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Profitability of Cabbage Production as Main and Ratoon Crop

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Abstract: The research work was conducted to determine the economic return with integrated use of manure and fertilizer on cabbage cultivation as main and ratoon crop. The highest total gross return (Tk. 181365 ha^{-1}) were obtained from T_{11} treatment with cowdung (3.75 t ha^{-1}), mustard oil cake (0.65 t ha^{-1}) and poultry manure (2.13 t ha^{-1}) plus $N_{130} P_{28} K_{108}$ kg ha^{-1} i.e. ,$^{1}/_{4}$ (CD + MOC+PM+NPK) in both main and ratoon crop. While the lowest total gross return (Tk. 69610 ha^{-1}) was found in control treatment. The treatment T_{11} was economically profitable than other treatment in respect of net return (Tk. 91648 ha^{-1} and Tk. 25953 ha^{-1}) and benefit cost ratio (2.79 and 3.08) for main and ratoon crop, respectively. Total net return (Tk. 117601 ha^{-1}) and benefit cost ratio (2.84) were also found to be higher in T_{11} treatment. While the lowest total net return (Tk. 17993 ha^{-1}) and benefit cost ratio (1.33) were recorded in control (T_0) treatment.

Key words: Profitability, cabbage, main and ratoon crop, gross return

Introduction

Cabbage (*Brassica oleracea* var *capitata* L.) is an important member of the cole crops and belongs to the family Brassicaceae. It is one of the most popular leafy vegetables and extensively grown in Bangladesh mainly in winter months. As vegetable cabbage has high nutritive value as well as high market demand. In Bangladesh about 10000 ha of land is under cultivation with annual production 107000 metric tons (Anonymous, 1998). The average yield of cabbage is very low (10.25 t ha^{-1}) in Bangladesh compared to that of many other developed countries of the world (Anonymous, 1999). In economic point of view, significantly higher yield (73.44 t ha^{-1}) of cabbage and more profit (1796 MRR) was found when organic manures applied in combination with mineral fertilizers (Farid *et al.*, 1998).

Very little information is available on economic return of cabbage cultivation. Due to absence of information the policy makers also can not adopt appropriate policy regarding its extension and development. Considering the above facts, the study was therefore, undertaken to estimate the costs and returns from cabbage cultivation as main and ratoon crop.

Materials and Methods

The experiment was conducted at the Horticulture Farm of Bangladesh Agricultural University (BAU), Mymensingh during November 1999 to April 2000. The soil of the experimental area was silty loam, medium high land belonging to the Agro-Ecological Zone-9 (AEZ-9), which was originated from Old Brahmaputra deposits, having non-calcareous dark grey flood plain soil (Anonymous, 1988). The variety of cabbage was K-K Cross (developed by T. Sakata Corporation, Japan). There were twelve treatments taking i.e., T_1, cowdung (CD); T_2, mustard oil cake (MOC); T_3, poultry manure (PM) and T_4, NPK fertilizer in various combinations. The doses for nutrients were $N_{130} P_{28} K_{108}$ kg ha^{-1} (Anonymous, 1997) from urea, TSP and MP, respectively. Cowdung, mustard oil cake and poultry manure were used at the rate of 15, 2.6 and 8.5 t ha^{-1}, respectively. The entire quantity of cowdung, mustard oil cake, poultry manure, TSP and half of MP were applied during final land preparation. The total amount of urea and rest half of MP were applied in three equal installments at 15, 30 and 45 days after transplanting in the specific (T_4, T_7, T_8, T_9, T_{10} and T_{11}) plots but T_0, control plots received no manure or fertilizer.

For production of ratoon crop of cabbage, three additional top dressing were done with only half of N of recommended dose of N_{130} kg ha^{-1} i.e., N_{65} kg ha^{-1} at 7, 21 and 35 days after harvesting of the main crop. Each top dressing was followed by irrigation. Twenty five day old healthy and uniform sized seedlings were transplanted in the experimental plots on 20 November, 1999 maintaining a spacing of 60x50 cm^2 accommodating 30 plants in each unit plot. The unit plot size was 3x3 m^2. Irrigation, earthing up, pest management and weeding were done as and when required. The main crop was harvested during 8-15th February, 2000. The heads of main crop was cut with a sharp knife leaving two loose leaves at the base of the stump for the production of ratoon crop. Ratoon crop was harvested during the period from 5-13th April, 2000.

Information relative inputs use as well as return was collected on plot basis, then converted into per hectare and were done according to the procedure of Alam *et al.* (1989). Interest on inputs cost was calculated on the basis of commercial bank rate. In this study, however, land rental value was for the period from planting of seedlings to harvesting of the ratoon crop.

Results and Discussion

Cabbage is a labor intensive crop, which required a number of man day per hectare from transplanting to harvesting. Moreover, it required more labor for production of ratoon crop. All the labors were hired and distributed in different operations among the treatments and counted in Taka.

Table 1: Production cost of cabbage per hectare due to use of inorganic fertilizers, organic manure and its combination

A. Material cost (Tk)

Treatments	Seed cost (Tk)	Bamboo and Chatai cost (Tk)	Cost of inorganic fertilizer			Cost of organic manure			Cost of irrigation (Tk)	Cost of pesticides (Tk)	Sub total (A)
			Urea (Tk)	TSP (Tk)	MP (Tk)	Cowdung (Tk)	Mustard oil oil cake (Tk)	Poultry manure (Tk)			
T_0	1200*	800*	-	-	-	-	-	-	3000*	2000*	7000
T_1	1200	800	-	-	-	6000	-	-	3000	2000	13000
T_2	1200	800	-	-	-	-	20800	-	3000	2000	27800
T_3	1200	800	-	-	-	-	-	3825	3000	2000	10825
T_4	1200	800	1974	1536	1944	-	-	-	3000	2000	12454
T_5	1200	800	-	-	-	3000	10400	-	3000	2000	20400
T_6	1200	800	-	-	-	3000	-	1912	3000	2000	11912
T_7	1200	800	987	768	972	3000	-	-	3000	2000	12727
T_8	1200	800	987	768	972	-	10400	-	3000	2000	20127
T_9	1200	800	987	768	972	-	-	1912	3000	2000	11639
T_{10}	1200	800	658	512	648	2000	6933	-	3000	2000	17751
T_{11}	1200	800	493	384	486	1500	5200	956	3000	2000	16019

B. Non-material cost (Tk)

Treatments	Cost of seed bed preparation (Tk)	Cost for land preparation and fertilization (Tk)	Cost of layout, transplanting, shading (Tk)	Cost of intercultural operation including top dressing (Tk)	Cost of harvesting and marketing (Tk)	Sub total (B)
T_0	250*	2500	2250*	3000	8000*	16000
T_1	250	3500	2250	3000	8000	17000
T_2	250	3800	2250	3000	8000	17300
T_3	250	3500	2250	3000	8000	17000
T_4	250	3600	2250	3600	8000	17700
T_5	250	3650	2250	3000	8000	17150
T_6	250	3600	2250	3000	8000	17100
T_7	250	3550	2250	3300	8000	17350
T_8	250	3700	2250	3300	8000	17500
T_9	250	3550	2250	3300	8000	17350
T_{10}	250	3635	2250	3250	8000	17385
T_{11}	250	3750	2250	3200	8000	17450

Urea @ Tk 7 kg^{-1}	Cowdung @ Tk 0.40 kg^{-1}	Seed rate 600 g ha^{-1} @ Tk.2000 kg^{-1}	TSP @ Tk 12 kg^{-1}
Mustard oil cake @ Tk 8 kg^{-1}	MP @ Tk 9 kg^{-1}	Poultry manure @ Tk 0.45 kg^{-1}	Labour @ Tk 50 day^{-1}

C. Over head cost (Tk)

Treatments	Over head cost (c)			Total cost of production (A+B+C) (Tk ha^{-1})	Marketable yield (t) ha^{-1}	Gross return (t) ha^{-1}	Net return (Tk ha^{-1})	Benefit cost ratio (BCR) (Tk ha^{-1})
	Cost of lease of land (For 6 months) (Tk)	Interest (12%) on running capital (For 6 months) (Tk)	Miscellaneous cost (5% of input cost) (Tk)					
T_0	15000*	1380	350	39730	18.42	46050	6320	1.16
T_1	15000	1800	650	47450	26.81	67025	19575	1.41
T_2	15000	2706	1390	64196	53.59	133975	69779	2.09
T_3	15000	1669	541	45035	43.73	109325	64290	2.43
T_4	15000	1809	622	47585	48.99	122475	74890	2.57
T_5	15000	2253	1020	55823	47.38	118450	62627	2.12
T_6	15000	1740	595	46347	38.98	97450	51103	2.10
T_7	15000	1804	636	47517	45.93	114825	67308	2.42
T_8	15000	2257	1006	55890	55.69	139225	83335	2.49
T_9	15000	1739	582	46310	48.33	120825	74515	2.61
T_{10}	15000	2108	887	53131	48.45	121125	67994	2.28
T_{11}	15000	2008	800	51277	57.17	142925	91648	2.79

*Cost TK ha^{-1} remained same due to use of same amount inputs in main crop	Cd= Cowdung, MOC= Mustard oil cake, PM = Poultry manure
Sale of cabbage @ Tk 2500/t Gross return = Marketable yield x Tk 2500/t	BCR= Gross return/cost of production

Table 2: Production cost of ratoon crop of cabbage per hectare (Tk) and benefit cost ratio

Treatments	Cost of fertilizer (Tk)	Cost of irrigation (Tk)	Cost of pesticides (Tk)	Cost of intercultural operation (Tk)	Cost of harvesting & marketing (Tk)	Total cost of production (Tk)	Marketable yield (t) ha^{-1}	Gross return (Tk ha^{-1})	Net return (Tk ha^{-1})	BCR (Tk ha^{-1})
T_0	987*	2000*	1500*	2000*	6000*	12487*	11.78	23560	11073	1.89
T_1	987	2000	1500	2000	6000	12487	13.02	26040	13553	2.09
T_2	987	2000	1500	2000	6000	12487	18.51	37020	24533	2.96
T_3	987	2000	1500	2000	6000	12487	18.22	36440	23953	2.92
T_4	987	2000	1500	2000	6000	12487	16.57	33140	20653	2.65
T_5	987	2000	1500	2000	6000	12487	18.64	37280	24793	2.99
T_6	987	2000	1500	2000	6000	12487	16.44	32880	20393	2.63
T_7	987	2000	1500	2000	6000	12487	16.00	32000	19513	2.56
T_8	987	2000	1500	2000	6000	12487	16.56	33120	20633	2.65
T_9	987	2000	1500	2000	6000	12487	16.18	32360	19873	2.59
T_{10}	987	2000	1500	2000	6000	12487	15.96	31920	19433	2.56
T_{11}	987	2000	1500	2000	6000	12487	19.22	38440	25953	3.08

*: Cost Tk ha^{-1} remained same due to use of same amount inputs in ratoon crop

T_0 (Control) T_1 (Cowdung) T_2 (Mustard oil cake) T_3 (Poultry manure) T_4 (NPK)
T_5 ½(Cd+MOC) T_6 ½(Cd+PM) T_7 ½(Cd+NPK) T_8 ½(MOC+NPK) T_9 ½(PM + NPK)
T_{10} 1/3(Cd+MOC+NPK) T_{11} 1/4(Cd+MOC+PM+NPK)

Table 3: Total benefit cost ratio of main and ratoon crop of cabbage

Treatments	Marketable yield ha^{-1} (t) Main crop	Ratoon crop	Total marketable yield (t) ha^{-1}	Gross return Main crop	Ratoon crop	Total gross return	Cost of production Main crop	Ratoon crop	Total cost of production	Total net return	BCR
T_0	18.42	11.78	30.20	46050	23560	69610	39730	12487	52217	17993	1.33
T_1	26.81	15.17	41.98	67025	26040	93065	47450	12487	59937	33128	1.55
T_2	53.59	18.51	72.10	133975	37020	170995	64196	12487	76683	94312	2.23
T_3	43.73	18.22	61.95	109325	36440	145765	45035	12487	57522	88243	2.53
T_4	48.99	16.57	65.56	122475	33140	155615	47585	12487	60072	95543	2.59
T_5	47.38	18.64	66.02	118450	37280	155730	55823	12487	68310	87420	2.28
T_6	38.98	16.44	55.42	97450	32880	130330	46347	12487	58834	71496	2.22
T_7	45.93	16.00	61.93	114825	32000	146825	47517	12487	60004	86821	2.45
T_8	55.69	16.56	72.25	139225	33120	172345	55890	12487	68377	104968	2.52
T_9	48.33	16.18	64.51	120825	32360	153185	46310	12487	58797	94388	2.61
T_{10}	48.45	15.96	64.41	121125	31920	153045	53131	12487	65618	87427	2.33
T_{11}	57.17	19.22	76.39	142925	38440	181365	51277	12487	63764	117601	2.84

Sale of cabbage @ Tk 2500/t of main and @ Tk 2000/t of ratoon crop
Gross return = Marketable yield x Tk 2500/ for main and Tk 2000/ of ratoon crop

T_0 (Control) T_1 (Cowdung) T_2 (Mustard oil cake) T_3 (Poultry manure) T_4 (NPK) T_5 ½(Cd+MOC)
T_6 ½(Cd+PM) T_7 ½(Cd+NPK) T_8 ½(MOC+NPK) T_9 ½(PM + NPK) T_{10} 1/3(Cd+MOC+NPK)
T_{11} 1/4(Cd+MOC+PM+NPK)

Material, non-material and over head costs including harvesting of the crop were recorded for all the treatments and calculated on per hectare basis (Table 1). The total cost of production ranged between Tk. 39730.00 to Tk. 64196.00 ha^{-1} for main crop (Table 1 C). Cost of seed, bamboo and chatai (made by bamboo), irrigation, pesticides, seed bed preparation, layout transplanting shading, harvesting and marketing and land rent Tk ha^{-1} were remained same in main crop cultivation. Among the treatments, the variation was due to the cost of different fertilizer and manures (Table 1 A, B). The total production cost was the lowest (Tk. 39730.00 ha^{-1}) for the control plot and the highest (Tk. 64196.00 ha^{-1}) for mustard oil cake (T_2) treated plots. The gross return from different treatments ranged between Tk. 46050.00 to Tk.142925.00 ha^{-1} for main crop (Table 1C). The production cost of ratoon crop Tk. 12487 ha^{-1} fixed in all treatments due to use of same imputes and cultural operation (Table 2). Gross return was the total income through sale of cabbage marketable yield @ Tk. 2500/t and Tk. 2000/t for main and ratoon crop respectively. The highest net return (Tk. 91648.00) was obtained from T_{11} treatment followed (Tk. 83335.00) by T_8 treatment (Table 1C). While the lowest net return (Tk. 6320.00) was found from the control treatments. This result is in agreement with the finding of Farid *et al.* (1998) who reported that economically more profit was found when organic and inorganic fertilizer were applied together in cabbage cultivation. The benefit cost ratio was found to be the highest (2.79) in treatment T_{11}. The second and third highest benefit cost ratio (2.61 and 2.57) was found in T_9 and T_4 treatment respectively, while the lowest (1.16) benefit cost ratio was recorded from the control in main crop. On the other hand, the highest gross and net return (Tk.38440/ and Tk. 25953/-) was obtained in the T_{11} treatment and the lowest (Tk. 23560/-

and Tk. 11073/-) was recorded from the control, T_0 (Table 2). The benefit cost ratio also the highest (3.08) was recorded in T_{11} and the lowest (1.89) was obtained from the control (T_0) treatment of ratoon crop of cabbage. In case of total benefit cost ratio of main and ratoon crop of cabbage the highest benefit cost ratio (2.84) was obtained from T_{11} treatment (Table 3). The second and third highest benefit cost ratio (2.61 and 2.59) was obtained from T_9 and T_4 treatments respectively. Benefit cost ratio was the lowest (1.33) in control (T_0) treatment. From the economic point of view, the above result indicated that treatment T_{11} i.e., $^1/_4$ (cowdung+mustard oil cake+poultry manure+NPK) was more profitable than other treatments for the main as well as ratoon crop of cabbage.

From the study, it is apparent that among the different fertilizer management practices, the T_{11} treatment showed the best performance (57.17 t ha^{-1}) for main as well as ratoon crop (19.22 t ha^{-1}) of cabbage. The second best results (55.69 t ha^{-1}) was observed in ½ (MOC+NPK) (T_8) for main crop and treatment ½ (Cd+MOC) (T_5) for ratoon crop including yield of 18.64t ha^{-1}. But cost of production was comparatively higher.

Therefore, among the 12 treatments the combined application of $^1/_4$(Cd+MOC+PM+NPK) may be suggested for the production of main and application of half the said amount for ratoon crop of cabbage.

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