Table 1).

Educational status of a farm operator influences selection of cropping patterns, production decisions as well as operation and management of a crop production. Education helps a person to have day to day information about modern techniques together with technological changes in various production processes including agriculture. Distribution of the respondents according to literacy level has been shown in Table 1.

Table 1. Age distribution and educational status of the respondents

Items	Marginal Farmers		Small farmers		Medium farmers	
	No.	(%)	No.	(%)	No.	(%)
Age groups (years)	Age distribution of the respondents					
Less than 30.00	10	33.33	5	16.67	4	13.34
30.01-40.00	8	26.67	9	30.00	7	23.33
40.01-50.00	3	10.00	5	16.67	10	33.33
50.01-60.00	5	16.67	7	23.34	6	20.00
Above 60	4	13.34	4	13.34	3	10.00
Total	30	100.00	30	100.00	30	100.00
Literacy level	Educational status of the respondents					
Illiterate	17	56.67	6	20.00	4	13.34
Primary	10	33.34	15	50.00	6	20.00
Up to SSC	3	10.00	7	23.34	15	50.00
HSC and above	0	0.00	2	6.67	5	16.67

Total	30	100.00	30	100.00	30	100.00
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Source: Author's calculation based on survey data, 2015

Crop Performance and Cropping Patterns

The major cropping patterns observed in the study areas are given Table 2.

Table 2. Common cropping patterns in the study areas

Cropping Patterns	Before 10 years	At present
P1	Mustard - Fallow - B. Aman rice	Boro rice (HYV) - Fallow - T. Aman
P2	Boro rice (local) - Mustard - B. Aman rice	Brinjal (HYV) - T. Aman rice - Fallow
P3	Boro rice (local) - Aus – B. Aman rice	Boro rice (HYV) - T. Aman rice - Fallow
P4	Aus rice - Fallow - B. Aman rice	Bean (HYV) - Fallow - T. Aman rice

Source: Field survey data, 2015

Table 1 (see in Appendix) shows the profitability of different cropping pattern indicating that in case of marginal farmers, total return was Tk. 125480/ha, 10 years before and at present total return was Tk. 384474/ha. In case of small farmers total return was Tk. 119172/ha before 10 years and at present total return was Tk. 378944/ha. In case of medium farmers, total return was Tk. 112534/ha before 10 years and at present total return was Tk. 393914/ha.

Ten years before the total return from different cropping patterns was higher in case of marginal farmers and it was lower in case of medium farmers. But a dramatic change is happened in three categories of farmers. At present medium farmers got the highest total return from different cropping patterns they practiced. It is due to their efficient use of land and inputs. On the other hand marginal farmers got the higher total return compare to small farmers.

Impact of Present Cropping Patterns on Livelihood

Development of human capital represents the development of the skills, knowledge and ability of labor and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives. In the present study, five components under human capital were considered. On the other hand social capital refers to formal and informal social relationship,

including their degree of trust, reliability and adaptability. The way in which people work together, both within the household and in wider community, is of key importance of household livelihoods. Table 2 (see in Appendix) shows that the sampled farmers health and sanitation condition increased 60, 73.34 and 66.67 percent respectively due to the changing cropping patterns. In case of education, the situation increased 73.34, 80.24, and 83.34 percent for marginal, small and medium farmers respectively. On the same way, training status also increased 23.33, 33.34 and 46.67 percent. In case of knowledge/efficiency, 83.34, 86.67, and 76.67 percent increased for marginal, small and medium farmer respectively. Access to information increased 56.67, 66.67 and 53.34 percent respectively for marginal, small and medium farmers compare to 10 years back. The table also reveals that their involvement in social group/activities increased 43.34, 66.67 and 50 percent for marginal, small and medium farmers. Political involvement and self-management capacity also increased. Social prestige capability increased 73.33, 43.33, and 56.66 percent respectively. Finally Women-empowerment capability increased 76.67, 83.33, and 70 percent for marginal, small and medium farmers. So, social capital of the farmers was also increased significantly after being involved in new cropping patterns.

Physical capital refers to the household goods, tools and equipment and physical infrastructure of the household. Natural capital consists of natural resources, including their flows and services. In the present study information about land (purchased), land (lease/mortgage in), pond and tube-well water access as the natural capital of sample farmers and Financial capital includes financial resources such as savings, cash in hand, bonds, debenture, etc. The present study also examines the condition of physical, natural and financial capital. Table 3 (see in Appendix) shows that housing increased 16.66, 46.66, and 66.67 percent and electricity connection increased 40.00, 53.33, and 100 percent for marginal, small and medium farmers. Other physical capital also increased due to the new cropping patterns. The study also shows that cultivable land (own) increased 16.67, 46.66, and 40.00 percent and pond area increased 53.33 and 16.66 percent for small and medium farmers. So the findings ensure the significant improvement of natural capital in the study area. In case of financial capital cash in hand increased 46.67, 66.67 and 96.67 percent and savings increased 50, 43.33, and 40 percent for marginal, small and medium farmers respectively.

Table 3 shows the comparative improvement of livelihood assets for all sampled farmers. It reveals that 45.62, 53.98, 55.72 and 54.54 percent of all kind of livelihood assets increased for marginal, small and medium and all sampled farmers" due to the change in cropping patterns in the study area of the sampled farmers.

Table 3. Improvements of livelihood assets

(in percentage of respondent's number)

Livelihood assets	Marginal farmers	Small farmers	Medium farmers	All farmers
Human capital	59.33	68.00	65.33	64.22
Social capital	48.88	52.22	57.77	62.22
Physical capital	48.00	67.78	86.11	64.22
Natural capital	34.16	27.76	18.33	35.55
Financial capital	37.76	54.16	51.10	47.03
Overall improvement	45.62	53.98	55.72	54.64

Source: Author's calculation based on survey data, 2015

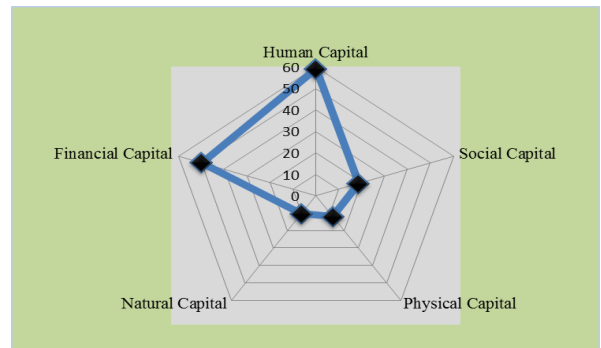
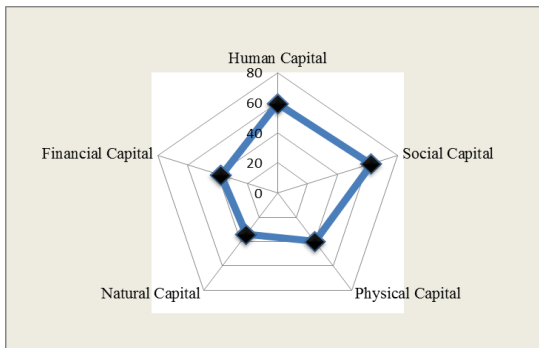


Figure 1 (a): Improvements of livelihoods of Marginal farmers (Asset pentagon)

Figure 1 (b): Improvements of livelihoods of Small farmers (Asset pentagon)

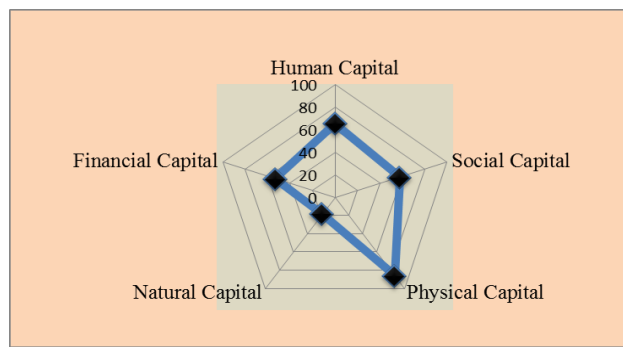


Figure 1 (c): Improvements of livelihoods of Medium farmers (Asset pentagon)

IV. CONCLUSIONS AND POLICY IMPLICATIONS

With increase in population, the demand for food is also increasing which pushing threats to food security because of civilizations taking places and area under cultivation decrease day by day. An overwhelming majority of the rural people is living below the poverty line and this situation is still very acute in the country. To overcome this situation, new strategies should be set up, so that people can earn more by utilizing their own resources. Accelerated agricultural growth through crop diversification offers considerable opportunity for expanding income and employment of rural people. Bangladesh can make remarkable progress in the field of crop productions by taking proper cultivation techniques. A number of farmers are producing their crop with new cropping patterns. The livelihood status of farmers is significantly increased due to the adaptation of new cropping patterns. All kinds of livelihood assets were increased largely in the study area. Among all other capital human capital increased significantly. In physical capital housing facility increased for all farmers. It can be concluded that adoption of new cropping patterns are highly profitable to the farm families in the study areas.

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APPENDIX

Appendix 1 : Calculation of profitability in different cropping patterns

(in Tk.)

Cropping Patterns	Marginal farmers				Small farmers				Medium farmers			
	Before 10 years		At present		Before 10 years		At present		Before 10 years		At present	
	Returns	Total return	Returns	Total return	Returns	Total return	Returns	Total return	Returns	Total return	Returns	Total return
P1	10500-0-10000	20500	30600-0-23690	54290	11150-0-10498	21648	27500-0-23360	50860	10500-0-10960	21460	30600-0-25550	56150
P2	15260-10500-10000	35760	120600-23690-0	144290	15940-11150-10498	37588	125600-23360-0	148960	15260-10500-9378	35138	120600-25550-0	146150
P3	15260-14350-10000	39610	30600-23690-0	54290	15940-11550-10498	37988	27500-23360-0	50860	15260-10960-9378	35598	30600-25550-0	56150
P4	14350-0-15260	29610	107914-0-23690	131604	11550-0-10498	22048	104904-0-23360	128264	10960-0-9378	20338	109914-0-25550	135464
Total		125480		384474		119172		378944		112534		393914

Source: Author's calculation based on survey data, 2015

Appendix 2: Changes in human and social capital

(in percentage of respondent's number)

Components	Marginal farmers			Small farmers			Medium farmers		
	Increased	Decreased	Unchanged	Increased	Decreased	Unchanged	Increased	Decreased	Unchanged
Human Capital									
Health and sanitation	60.00	6.67	33.33	73.34	16.67	10.00	66.67	13.34	20.00
Education	73.34	0.00	26.67	80.24	0.00	20.6	83.34	0.00	16.67
Training	23.33	0.00	76.67	33.34	0.00	66.67	46.67	0.00	53.34
Knowledge	83.34	0.00	16.67	86.67	0.00	13.34	76.67	0.00	23.34
Access	56.67	0.00	43.34	66.67	0.00	33.34	53.34	0.00	46.67
Social Capital									
Involved in social activities	43.34	10.00	46.66	66.67	6.66	26.66	50.00	13.33	36.66
Political involvement	36.67	0.00	63.33	50.00	20.00	30.00	43.34	20.00	36.66
Self-managerial capacity	80.00	16.66	3.33	70.00	0.00	30.00	46.66	13.33	40.00
Social prestige	73.33	10.00	16.66	43.33	16.66	40.00	56.66	16.66	23.333
Decision making	63.33	10.00	26.66	60.00	10.00	30.00	80.00	0.00	20.00
Women empowerment	76.66	0.00	23.33	83.33	0.00	16.66	70.00	0.00	30.00

Source: Author's calculation based on survey data, 2015

Appendix 3: Changes in physical, natural and financial capital

(in percentage of respondent's number)

Components	Marginal farmers			Small farmers			Medium farmers		
	Increased	Decreased	Unchanged	Increased	Decreased	Unchanged	Increased	Decreased	Unchanged
Physical Capital									
Housing	16.66	0.00	83.33	46.66	0.00	53.33	66.66	0.00	33.33
Agricultural	10.00	0.00	90.00	60.00	0.00	40.00	80.00	0.00	20.00
Bicycle	70.00	0.00	30.00	80.00	0.00	20.00	90.00	0.00	10.00
Electricity	40.00	0.00	60.00	53.33	0.00	46.66	100.00	0.00	0.00
TV/Radio/VCD/DVD	26.66	0.00	73.33	66.66	0.00	33.33	80.00	0.00	20.00
Mobile Phone	76.66	0.00	23.33	100.00	0.00	0.00	100.00	0.00	0.00
Natural Capital									
Cultivable land(own)	16.66	0.00	83.33	46.66	0.00	53.33	40.00	0.00	60.00
Mortgaged in	80.00	0.00	20.00	43.33	0.00	56.66	0.00	6.66	93.33
Pond	0.00	16.66	83.33	53.33	20.00	26.66	16.66	20.00	63.33
Tube-well	40.00	0.00	60.00	73.33	0.00	26.66	16.66	0.00	83.33
Financial Capital									
Cash in hand	46.66	10.00	43.33	66.66	10.00	23.33	96.66	0.00	03.33
Savings	50.00	0.00	50.00	43.33	0.00	56.66	40.00	6.66	53.33
Jewelry	16.66	0.00	83.33	40.00	20.00	60.00	23.33	20.00	56.66

Source: Author's calculation based on survey data, 2015