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Profitability of Cabbage Cultivation in Different Growing Periods at Jessore Area

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Abstract: The study was carried out to assess the input use pattern, comparative profitability and resource utilization to cabbage cultivation in different growing periods. The highest gross return as well as net return was obtained from pre-rabi period of cabbage cultivation. The lowest gross return and net loss was obtained from late-rabi period of cabbage cultivation. The study revealed that cabbage cultivation is more profitable in pre-rabi period and least profitable (actually negative profitable) in the late-rabi period. The benefit cost ratio was the highest for pre-rabi period in both variable cost and total cost basis. Return to labour was calculated highest for pre-rabi cultivation indicating best use of highest cost involvement input. Marginal rate of return was found 1667% for pre-rabi cultivation which implies that taka one hundred additional investment to pre-rabi rather than optimum-rabi will provide additional taka 1667 to the growers.

Key words: Cabbage, profitability, growing period, resource utilization

Introduction

Cabbage (*Brassica oleracea*) is an important vegetable crop and is widely grown in Bangladesh mainly in the rabi season. It is one of the main cash crops of the season. There are 0.75 million hectare of land under cabbage cultivation in Bangladesh with the production of 11.3 million metric ton fresh cabbage (Anonymous, 1998). It indicates a very poor yield (15 t ha⁻¹) per unit area. Per capita consumption of vegetable in Bangladesh is very low (30 g/head/day) compared to that in neighboring countries (Rampal and Gill, 1990). Vegetables are quick growing and cash earning enterprise to the growers. Moreover vegetable production needs at least 50% more human labour compared with cereals production which will obviously help more employment of farm labour (Sabur, 1989). In this context vegetable production must be increased to meet the food supply and dietary standard.

Farmers at Jessore area of Bangladesh grow cabbage in a wide range of time. Generally they start planting at mid July (pre-rabi) and continued up to December (late-rabi). The production technology, management practices and input use level is different in this wide range of cabbage planting period. The yield level and market price of cabbage also varied. When the produce comes to the market at the beginning of October earned a good profit. The price of cabbage, like other vegetable decrease with the increase in supply in the peak season and late season. The study was therefore designed to know the production technology, input use pattern, profitability and resource utilization in different growing periods.

Materials and Methods

The study was conducted at Sadar Upazila of Jessore district during July 1998 to March 1999. The village Bijoyagar under the sadar upazila was purposively selected for farm level data collection as the village produce large amount of cabbage as field crop in a wide range of period. A total of 439 farmers were found to grow cabbage in three growing periods in the village, which was identified during the planting period. Of them 108 was pre-rabi, 179 was optimum rabi and 152 was late rabi grower. The sample farmers were selected randomly as such that at least 30 individual farmers in each group can be interviewed for necessary data collection. In this process a total of 97 farmers were selected for the collection of information of which 32 were pre-rabi period cabbage grower, 34 were optimum-rabi period grower and the rest 31 were late-rabi period grower. The growing season was purposively divided into three separate periods as the planting time starts from July and continued up to December. The three separate growing periods are pre-rabi (Mid July to mid September planting), optimum-rabi (mid September to mid November planting) and late-rabi (mid November to mid December planting). Labour use efficiency was measured to see the rate of return from labour employed by using the following formula as Huq *et al.* (1998).

$$\text{Return to labour} = \frac{\text{Gross return} - \text{All cost except cost of labour}}{\text{No. of labour employed}}$$

Results and Discussion

Agronomic practices: The study revealed that 100% of the pre-rabi period growers used KK cross variety for cabbage cultivation. In the optimum-rabi period 87% of the growers used the variety green express and the rest 13% used KK cross. In the late-rabi period 60% of the growers used atlas-70 and the rest 40 percent used green express variety (Table 1).

It indicates that farmers preferred KK cross variety for early growing and atlas-70 and green express for optimum and late period growing respectively. All these modern varieties are imported and cross breed. The pre-rabi planting of cabbage starts from mid-July and continued up to mid-September. The late planting includes the period from mid-November to mid-December. The planting period in between pre and late rabi i.e. from mid-September to mid-November is the optimum planting period of cabbage. The plant spacing followed by the farmers was 45x60 cm² in pre-rabi and 50x60 cm² in optimum and late rabi period in all cases. Application of irrigation was more (7 times) for optimum and late rabi and less (2 times) for pre-rabi period. More weeding (4 times) was required for pre-rabi period and less weeding (3 and 2 times) was required for optimum and late rabi period respectively. The pre-rabi planting cabbage was harvest from first week of October to fourth week of November. Farmers' started selling cabbage at its immature stage when market price was high. Optimum-rabi planting cabbage harvested from mid November to mid February and the late-rabi planting cabbage was harvested from mid January to mid March.

The harvesting periods were overlapped by one another as the produce was not sold at a time, rather at different lots.

Input use pattern: On an average 332 man-days of human labour and 31 pair-days of animal power was required for cabbage cultivation per hectare (Table 2). More human labour (383 man-day ha⁻¹) was required in pre-rabi period of cabbage growing for taking more care and less human labour (275 man-day ha⁻¹) was required for late-rabi period of cabbage growing. This high amount of human labour involvement indicates more employment opportunity of human labour at farm level cabbage cultivation.

Farmer used high dose of fertilizer in cabbage cultivation departing from its recommended dose. The average rate used by the farmers was 241-72-74-9-5 kg ha⁻¹ N-P-K-S-Zn against a recommendation of 150-45-138 kg ha⁻¹ NPK (Razzaque *et al.*, 2000). Permadi *et al.* (1973) also recommended similar amount of fertilizer for optimum yield of cabbage. Bangladesh Agricultural Research Institute recommended 103-150 kg N, 45-75 kg P and 125-138 kg K ha⁻¹ for its varieties to produce 50-100 t ha⁻¹ fresh cabbage (Anonymous, 1993). The highest amount of nitrogen, phosphorus and zinc was used in optimum-rabi period and the lowest amount of nitrogen, potassium and sulphur was used in late-rabi period. The lowest amount of phosphorous was used in pre-rabi period. The use of chemical fertilizer indicates that farmers do not apply recommended amount and ratio of different nutrients used

Table 1: Agronomic practice of cabbage cultivation at Jessore area in different growing periods

Growing periods	Cultivation practices		
	Pre-rabi	Optimum-rabi	Late-rabi
Planting period	Mid July–mid September	Mid September–mid November	Mid November–mid December
Variety used	KK cross (100)	Green express(87) KK cross (13)	Atlas-70 (60) Green express (40)
Ploughing (No.)	4	4	4
Laddering (No.)	7	7	7
Plant spacing (cm)	45x60	50x60	50x60
Irrigation (No.)	2	7	7
Weeding (No.)	4	3	2
Harvesting period	1st week of October-4th week of November	Mid November–mid February	Mid January–Mid March

Figure in the parenthesis indicate percentage

Table 2: Per hectare use of input and yield obtained in growing cabbage at Jessore area for different growing period

Items	Growing period			
	Pre-rabi	Optimum-rabi	Late-rabi	All
Human labour (man-days):	383.0	337.0	275.0	332.0
Owned	230.0	219.0	193.0	214.0
Hired	153.0	118.0	82.0	118.0
Animal power (Pair-days):	28.0	31.0	33.0	30.8
Owned	17.0	20.0	21.0	19.5
Hired	11.0	11.0	12.0	11.3
Fertilizers (Kg):				
N	250.0	278.0	196.0	241.0
P	58.0	80.0	78.0	72.0
K	80.0	78.0	64.0	74.0
S	13.0	8.0	7.0	9.0
Zn	4.0	5.0	5.0	5.0
Owned FYM (kg)	1914.0	-	-	638.0
Irrigation (No.)	2.0	7.0	7.0	5.0
Weeding (No.)	4.0	3.0	2.0	3.0
Seeding (No.)	38500.0	34400.0	33500.0	35467.0
Pesticides:				
Liquid (litre)	13.1	9.6	2.2	8.3
Solid (kg)	3.8	2.6	1.3	2.6
Fresh cabbage yield (ton)	28.0	52.0	58.0	46.0

Table 3: Per hectare benefit and cost of cabbage cultivation at Jessore area in different growing period

Items	Growing period			
	Pre-rabi	Optimum-rabi	Late-rabi	All
Farm gate price (Tk./kg)		5.37	1.43	0.69 2.50
Gross return (Tk.)	150360.0	74360.0	40020.0	88247.0
Human labour (Tk.)	26810.0 (39.03)	23590.0 (36.64)	19250.0 (37.05)	23217.0 (37.64)
Animal power (Tk.)	2240.0 (3.26)	2480.0 (3.85)	2640.0 (5.08)	2453.0 (3.98)
Seedling (Tk.)	13156.0 (19.2)	9185.0 (14.26)	6200.0 (11.93)	9514.0 (15.42)
Fertilizer (Tk.)	9861.0 (14.4)	11948.0 (18.56)	10491.0 (20.19)	11767.0 (19.08)
Farm Yard Manure (Tk.)	410.0 (0.60)	-	-	3163.0 (5.13)
Irrigation (Tk.)	1186.0 (1.73)	4151.0 (6.45)	4151.0 (7.99)	4347.0 (7.05)
Pesticides (Tk.)	6760.0 (9.84)	4880.0 (7.58)	1400.0 (2.69)	4347.0 (7.05)
Int. on operating capital (Tk.)	1611.0 (2.35)	1500.0 (2.33)	1177.0 (2.27)	1429.0 (2.32)
Opportunity cost of land (Tk.)	6654.0 (9.69)	6654.0 (10.53)	6654.0 (12.81)	6654.0 (10.79)
Total variable cost (Tk.)	62034.0 (90.31)	577734.0 (89.67)	44132.0 (84.93)	54633.0 (88.57)
Total cash cost (Tk.)	42591.0 (62.0)	39289.0 (61.02)	28941.0 (55.70)	36940.0 (59.89)
Total cost (Tk.)	68688.0 (100)	64388.0 (100)	51963.0 (100)	61680.0 (100)
Gross margin (Tk.):				
Total variable cost basis	88326.0	16626.0	(-4112.0)	33614.0
Total cash cost basis	107769.0	35071.0	11079.0	51307.0
Net return (Tk.)	81672.0	9972.0	(-11943.0)	26567.0
Benefit cost ratio:				
Total variable cost basis	2.42	1.29	0.91	1.62
Total cost basis	2.19	1.15	0.77	1.43
Return to labour	283.00	100.0	27.00	150.00

Figures in the parenthesis indicate percentage

Table 4: Marginal rate of return from cultivation of cabbage in different growing period at Jessore area

Growing period	Total variable cost (Tk ha ⁻¹)	Gross margin (Tk ha ⁻¹)	Marginal variable cost (Tk ha ⁻¹)	Marginal gross margin (Tk)	Marginal rate of return (%)
Late-rabi	44132	-4112			
Optimum-rabi	57734	16626	13602	20738	152
Pre-rabi	62034	88326	4300	71700	1667

was not also as per recommendation. The farmers were found to use a very few amount of farm yard manure (1914 kg ha⁻¹) to cabbage only in pre rabi growing period. Optimum and late rabi period planting did not get any farm yard manure, though 5-10 t ha⁻¹ FYM was recommended depending on soil condition. Use of seedling was found highest (38,500 No. ha) in pre-rabi period planting because of closer plant spacing and necessity of gap filling for comparative higher mortality. The lowest number of seedling (33,500 ha⁻¹) was used for late-rabi period planting. On an average per hectare 35,467 number of seedling was planted. Farmers also used a huge amount of pesticides in cabbage cultivation. Pre-rabi period used more pesticides (13.1 litre liquid and 3.8 kg solid per ha) than that of late-rabi (2.2 litre liquid and 1.3 kg solid per ha) period. Optimum-rabi period needed 9.6 litre liquid and 2.6 kg solid pesticides per hectare. Pre-rabi and optimum-rabi period of cabbage cultivation required more pesticides for more insect-pest infestation due to rainfall and comparatively higher temperature than that of late-rabi cultivation of cabbage.

The farmers obtained highest yield (58 t ha⁻¹) in late-rabi cultivation followed by optimum-rabi (52 t ha⁻¹) and pre-rabi (28 t ha⁻¹) period. Cruz Perez *et al.* (1976) classified cabbage growing period as early, intermediate and late according to average number of days from transplanting to harvest and recorded yield variation from 32 to 37 t ha⁻¹. It is to be mentioned here that optimum-rabi and late-rabi period produced about double of what produced in pre-rabi period. Farid *et al.* (1998) found 64-85 kg ha⁻¹ yield of fresh cabbage in the optimum period of cabbage cultivation in the research station. One of the main causes of less production in pre-rabi period is that the produce was sold in pre mature stage for getting higher market price.

Resource utilization, cost and benefits: On an average total variable cost (TVC) for cabbage cultivation was Tk. 54633 per hectare. Considering the growing period TVC was highest for pre-rabi period (Tk.62034 ha⁻¹) followed by optimum-rabi (Tk.57734 ha⁻¹) and late-rabi (Tk.44132 ha⁻¹) period. Per hectare cost of cultivation on the basis of cash cost and total cost also followed the same trend. The average cost of human labour required in one hectare of land was found highest in pre-rabi period (Tk.26810 ha⁻¹) followed by optimum-rabi and late-rabi periods respectively (Table 3). The human labour cost was single highest cost item that shared 37.64% of total cost. Cost of fertilizer and seedling was also remarkable which shared 19.08 and 15.42% of total cost respectively. Cost for seedling and pesticides decreases with planting time goes ahead. On the other hand, fertilizer cost and cost for irrigation increases with the planting time goes ahead from

pre-rabi period to late rabi period. Average farm gate price of fresh cabbage was Tk.2.50 per kilogram, but the price varied remarkably in the growing periods. Per kilogram average price at pre-rabi period was Tk.5.37 which was followed by optimum-rabi (Tk.1.43) and late-rabi (Tk.0.69). Though per hectare yield in pre-rabi period was the lowest but due to higher market price of cabbage gross return was found the highest in this period. Sabur and Haque (1992) also found variation in selling price of different vegetables across growing period and higher price was recorded in the beginning of the season.

The average net return was calculated Tk.26,567 per hectare with highest in pre-rabi period (Tk.81,672 ha⁻¹) followed by that in optimum-rabi period (Tk.9972 ha⁻¹). The net return earned by the farmers in late-rabi period was negative i.e. farmers loose Tk.11943 ha⁻¹ for growing cabbage in this period. Late-rabi period cultivation of cabbage provides negative gross margin even in total variable cost basis calculation. But on cash cost basis calculation late-rabi period cabbage provides a small gross margin to the farmers (Tk.11079 ha⁻¹). The cabbage grown in optimum-rabi period provides moderate return to the farmers. The benefit cost ratio was also better in pre-rabi period than that of optimum-rabi and late-rabi period. It is thus revealed that pre-rabi period of cabbage cultivation in a good profit earning enterprise. Though the yield in late-rabi period was highest but due to lower market price of cabbage the return come down and thus the loss occurred.

Return to labour was found highest in pre-rabi period (Tk.283/head) which indicate efficient utilization of labour input as it was the single highest cost involved input in cabbage cultivation. Return to labour in optimum-rabi period was also found efficient, as it was also greater than that of the wage rate of labour. But late-rabi cabbage was not at all efficient in respect of return to labour.

Marginal rate of return: The marginal rate of return calculation provides information on an additional return in respect of additional investment in different growing periods of cabbage cultivation. It was found that pre-rabi period of cabbage cultivation provides highest Marginal rate of return (MRR) (1667%), indicating that if the farmers invest additional taka 100 in pre-rabi period cultivation other than optimum rabi period cultivation it will provide additional Tk.1667 for every Tk.100 additional investment (Table 4). This MRR will be highly acceptable subject to other conditions unchanged.

The results showed that there exists a large variation in input use level departing from its recommendation. Periodic variation in fertilizer use in also high. Farmers at Jessore area used a very high dose of fertilizer and

pesticides. Demonstration of cabbage cultivation in this area with recommended package is essential.

Despite excessive and improper use of fertilizers the farmers earned a good net return in pre-rabi period and a moderate net return in optimum-rabi period. Farmers will be immensely benefited if more land can be brought under pre-rabi period cabbage cultivation. The pre-rabi period of cabbage cultivation employed huge number of human labour and the return to labour is also very high. So encouraging of pre-rabi period cabbage cultivation could be able to employ more labour and unemployment problem of seasonal agricultural labour could be partially eliminated. The forward linkage effect will also generate employment of more labour.

Use of recommended package can ensure optimum use of resource and lower production cost. Research institute can undertake research program for location specific recommendation of fertilizer, pesticides and other management aspects. The study thus depicted that the farmers of Jessore area should be encouraged to grow cabbage in pre-rabi period and discouraged to grow cabbage in late-rabi period i.e. no planting of cabbage after mid November.

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