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CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	IDENTIFICATION OF KEY MOTIVATIONAL FACTORS; AN IMPLEMENTATION OF MASLOW'S HIERARCHY OF NEEDS IN PAKISTANI ORGANIZATIONS MUHAMMAD TAHIR AKBAR & DR. MUHAMMAD RAMZAN	1
2.	PROFITABILITY OF POTATO BASED CROPPING PATTERNS COMPARED TO RICE BASED CROPPING PATTERNS IN MYMENSINGH REGION ROMAZA KHANUM, MD.SHARIFUL ISLAM & D. AFROZA	5
3.	THE IMPACT OF ACCOUNTING INFORMATION SYSTEMS IN THE QUALITY OF FINANCIAL INFORMATION IN THE PRIVATE JORDANIAN UNIVERSITIES: AN EMPIRICAL STUDY DR. ATEF A. S. AL-BAWAB	11
4.	THE ROLE OF SNNPRS MARKETING AND COOPERATIVE BUREAU IN THE EXPANSION AND DEVELOPMENT OF COOPERATIVES IN SNNPR REGION, ETHIOPIA, AFRICA DR. S. BALAMURUGAN	18
5.	STUDY ON THE HEALTH LIFESTYLE OF SENIOR LEARNERS IN TAIWAN JUI-YING HUNG & CHIEN-HUI YANG	27
6.	EFFECT OF INFORMATION TECHNOLOGY ON CORPORATE FINANCIAL REPORTING IN NIGERIA AKINYOMI OLADELE JOHN & DR. ENAHORO JOHN A.	31
7.	DIAGNOSTIC STUDY ON INTERACTIVE ADS AND ITS RESPONSE TOWARDS THE FM RADIO EMON KALYAN CHOWDHURY & TAHMINA REZA	36
8.	ACCOMMODATION OF ETHNIC QUEST FOR SELF-GOVERNANCE UNDER ETHNIC FEDERAL SYSTEM IN ETHIOPIA: THE EXPERIENCE OF SOUTHERN REGIONAL STATE TEMESGEN THOMAS HALABO	42
9.	UNIVERSITY PERFORMANCE MEASUREMENT USING THE BALANCED SCORECARD METHOD – SPECIAL FOCUS TO THE LEARNING AND GROWTH PERSPECTIVE W.M.R.B.WEERASOORIYA	46
10.	INDEPENDENT DIRECTORS IN LISTED INDIAN PUBLIC SECTOR ENTERPRISES: AN ANALYTICAL STUDY MOHINDER SINGH TONK	51
11.	RELATIONSHIP BETWEEN EMOTIONAL & SOCIAL COMPETENCES AND TRANSFORMATIONAL LEADERSHIP STYLE BADRI BAJAJ & DR. Y. MEDURY	56
12.	ICT DEVELOPMENTS IN HIGHER EDUCATION IN INDIA: THE ROAD MAP AHEAD DR. M. K. SINGH & DR. SONAL SHARMA	60
13.	CONSUMER SENSITIVITY TOWARDS PRICING OF COSMETIC PRODUCTS: AN EMPIRICAL STUDY DR. D. S. CHAUBEY, LOKENDRA YADAV & HARISH CHANDRA BHATT	67
14.	CONVENIENCE YIELD: EMPIRICAL EVIDENCES FROM INDIAN CHILLI MARKET IRFAN UL HAQ & DR. K CHANDERASEKHARA RAO	74
15.	CELLULAR PHONES: THE HUB OF MODERN COMMUNICATION - AN ANALYTICAL STUDY DR. A. RAMA & S. MATHUMITHA	78
16.	WOMAN LEADERSHIP IN AXIS BANK: A COMPARISON OF WOMAN AND MAN LEADER USING CAMEL MODEL ARTI CHANDANI & DR. MITA MEHTA	83
17.	A STUDY OF ANTS TEAMBUILDING TECHNIQUES AND ITS APPLICATION IN ORGANIZATIONAL WORK TEAMS AMAR DATT & DR. D. GOPALAKRISHNA	90
18.	BASEL II AND INDIAN CREDIT RATING AGENCIES – IMPACT & IMPLICATIONS RAVI KANT & DR. S. C. JAIN	95
19.	A STUDY ON THE CONSUMPTION PATTERN OF BAKERY PRODUCTS IN SOUTHERN REGION OF TAMIL NADU DR. A. MARTIN DAVID, R. KALYAN KUMAR & G.DHARAKESWARI	101
20.	e-COMMERCE: AN INVISIBLE GIANT COMPETITOR IN RETAILING IN EMERGING COUNTRIES NISHU AYEDEE.	107
21.	THE GREAT MATHEMATICIAN SRINIVASA RAMANUJAN G. VIJAYALAKSHMI	111
22.	ISSUES RELATING TRANSITION IPv4 TO IPv6 IN INDIA ANANDAKUMAR.H	117
23.	QUALITY OF WORK-LIFE: A TOOL TO ENHANCE CONFIDENCE AMONG EMPLOYEES JYOTI BAHL	124
24.	GLOBAL RECESSION: IMPACT, CHALLENGES AND OPPORTUNITIES SHAIKH FARHAT FATMA	128
25.	IMPACT OF CELL PHONE ON LIFESTYLE OF YOUTH: A SURVEY REPORT MALIK GHUFRAN RUMI, PALLAVI TOTLANI & VINSHI GUPTA	133
26.	EFFECTIVENESS OF TRAINING IN AUTO COMPONENT INDUSTRY – AN EMPIRICAL STUDY R.SETHUMADHAVAN	143
27.	THE IMPACT ON MARKETING BY THE ADVENT OF WEB 2.0 INTERNET TOOLS JAYAKUMAR MAHADEVAN	146
28.	MARKET INFLUENCE ON THE TECHNOLOGY IN THE ENERGY SECTOR - A STUDY OF INDIAN SCENARIO MANOHAR SALIMATH C	150
29.	SPOT ELECTRICITY PRICE MODELLING AND FORECASTING G P GIRISH	154
30.	AN ANALYTICAL STUDY OF RURAL MARKETING IN INDIA - OPPORTUNITIES AND POSSIBILITY BASAVARAJAPPA M T	158
	REQUEST FOR FEEDBACK	162

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PROFITABILITY OF POTATO BASED CROPPING PATTERNS COMPARED TO RICE BASED CROPPING PATTERNS IN MYMENSINGH REGION

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ABSTRACT

The study was carried out to evaluate the performance of different cropping patterns for identification of the most profitable cropping pattern during April to May; 2010. The area selected for the study covered four villages. Two villages from Shakhipur upazila of Tangail district and two villages from Bhaluka upazila of Mymensingh district were purposively selected. Sixty (60) farmers were selected randomly for this study. There were four major cropping patterns selected in the study area, namely, Jute-Aman rice-Wheat, Aus rice-Potato-Fallow, Jute-Potato-Fallow and Aus rice-Aman rice-Wheat. It was found that per hectare total human labor used in cultivation of aforesaid patterns were 215, 291, 254 and 253 respectively. Farmers responded to have applied the dose of 469.34, 425.26, 388.21 and 506.39 kg Urea, 318.76, 283.51, 214.83 and 387.44 kg TSP, and 292.32, 351.16, 316.58 and 326.90 kg MP per hectare for the selected patterns, respectively. In terms of economic viability, the Aus rice-Potato-Fallow pattern appeared to have the high potential as replacement for the farmers' other existing cropping patterns having the highest net return of Tk. 57143.82 per hectare. Based on findings Aus rice-Potato-Fallow pattern might be recommended to the farmers as the economically pattern.

KEYWORDS

Profitability, Economic Viability, Cropping Pattern, Net Return, Competitive Crops.

INTRODUCTION

Bangladesh is a densely populated agrarian country where agriculture contributes 23.50 percent to the Gross Domestic Product. The total cropped area is estimated to be 13.742 million hectares with an average cropping intensity of about 175.97 percent (BBS, 2008). 8.44 million hectares are cultivable; 2.599 million hectares are utilized for forest of the total cropped area. Homesteads, rivers, tidal creeks, lakes, ponds, and roads cover the rest. Besides, augmentation of new roads and highways, dwelling house, industrialization and land fragmentation, etc. is causing the cropland reduced day by day. So, a little scope is left to increase agricultural output by putting new land under cultivation. Adopting improved cropping patterns, improved management and cultural practices can attain increase in crop output. Rice, the staple food of the people of Bangladesh, occupies about 72.24 percent of the total cropped area and remaining 27.76 percent of total cropped area (i.e. 3.58 percent Jute, 2.11 percent Wheat and 2.23 percent Potato) is devoted to other non-rice crops (BBS, 2008).

Potato (*Solanum tuberosum*) is the third largest food crop in Bangladesh next to rice and wheat. It is the leading vegetable crop in the world and at present people of at least 40 countries eat potato as their also staple food (Islam, 1987 and Huq *et al.*, 2007). Potato production constitutes 23 percent of total world production of potato, rice and wheat (FAO, 1987 and Roy, 1993). It is very important crop due to its higher yield, diversified use, low risk involvement, excellent potentiality to grow in the soil and agro-climatic conditions of Bangladesh. Expansion of potato hectareage depends on its economic viability compared to its competitive crops. Most of the farmers' cropping patterns need modification, in particular, in terms of improved varieties, optimum planting schedules, input use and management of individual crops in the patterns. There are some economic studies on cost and returns of potato and some other crops, conducted individually. But little information is available on economic aspects of profitability of alternative cropping patterns. For this reason the present study is an attempt to the relative profitability of potato based cropping patterns compared to rice based cropping patterns in Mymensingh region.

OBJECTIVES OF THE STUDY

The specific objectives of the study are: i) to identify different cropping patterns practiced by the farmers; ii) to find out the extent of land resource and other inputs utilized for different patterns according to cropping; iii) to evaluate the performance of different cropping patterns for identification of the most profitable cropping pattern.

MATERIALS AND METHODS

The area selected for the study covered four villages. Two villages from Shakhipur upazila of Tangail district, namely Mucharia Pathar and Gajaria and two villages from Bhaluka upazila of Mymensingh district, namely, Batajore and Gilachala were purposively selected. 60(Sixty) farmers were selected randomly for this study. Before finalizing the questionnaire, it was pre-tested. After pre-testing, the schedule was changed, rearranged, improved and modified in the light of the practical experience gained from the pre-testing. The schedule was then finalized and questions were listed in logical sequence so that the farmers could answer easily. After preparing final schedule primary data were collected from the selected farmers by the author himself. Survey method was used to collect the data. The collected data were coded, tabulated and analyzed for achieving the ultimate objectives of the study. Mainly tabular method using average, percentages were followed to find out the various objectives of the study.

RESULTS AND DISCUSSION

A. SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE FARMERS

Family size and composition of the Sample Farmers

In this study, a family has been considered as one which has a group of persons living together and taking their meals jointly from the same kitchen under the administration of the head of the family. The permanent hired labor was not included as a member of the family.

Table 1 show that the average family size of the selected beneficiaries stood at 4.8 members. The estimated family size was lower than the national average of 4.9 (BBS, 2010). The study reveals that the highest number of members (60.62 percent) belonged to the working age group, i.e. above 18 to 60 years, while 23.60 percent of the family members aged above 6 to 18 years. In the case of beneficiaries 50.69 percent members were male and 49.31 percent members were female.

TABLE 1: FAMILY COMPOSITION OF THE BENEFICIARIES ACCORDING TO AGE AND SEX

Type of sex	Age					Average family size
	Up to 6 years	Above 6 to 18 years	Above 18 to 60 years	Above 60 years	Total	
Male	4.86	10.75	31.25	3.82	50.69	4.90
Female	4.17	12.85	29.17	3.13	49.31	4.75
All	9.03	23.60	60.62	6.95	100	4.80

Source: Field survey, 2010

Farm size of the sample farmers

The farm size of a farmer was measured by using the following formula (Yang, 1965): Farm size = cultivated land + rented in + mortgaged in – (rented out + mortgaged out) + homestead. Based on farm size, in this study, farmers were classified into three categories ranging from 0.01 to 1.00, 1.01 to 3.00 and above 3.00 hectare. It was found that 14, 44 and 3 in percentage 23.34, 73.33 and 3.33, respondent farmers were belonged to the farm size 0.01 to 1.00, 1.01 to 3.00 and above 3.00 hectare (Table 2).

TABLE 2: FARM SIZE OF THE SAMPLE FARMERS

Farm size (hectare)	Number of respondent farmers	Percentage of respondent farmers
0.01 to 1.00	14	23.34
1.01 to 3.00	44	73.33
Above 3.00	2	3.33

Source: Field survey, 2010

B. MAJOR CROPPING PATTERNS AND AREA COVERAGE

There were four major cropping patterns identified in the study area namely Jute- Aman rice-Wheat, Aus rice-Potato-Fallow, Jute-Potato-Fallow, Aus rice-Aman rice-Wheat having an area of 45.20, 27.00, 26.70 and 45.40 ha, capturing 31.32, 18.71, 18.51 and 31.46 percent of the total area (Table 3). The above mentioned patterns will be abbreviated to P1, P2, P3 and P4 respectively, in the succeeding chapter of this report.

TABLE 3: AREA COVERED BY THE CROPPING PATTERNS PRACTICED BY THE RESPONDENT FARMERS

Cropping patterns	Gross area coverage(hectare)	Percentage of total gross area
Jute-Aman rice-Wheat (P1)	45.20	31.32
Aus rice-Potato- Fallow (P2)	27.00	18.71
Jute-Potato- Fallow (P3)	26.70	18.51
Aus rice-Aman rice-Wheat (P4)	45.40	31.46
Total	144.30	100.00

Source: Field survey, 2010

C. PROCEDURE FOR COMPUTATION OF COST AND RETURNS OF DIFFERENT CROPPING PATTERNS

In this section, methods of costing of various items used in producing different crops have been discussed in order to determine relative profitability of different cropping patterns. In calculating cost, both full cost and cash cost were considered. The cost items classified in calculating the total cost were as follows: cost of human labor, cost of animal labor, cost of seed/ seedling, cost of manure's, cost of chemical fertilizer, cost of insecticides, cost of irrigation, cost of tools and equipment, interest on operating capital and land rent.

Cost of human labor

One of the most important inputs used in crop production is human labor. In this study, human labor was classified into family labor and hired labor. Family labor included the farmer himself, the adult male and female as well as children of the farmer's family and the permanent labor appointed by him. The cost of hired labor was calculated at the average wage rate actually paid by the farmers. To standardize labor hours or man-days required for different operations, all the labor units were converted into man-equivalents. This was performed as: 1 adult male = 1.5 adult female = 2 children (Shiblee *et. al.*, 2000). The family labor was priced at the rate as hired labor. In the study area, wage rate varied from Tk. 200-250 and average wage rate was Tk.200 per man-day for different crop cultivation. One man-day was equal to 8 hours of work. Labor wage was highest at the peak period such as land preparation, harvesting and lowest at the lean period. Total human labor used in cultivation of patterns P1, P2, P3 and P4 were 215.48, 291.40, 254.12 and 252.76 man-days per hectare of which 107.28, 102.04, 91.10 and 118.22 man-days were hired labor, respectively. Corresponding total cost incurred for human labor for aforementioned cropping patterns were Tk. 43072.95, Tk. 58280, Tk. 50824 and Tk. 50552 respectively (Table 4 & 5). The result indicated that the highest employment was created by the pattern P2 followed by the pattern P3. For the purpose of harvesting, carrying and thrashing/ washing and drying the highest labor use was found to be 77.16 man-days per hectare for the pattern P2 followed by 76.39 man-days for the pattern P3 and the lowest 71.24 man-days per hectare for the pattern P1 (Table 4). The human labor use for transplanting/ sowing were found to be 34.72, 64.00, 42.00 and 56.72 man-days, per hectare of which 21.16, 26.00, 15.50 and 31.66 were hired labor for the patterns P1, P2, P3, and P4, respectively and corresponding total costs were Tk.6944, Tk. 12800, Tk. 8400 and Tk. 11344, respectively (Table 4 & 5).

TABLE 4: OPERATION-WISE DISTRIBUTION OF HUMAN LABOR FOR PRODUCING DIFFERENT CROPPING PATTERNS ON FULL COST BASIS

Operations	Jute-Aman rice-Wheat (P1)		Aus rice-Potato- Fallow (P2)		Jute-Potato- Fallow (P3)		Aus rice-Aman rice-Wheat (P4)	
	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha
Land preparation	25.05	4982.95	39.51	7902.00	34.31	6862.00	30.23	6046.00
Spading	12.51	2502.00	28.18	5636.00	22.78	4556.00	17.91	3582.00
Transplanting/ Sowing	34.72	6944.00	64.00	12800.00	42.00	8400.00	56.72	11344.00
Weeding	34.34	6868.00	28.35	5670.00	23.65	4730.00	39.04	7808.00
Application of fertilizer and manure	11.26	2252.00	17.77	3554.00	16.27	3254.00	12.76	2552.00
Application of insecticide	5.86	1172.00	6.07	1214.00	5.67	1134.00	6.26	1252.00
Application of irrigation	6.07	1214.00	12.04	2408.00	12.04	2408.00	6.07	1214.00
Harvesting, carrying and thrashing /washing and drying	71.24	14248.00	77.16	15432.00	76.39	15278.00	72.01	14402.00
Marketing	14.45	2890.00	18.32	3664.00	21.01	4202.00	11.76	2352.00
Total human labor	215.50	43072.95	291.40	58280.00	254.12	50824.00	252.76	50552.00

Source: Field survey, 2010.

TABLE 5: OPERATION-WISE DISTRIBUTION OF HUMAN LABOR FOR PRODUCING DIFFERENT CROPPING PATTERNS ON CASH COST BASIS

Operations	Jute-Aman rice-Wheat (P1)		Aus rice-Potato- Fallow (P2)		Jute-Potato- Fallow (P3)		Aus rice-Aman rice-Wheat (P4)	
	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha	Qty. (man-days/ha)	Tk./ha
Land preparation	8.27	1654.00	11.71	2342.00	9.51	1902.00	10.47	2094.00
Spading	4.02	804.00	7.42	1484.00	4.22	844.00	7.22	1444.00
Transplanting/ Sowing	21.16	4232.00	26.00	5200.00	15.50	3100.00	31.66	6332.00
Weeding	19.57	3914.00	10.80	2160.00	13.10	2620.00	17.27	3454.00
Application of fertilizer and manure	-	-	3.57	714.00	2.37	474.00	1.20	240.00
Application of insecticide	-	-	-	-	-	-	-	-
Application of irrigation	3.57	714.00	4.36	872.00	4.36	872.00	3.57	714.00
Harvesting, carrying and thrashing/washing and drying	44.87	8974.00	32.00	6400.00	33.56	6712.00	43.31	8662.00
Marketing	5.82	1164.00	6.18	1236.00	8.48	1696.00	3.52	704.00
Total human labor	107.28	21456.00	102.04	20408.00	91.10	18220.00	118.22	23644.00

Source: Field survey, 2010

Cost of Animal Labor / Mechanical Power

In Bangladesh, the use of animal labor usually involves a pair of animal and one attendant. Most of the sample farmers used family supplied animal labor, but a few of them used hired animal labor. The measuring unit for animal labor was pair-day, locally called 'hal'. Animal pair-day was assumed to be five hours of work. Home supplied animal labor was priced at the prevailing hiring rate. Due to scarcity of animal draft power, some farmers used power tiller for land preparation in the study area. During the study period, the average hiring rate of animal labor was Tk. 280 per pair-day and power tiller cost was Tk.2000 per hectare in the study area. For animal and mechanical power together, farmers spent Tk.10243.20, Tk. 7817.60, Tk. 7664.00 and Tk.10396.80 in full cost basis and no cost in cash cost basis for the patterns P1, P2, P3, and P4 respectively (Table 6 & 8).

Cost of Seed /Seedling

Farmers used home supplied seed / seedlings. The cost of home supplied seed / seedlings were valued at the price which farmers would have got if he had sold it to the market. Farmer used the seed / seedling having costs of Tk. 6297.15, Tk. 35899.50, Tk. 33895.95 and Tk. 8300.70 for the patterns P1, P2, P3, and P4 respectively (Table 6). Price of seeds was charged Tk.100 per kg for Jute, average price Tk. 40 per kg for Wheat, Potato, Aus and Aman during the period of study area.

Cost of Manure

For producing different crops, most of the farmers in the study area used manure, such as cow dung, and oilcake from home-supplied and purchased. Use of cow dung as manure was very low. Because, they mostly used cow dung as fuel. Price of oilcake was Tk.18.00/ kg and cow dung was assumed fixed for all farmers at Tk. 0.30/ kg. It was observed from the Table 6 that farmers applied 10451.58, 10254.70, 9928.98 and 10777.30 kg cow dung per hectare amounting Tk. 3135.47, Tk. 3076.41, Tk. 2978.69 and Tk. 3233.19 for the patterns P1, P2, P3, and P4 respectively. Oilcake was not applied for the patterns P1 and P4 but the patterns P2 and P3 were applied same amount of oilcake of 193.56 kg/ ha and costing at Tk. 3484.08 (Table 6).

Cost of Fertilizers

Proper use of fertilizer can enhance agricultural production to a great extent and help to improve soil fertility. Farmers in the study area used three kinds of chemical fertilizers namely Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) which were purchased by the farmers. In study area, the cost of fertilizers was charged at the purchase price of fertilizer from the market. Application of Urea was common for all farmers. Farmers responded to have applied the dose of 469.34, 425.26, 388.21 and 506.39 kg Urea, 318.76, 283.51, 214.83 and 387.44 kg TSP and 292.32, 351.16, 316.58 and 326.90 kg MP for the patterns P1, P2, P3, and P4 respectively. Their corresponding costs were estimated at Tk.2581.37, 2338.93, 2135.16 and 2785.15 for Urea, Tk.3825.12, 3402.12, 2577.96 and 4649.28 for TSP and Tk.2630.88, 3160.44, 2849.22 and 2944.10 for MP for the aforementioned patterns, respectively (Table 6 & 8). It is evident from Table 6 that the highest amount of fertilizer (1220.73 kg/ ha) was used for the pattern P4 than those of other patterns practiced by the farmers in the study area.

Cost of Insecticides

In the study area most of the farmers used insecticides, such as Tilt, Agro-vita, Vitaforan, Agnol, Relothin, Opsin, Basudin etc. The costs of insecticides were computed on the basis of the actual prices paid by the farmers. Insecticide costs were Tk.1499.73, Tk. 1629.05, Tk. 1628.71 and Tk. 1500.07 for the patterns P1, P2, P3, and P4 respectively (Table 6 & 8).

Cost of Irrigations

Irrigation was a leading input in producing different crop. In the study area, shallow and deep tubewells were used for irrigation purpose. The cost of irrigation was estimated on the basis of the actual prices paid by the farmers. A few farmers used their own shallow tubewells. Irrigation costs were Tk. 6437.82, Tk. 2691.54, Tk. 2691.54 and Tk. 6437.82 for the patterns P1, P2, P3, and P4 respectively (Table 6 & 8).

Land Rent

The cost of land was different for different crops depending upon their location, topography and fertility of the soil. The cost of land use may be estimated using one of the following three alternative ways:

- Interest on the average value of land;
- Rental value, and
- Forgoing income from alternative use.

In this study, the cost of land was estimated taking the interest on the average value of land. The interest was charged at the rate of 9 percent per annum. Interest on the average value of land was computed by using the following formula (Hossain, 2000):

$$C = V \times I \times T$$

Where,

C = Interest on the average value of land

V = value of land

I = Rate of interest per annum

T = Length of production period.

It was assumed at Tk. 82585.35, Tk. 44242.26, Tk. 50141.22 and Tk. 76689.39 for the patterns P1, P2, P3, and P4 respectively (Table 6).

Interest on Operating Capital

The operating capital included cash expenses on purchased inputs, such as, human labor, animal power, seeds, manure's, fertilizers, insecticides, irrigation etc. In estimating this cost the interest rate was assumed to be 9 percent per annum. Interest on operating capital was calculated in accordance with the following formula (Hossain, 2000):

Interest on operating capital = Alit

Where,

Al = (total investment)/2

i = interest rate

t = length of the period of crop production

Here, time covered the period from land preparation to harvesting. In this case, interest on operating capital was charged for four months for each crop. Interest on operating capital was calculated at Tk. 1385.97, Tk. 1159.35, Tk. 1288.23 and Tk. 1257.09 for the patterns P1, P2, P3, and P4 respectively (Table 6).

Total Variable Cost and Gross Cost

At full cost basis, gross cost and total variable cost were Tk. 163695.01 and Tk. 81109.66 for pattern P1, Tk. 167181.26 and Tk. 122939.02 for pattern P2, Tk. 162158.72 and Tk. 112017.50 concerning pattern P3, and Tk. 168745.59 and Tk. 92056.20 regarding pattern P4, respectively. As land rent was not included in cash cost total variable cost (TVC) and gross cost are same at this cash cost basis. Costs incurred for the patterns P1, P2, P3, and P4, at cash cost basis, were Tk. 41992.07, Tk. 70361.36, Tk. 67482.62 and Tk. 44872.82, respectively (Table 9). It is observed that patterns P2 incurred the highest cost followed by the pattern P3 and pattern P4 incurred the lowest cost preceded by the pattern P1.

TABLE 6: PER HECTARE COST OF POTATO BASED AND RICE BASED CROPPING PATTERNS ON FULL COST BASIS

Costs	Jute-Aman rice-Wheat (p1)		Aus rice-Potato-Fellow (p2)		Jute-Potato-Fallow (p3)		Aus rice-Aman rice-Wheat (p4)	
	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.
1. Total Variable Cost (TVC) (A+B+C+D)	-	81109.66	-	122939.02	-	112017.50	-	92056.20
A. Material Costs (a+b+c+d+e)	-	26407.54	-	55682.07	-	52241.31	-	29850.31
a. Fertilizer costs (kg)	1080.42	9037.37	1059.93	8901.49	919.62	7562.34	1220.73	10378.53
i. Urea (kg)	469.34	2581.37	425.26	2338.93	388.21	2135.16	506.39	2785.15
ii. TSP (kg)	318.76	3825.12	283.51	3402.12	214.83	2577.96	387.44	4649.28
iii. MP (kg)	292.32	2630.88	351.16	3160.44	316.58	2849.22	326.90	2944.10
b. Manure Costs (kg)	10451.58	3135.47	10448.26	6560.49	10122.54	6462.77	10777.30	3233.19
i. Cow dung (kg)	10451.58	3135.47	10254.70	3076.41	9928.98	2978.69	10777.30	3233.19
ii. Oil cake (kg)	-	-	193.56	3484.08	193.56	3484.08	-	-
c. Seed cost (kg)	-	6297.15	-	35899.50	-	33895.95	-	8300.70
d. Insecticide	-	1499.73	-	1629.05	-	1628.71	-	1500.07
e. Irrigation	-	6437.82	-	2691.54	-	2691.54	-	6437.82
B. Human labour (man-day)	215.48	43072.95	291.40	58280.00	254.12	50824.00	252.76	50552.00
C. Animal/Mechanical Power	-	10243.20	-	7817.60	-	7664.00	-	10396.80
D. Interest on operating capital	-	1385.97	-	1159.35	-	1288.23	-	1257.09
2. Land rent	-	82585.35	-	44242.26	-	50141.22	-	76689.39
Gross cost (1+2)	-	163695.01	-	167181.26	-	162158.72	-	168745.59

Source: Field survey, 2010

TABLE 7: PER HECTARE RETURN OF POTATO BASED AND RICE BASED CROPPING PATTERNS ON FULL COST BASIS

Operations	Jute-Aman rice-Wheat (P1)		Aus rice-Potato- Fallow (P2)		Jute-Potato- Fallow (P3)		Aus rice-Aman rice-Wheat (P4)	
	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.
Gross Return (GR)	-	206572.28	-	224325.08	-	218865.47	-	212211.90
i. Main product	-	167774.78	-	218475.08	-	196167.47	-	190761.90
ii. By-product	-	38797.50	-	5850.00	-	22698.00	-	21450.00
Gross margin (GR-TVC)	-	125462.62	-	101386.08	-	106847.97	-	120155.70
E. Net Return (GR-GC)	-	42877.27	-	57143.82	-	56706.75	-	43466.31

Source: Field survey, 2010.

TABLE 8: PER HECTARE COST OF POTATO BASED AND RICE BASED CROPPING PATTERNS ON CASH COST BASIS

Costs	Jute-Aman rice-Wheat (P1)		Aus rice-Potato- Fallow (P2)		Jute-Potato- Fallow (P3)		Aus rice-Aman rice-Wheat (P4)	
	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.
1. Total Variable Costs (TVC) (A+B+C+D)		41992.07	-	70361.36	-	67482.62	-	44872.82
A. Material Costs	-	20536.07	-	49953.36	-	49262.62	-	21228.82
a. Fertilizer costs (kg)	1080.42	9037.37	1059.93	8901.49	919.62	7562.34	1220.73	10378.53
i. Urea (kg)	469.34	2581.37	425.26	2338.93	388.21	2135.16	506.39	2785.15
ii. TSP (kg)	318.76	3825.12	283.51	3402.12	214.83	2577.96	387.44	4649.28
iii. MP (kg)	292.32	2630.88	351.16	3160.44	316.58	2849.22	326.90	2944.10
b. Manure Costs (kg)	-	-	193.56	3484.08	193.56	3484.08	-	-
i. Cow dung (kg)	-	-	-	-	-	-	-	-
ii. Oil cake (kg)	-	-	193.56	3484.08	193.56	3484.08	-	-
c. Seed cost (kg)	-	3561.15	-	33247.20	-	33895.95	-	2912.40
d. Insecticide	-	1499.73	-	1629.05	-	1628.71	-	1500.07
e. Irrigation	-	6437.82	-	2691.54	-	2691.54	-	6437.82
B. Human labour (man-day)	107.28	21456.00	102.04	20408.00	91.10	18220.00	118.22	23644.00
C. Animal/Mechanical Power	-	-	-	-	-	-	-	-
D. Interest on operating capital	-	-	-	-	-	-	-	-
2. Land rent	-	-	-	-	-	-	-	-
Gross Costs (1+2)	-	41992.07	-	70361.36	-	67482.62	-	44872.82

Source: Field Survey, 2010

TABLE 9: PER HECTARE RETURN OF POTATO BASED AND RICE BASED CROPPING PATTERNS ON CASH COST BASIS

Operations	Jute-Aman rice-Wheat (P1)		Aus rice-Potato- Fallow (P2)		Jute-Potato-Fallow (P3)		Aus rice-Aman rice-Wheat (P4)	
	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.	Qty.	Tk.
Gross Return (GR)	-	118041.30	-	153001.21	-	148918.77	-	121810.19
Main product	-	95871.30	-	149011.21	-	133474.77	-	109915.19
By-product	-	22170.00	-	3990.00	-	15444.00	-	11895.00
Gross Margin (GR-TVC)	-	76049.23	-	82639.85	-	85714.01	-	76937.37
E. Net Return (GR-GC)	-	76049.23	-	82639.85	-	81436.15	-	76937.37

Source: Field survey, 2010.

FIG.1: GROSS RETURN, GROSS COST, GROSS MARGIN, NET RETURN OF POTATO BASED CROPPING PATTERNS COMPARED TO RICE BASED ON FULL COST BASIS

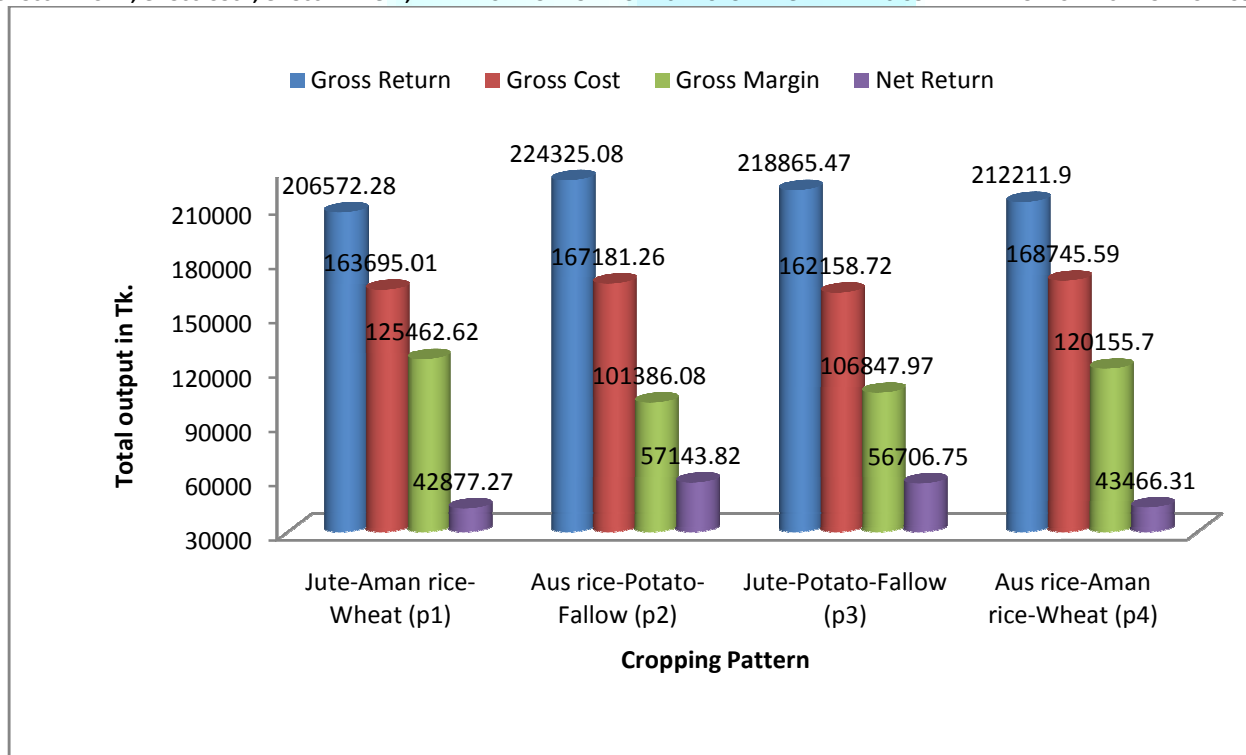


FIG.2: GROSS RETURN, GROSS COST, GROSS MARGIN, NET RETURN OF POTATO BASED CROPPING PATTERNS COMPARED TO RICE BASED ON CASH COST BASIS



D. RELATIVE PROFITABILITY: A COMPARISON

Gross Return

The pattern P2 was superior in terms of economic return in comparison with the other cropping patterns. Per hectare giving the farmers Tk.224325.08 including by-product of Tk. 5850.00 followed by the pattern P3, having per hectare amounting Tk. 218865.47 including by-product of Tk. 22698.00 among the rest of the patterns, pattern P4 that Tk. 212211.90 including by-product of Tk. 21450.00 and pattern P1 Tk. 206572.28 including by-product of Tk. 38797.50 were farmers earned (Table 8).

Gross Margin and net Return

Considering full cost, gross margin was estimated at Tk. 125462.62, Tk. 101386.08, Tk. 106847.97 and Tk. 120155.70 for the patterns P1, P2, P3, and P4 respectively (Table 6). The net return was estimated at Tk. 57143.82 for the pattern P2, Tk. 56706.75 for the pattern P3, Tk. 43466.31 for the pattern P4 and Tk. 42877.27 for the pattern P1 respectively, which have been written in order of highest to lowest. Based upon cash cost, gross margin or net return, whatever it may be, was computed at Tk.82639.85, Tk. 81436.15, Tk. 76937.37 and Tk. 76049.23 regarding the patterns P2, P3, P4, and P1 respectively (Table 9).

CONCLUSION

In terms of economic viability, the Aus rice-Potato-Fallow pattern appeared to have the greatest potential as replacement for the farmers' than other cropping patterns. Aus rice-Potato-Fallow had the highest net return compared to other cropping patterns. Based on findings, Aus rice-Potato-Fallow pattern should be recommended to the farmers.

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