Bangladesh J. Sugarcane, 22 : 42-48

July, 2000

Profitability of Irrigated and Non-irrigated Sugarcane and Its Competing Crops in Northwest and Southwest Regions of Bangladesh

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Received on 20.01.2000

ABSTRACT

A study was conducted during 1997-1998 to determine the profitability of irrigated and non-irrigated sugarcane and its competing crops in the Northwest and Southwest regions of Bangladesh. The highest gross margin return of Tk. 40,117.00/ha was accrued from modern variety (MV) T. Aman cultivated in medium low land (MLL) and MV-Aus in MLL combination and the second highest of Tk. 38,556.00/ha was obtained from sugarcane cultivated in medium high land (MHL) + lentil at Chuadanga district under irrigated condition. Sugarcane + lentil gave the highest gross margin over full cost of Tk. 33,876.00/ha under non-irrigated condition at the same location. MV-T. Aman cultivated in medium high land in combination with wheat (MHL) gave the highest gross margin of Tk.33150.00/ha over full cost under non-irrigated condition and sugarcane (MHL) cultivation had the second highest gross margin of Tk. 21,652.00/ha under irrigated conditions at Thakurgaon district. Higher yields and gross returns were obtained in irrigated crops.

Key words: Cropping patterns, gross margin, sugarcane

INTRODUCTION

Sugarcane is an important cash-cum-field crop in the Northwest and Southwest regions of Bangladesh. Sugarcane farmers can earn higher net benefit from sugarcane production when the relative price of sugarcane is higher and its cost of production is low as compared to its competing crops. Although around 180 thousand hectares of land is occupied by sugarcane but only 8.75% of which is irrigated (BBS, 1997). Sugarcane cultivation is decreasing day by day. There is a tendency of replacing local varieties (LV) by modern varieties (MV) of rice in irrigated areas. Different cropping patterns have emerged in different agro-ecological zones (BBS, 1997). The most important implications are the profitability of individual crops as well as combination of crops in a sequence determines the dominancy of specific cropping pattern. A number of studies on land use and cropping patterns were conducted by Kabir (1985), and Mandal and Miah (1993). The present study was conducted in the fields of high lands (HL), medium high lands (MHL) and medium low lands (MLL) where local and modern varieties of sugarcane, aus, aman, boro, jute, wheat, mustard, lentil, gram, vegetables were cultivated under irrigated and non-irrigated conditions to know the cost and return of sugarcane vis-a-vis other competing crops and cropping patterns in Chuadanga and Thakurgaon districts during 1997-98. The major purpose of this study was to estimate the relative profitability for different individual crops and cropping patterns under irrigated and non-irrigated conditions in two selected areas.

MATERIALS AND METHODS

The study was conducted in the mill zones of Carew & Co. and Thakurgaon Sugar Mills (TSM) representing Rajshahi division of the Northwest region and Khulna division of the Southwest region respectively during 1997-98. One sub-zone from each of the two mills zones, namely Carew & Co. and TSM was selected for sampling purposively. The samples included 12 villages of Chuadanga and 8 villages of Thakurgaon districts. Stratified random sampling was followed in selecting the sample farms. A total of 148 samples were selected for collecting data from Carew & Co. and TSM zones. Data were collected by the field investigators. Gross margins were calculated by valuing both main product and by-products. Cash costs included costs incurred for hired human labour, animal power, purchased seeds and seedlings, fertilizers, insecticides, irrigation, transport, land tax and interest on operating capital. Full cost refers to total variable costs and fixed costs. Fixed costs included family supplied human and animal labour, depreciation cost of animal and equipment, interest on equipment investment and interest on land investment.

RESULTS AND DISCUSSION

The study revealed that three major kharif crops and five rabi crops were grown. Amongst rabi and kharif crops, sugarcane, aman, aus, and wheat were cultivated under irrigated and non-irrigated conditions. Table 1 showed that return over cash cost was positive to all crops. Return over full cost was also positive to all crops except jute in MHL (Medium High Land) under non-irrigated conditions at Thakurgaon areas. Gross cost was found to be the highest in sugarcane in HL (High Land) cultivation at Tk. 51,273.00/ha followed by sugarcane in MHL (Tk. 32,018.00/ha), LV T. Aman in MHL(Tk. 19,723.00/ha), LV T. Aman in HL (Tk.15,794.00/ha), wheat in HL (Tk. 14,216.00/ha) and wheat in MHL (Tk. 14,203.00/ha) under irrigated conditions at Thakurgaon areas. In non-irrigated conditions, gross cost of sugarcane in MHL was found to be the highest Tk. 33,073.00/ha followed by jute in MHL (Tk. 23,161.00/ha), jute in MLL (Medium Low Land) (Tk. 15,573.00/ha), wheat in MLL (Tk. 12,333.00/ha), wheat in MHL (Tk. 11,613.00/ha), MV T. Aman in MHL (Tk. 11,600.00/ha), MV T. Aman in MLL (Tk. 11,226.00/ha), LV T. Aman in MHL (Tk. 11,105.00/ha), mustard in HL (Tk. 10,339.00/ha), and LV T. Aman in MLL (Tk. 9,590.00/ha) at Thakurgaon areas. Gross margin ranked first in sugarcane in MHL (Tk. 21,652.00/ha) followed by LV T. Aman in MHL (Tk. 15,771.00/ha), sugarcane in HL (Tk. 13,687.00/ha), wheat in MHL (Tk. 12,859.00/ha), wheat in HL (Tk. 10,380.00/ha), and LV T. Aman (HL) (Tk. 9322.00/ha) among the crops under irrigated conditions at Thakurgaon areas. Gross margin was the highest in MV T. Aman in MHL (Tk. 20,339.00/ha) followed by LV T. in Aman MLL (Tk. 15,180.00/ha), LV T. Aman in MHL (Tk. 14,912.00/ha), MV T. Aman in MLL (Tk. 14,653.00/ha), wheat MHL (Tk. 12,811.00/ha), sugarcane MHL (Tk. 11,842.00/ha), mustard HL (Tk. 9,994.00/ha), wheat MLL (Tk. 7,072.00/ha), and jute MLL (Tk. 2,267.00/ha) under non-irrigated conditions at Thakurgaon areas. Benefit-cost ratio was higher than one in all the crops except jute MHL at Thakurgaon district under non-irrigated conditions.

Table 1. Costs and returns of different crops of Thakurgaon areas, 1997-98.

Crops	No. of farms	Yield (t/ha)	Gross return (Tk./ha)	Cash cost (Tk./ha)	Full cost (Tk./ha)	Return over cash cost (Tk./ha)	Return over full cost (Tk./ha)	BCR
Non-irrigated :								
MV T. Aman MLL	4	2.66	25,879	9,308	11,226	16,571	14,653	2.31
MV T. Aman MHL	7	3.31	31,939	8,747	11,600	23,191	20,339	2.75
LV T. Aman MHL	20	2.68	26,017	9,037	11,105	16,980	14,912	2.34
LV T. Aman MLL	5	2.54	24,770	7,152	9,590	17,618	15,180	2.58
Jute MHL	19	1.67	20,041	18,757	23,161	1,285	-3,120	0.87
Jute MLL	13	1.67	17,840	10,315	15,573	7,525	2,267	1.15
Wheat MLL	3	1.83	19,405	10,340	12,333	9,065	7,072	1.57
Wheat MHL	7	2.51	24,424	9,444	11,613	14,980	12,811	2.10
Mustard HL	14	0.69	20,333	7,994	10,339	12,339	9,994	1.97
Sugarcane MHL	2	43.80	44,915	28,936	33,073	15,978	11,842	1.36
Irrigated :								
LV T. Aman HL	2	2.58	25,116	14,218	15,794	10,897	9,322	1.59
LV T. Aman MHL	1	3.69	35,495	18,514	19,723	16,979	15,771	1.80
Sugarcane HL	24	63.76	64,960	45,730	51,273	19,230	13,687	1.27
Sugarcane MHL	2	52.80	53,670	29,378	32,018	24,291	21,652	1.68
Wheat HL	8	2.72	24,596	12,603	14,216	11,993	10,380	1.73
Wheat MHL	16	2.79	27,061	11,905	14,203	13,157	12,859	1.91

Notes: HL = High land, MHL = Medium high land, MLL = Medium low land, LV = Local variety, MV = Modern variety.

Table 2 indicates that return over cash cost was positive to all the crops. Return over full cost to MV T. Aman, LV T. Aman, MV Aus, LV Aus, jute, lentil, wheat, sugarcane and intercrops with sugarcane was positive under irrigated and non-irrigated conditions except LV Aus HL, and jute MLL of non-irrigated crops. Return over full cost was found to be the highest in MV T. Aman MLL Tk. 24, 868.00/ha and that of second was Tk. 24,156.00/ha in sugarcane MLL under irrigated conditions. Full cost was the highest in sugarcane cultivation Tk. 44,510.00/ha in high land followed by sugarcane Tk. 43,259.00/ha in medium high land and sugarcane Tk. 42,968.00/ha in medium low land, MV Aus HL (Tk. 25,269.00/ha), MV Aus MHL Tk. 21,411.00/ha, MV Aus MLL Tk. 20,946.00/ha, MV T. Aman MLL Tk. 18,660.00/ha, LV Aus MHL Tk. 16,469.00/ha, LV T. Aman MLL Tk. 16,192.00/ha and LV Aus HL Tk. 15,662.00/ha under irrigated conditions at Chuadanga areas. Full cost of sugarcane cultivation was Tk. 41,153.00/ha in medium high land followed by sugarcane MLL Tk. 36,558.00/ha, sugarcane HL Tk. 35,820.00/ha, MV Aus MHL Tk. 23,832.00/ha, MV Aus HL Tk. 22,351.00/ha, jute MLL Tk. 18,276.00/ha, jute MHL Tk. 17,043.00/ha, jute HL Tk. 15,668.00/ha, LV Aus MHL Tk. 15,143.00/ha, LV Aus HL Tk. 14,865.00/ha, LV T. Aman MLL Tk. 14,612.00/ha, LV Aus MLL Tk. 13,619.00/ha, mustard HL Tk. 10,048.00/ha, lentil HL Tk. 8,227.00/ha, wheat HL Tk. 7,638.00/ha, lentil intercrop Tk. 4,253.00/ha and mustard intercrop Tk. 3253.00/ha under non-irrigated conditions. Benefit-cost ratio was higher than one in all the crops except LV Aus HL and jute MLL at Chuadanga district under non-irrigated conditions.

Table 2. Costs and returns of different crops of Chuadanga areas, 1997-98.

Crops	No of farms	Yield (t/ha)	Gross return (Tk./ha)	Cash cost (Tk./ha)	Full cost (Tk./ha)	Return over cash cost (Tk./ha)	Return over full cost (Tk./ha)	BCR
Non-irrigated :								
LV T Aman MLL	6	2.08	18,233	103,10	14,612	7,923	3,621	1.25
MV Aus HL	2	2.85	27,251	19,523	22,351	7,729	4,911	1.22
MV Aus MHL	6	3.44	30,552	20,552	23,832	10,200	6,729	1.28
LV Aus HL	28	1.87	12,960	10,602	14,865	2,358	-1,905	0.87
LV Aus MLL	2	1.97	14,198	11,521	13,619	2,678	569	1.04
LV Aus MHL	18	1.92	16,533	12,049	15,143	4,485	1,390	1.09
Jute HL	19	2.09	18,758	11,810	15,668	6,947	3,090	1.20
Jute MLL	6	1.74	19,341	18,758	18,276	2,572	-1,065	0.94
Jute MHL	28	2.19	20,941	13,983	17,043	6,957	3,900	1.23
Lentil HL	16	0.85	20,150	6,000	8,227	14,149	11,923	2.45
Lentil MHL	7	1.11	25,897	5,198	6,521	20,699	19,376	3.97
Mustard HL	7	0.98	23,200	8,018	10,048	15,182	13,153	2.31
Gram (Intercrop)	2	0.37	6,964	1,586	2,860	5,378	4,103	2.43
Lentil (Intercrop)	11	0.79	18,653	2,617	4,253	16,036	14,400	4.39
Mustard (Intercrop)	13	0.69	12,998	1,506	3,253	11,491	9,745	4.00
Wheat HL	4	1.54	14,381	6,631	7,638	7,750	6,744	1.88
Sugarcane HL	10	49.2	51,664	30,227	35,820	21,437	15,844	1.44
Sugarcane MLL	11	53.4	56,034	30,527	36,558	25,507	19,476	1.53
Sugarcane MHL	8	55.2	57,779	34,008	41,153	23,770	16,625	1.40
Irrigated :								
MV T Aman MLL	4	4.45	43,527	16,047	18,660	27,480	24,868	2.33
LV T Aman MLL	7	3.71	38,647	14,818	16,192	23,830	22,455	2.39
MV Aus HL	3	3.06	27,934	22,694	25,269	5,241	2,667	1.11
MV Aus MLL	12	3.74	36,194	18,040	20,946	18,154	15,249	1.73
LV Aus MHL	3	2.14	20,805	14,457	16,469	6,348	4,335	1.26
LV Aus HL	6	3.29	18,280	13,683	15,662	4,597	2,618	1.67
MV Aus MHL	17	3.81	34,848	18,717	21,411	16,111	13,417	1.63
Wheat HL	6	2.51	23,821	16,072	17,984	7,749	5,837	1.32
Wheat MHL	15	2.68	24,699	13,890	16,777	10,808	7,922	1.47
Sugarcane HL	40	59.2	61,856	38,387	44,510	23,469	17,346	1.39
Sugarcane MLL	11	64.3	67,124	37,104	42,968	30,021	24,156	1.56
Sugarcane MHL	40	56.4	58,960	37,716	43,259	21,244	15,701	1.36

Note: Abbreviations have been mentioned in Table 1.

Existing Cropping Patterns

Among the cropping patterns of Thakurgaon areas in Table 3, sugarcane alone HL had the highest cost on full-cost basis followed by LV T. Aman MHL I(Irrigated) - wheat MHL (I), sugarcane NI (Non-irrigated) MHL, sugarcane (I) MHL, LV T. Aman HL (I) - wheat (HL) (I), MV T. Aman MLL (NI) - wheat MLL (NI), MV T. Aman MHL (NI) - wheat MHL (NI), and LV T. Aman MHL (NI) - wheat MHL (NI). At Chuadanga area, cost of sugarcane MHL + lentil production was the highest followed by sugarcane MHL + mustard, sugarcane MHL + gram, sugarcane MHL alone, sugarcane MLL + lentil, HYV Aus HL - wheat HL, sugarcane HL + lentil, sugarcane MLL + mustard, sugarcane MLL + gram, sugarcane HL + mustard, sugarcane HL + gram, sugarcane MLL, sugarcane HL, jute HL - wheat HL, LV T. Aman MLL - LV Aus MLL, jute HL - mustard HL, jute HL - lentil HL, jute MHL - lentil MHL and LV Aus HL - lentil HL on full cost basis under non-irrigated conditions (Table 4). Sugarcane MLL + gram incurred the highest cost on full cost basis and MV T. Aman MLL - jute MLL had the lowest cost of production under irrigated conditions (Table 4).

There were nine cropping patterns at Thakurgaon area. MV T. Aman MHL (NI) - wheat MHL (NI) gave the highest return on full cost basis (Tk. 33,150.00/ha) followed by LV T. Aman MHL (I) - wheat (HL (I) (Tk. 27,771.00/ha), LV T. Aman MHL (NI) - wheat MHL (NI) (Tk. 27,723.00/ha), MV T. Aman MLL (NI) - wheat MLL (NI) (Tk.21,726.00/ha), sugarcane (I) MHL (Tk. 21,652.00/ha), LV T. Aman HL (I) - wheat HL (I)(Tk. 19,702.00/ha), MV T. Aman MLL (NI) - jute MLL (NI) (Tk. 18,838.00/ha), sugarcane HL (I) (Tk. 13,687.00/ha), and sugarcane MHL (NI) (Tk. 11,842.00/ha) (Table 3).

Table 3. Cropping patterns of Thakurgaon areas, 1997-98.

Cropping patterns	Gross return (Tk./ha)	Cash cost (Tk./ha)	Full cost (Tk./ha)	Return over cash cost (Tk./ha)	Return over full cost (Tk./ha)
LV T. Aman HL(I) – Wheat HL (I)	49,712	26,821	30,010	22,890	19,702
LV T. Aman MHL(I) – Wheat MHL(I)	62,556	30,419	33,926	30,136	27,771
MV T. Aman MLL(NI) – Jute MLL(NI)	43,719	19,623	26,799	22,178	18,838
MV T. Aman MLL(NI) –Wheat MLL(NI)	45,284	19,648	23,559	25,636	21,726
MV T. Aman MHL(NI)–Wheat MHL(NI)	56,363	18,191	23,213	38,171	33,150
LV T. Aman MHL(NI) –Wheat MHL(NI)	50,441	18,481	22,718	31,960	27,723
Sugarcane(I) HL	64,960	45,730	51,273	19,230	13,687
Sugarcane (I) MHL	53,670	29,378	32,018	24,291	21,652
Sugarcane (NI) MHL	44,915	28,936	33,073	15,978	11,842

Notes: I = Irrigated crops, NI = Non-irrigated crops and the rest of the abbreviations have noted in Table 1.

There are 20 cropping patterns under non-irrigated conditions and 14 cropping patterns under irrigated conditions at Chuadanga area. Sugarcane MLL + lentil gave the highest return over full cost (Tk. 33,876.00/ha) followed by sugarcane MHL + lentil (Tk. 31,025.00/ha), sugarcane HL + lentil (Tk. 30,244.00/ha), sugarcane MLL + mustard (Tk. 29,221.00/ha), sugarcane HL + mustard (Tk. 25, 589.00/ha), sugarcane MHL + mustard (Tk. 25,446.00/ha), sugarcane MLL + gram (Tk.23,579.00/ha), jute MHL + lentil MHL

(Tk. 23,276.00/ha), LV Aus MHL + lentil MHL (Tk. 20,766.00/ha), sugarcane MHL + gram (Tk. 20,728.00/ha), sugarcane HL + gram (Tk. 19,947.00/ha), sugarcane MLL (Tk. 19,476.00/ha), sugarcane MHL (Tk. 16,625.00/ ha), jute HL- mustard HL (16,243.00/ha), sugarcane HL (Tk. 15,844.00/ha), jute HL - lentil HL (Tk. 15,013.00/ha), jute HL - wheat HL (Tk. 11,026.00/ha), MV Aus HL - wheat HL (Tk. 10,748.00/ha), LV Aus HL - lentil HL (Tk. 9,478.00/ha) and LV T. Aman MLL (NI) - LV Aus MLL (NI) (Tk. 4,200.00/ha) under non-irrigated conditions. MV T. Aman MLL - MV Aus MLL accrued the highest return (Tk. 40,117.00/ha) followed by sugarcane MHL + lentil (Tk. 38,556.00/ha), LV T. Aman MLL - MV Aus MLL (Tk. 37,704.00/ha), sugarcane MHL + mustard (Tk. 33,901.00/ha), sugarcane MLL + gram (Tk.31,746.00/ha), sugarcane HL + lentil (Tk. 30,101.00/ha), MV T. Aman MLL - jute MLL (Tk. 28,768.00/ha), sugarcane HL + gram (Tk. 28,259.00/ha), sugarcane MLL + lentil (Tk. 27,091.00/ha), sugarcane HL + mustard (Tk. 25,454.00/ha), sugarcane HL (Tk.24,156.00/ha), sugarcane MHL (Tk. 21,250.00/ha), sugarcane MHL + gram (Tk. 19,804.00/ha), and sugarcane MLL (Tk. 15,701.00/ha) under irrigated conditions (Table 4).

Table 4. Cropping patterns of Chuadanga areas, 1997-98.

Cropping patterns	Gross return (Tk./ha)	Cash cost (Tk./ha)	Full cost (Tk./ha)	Return over cash cost (Tk./ha)	Return over full cost (Tk./ha)
Non-irrigated:					
LV T. Aman MLL(NI) – LV Aus MLL	32,431	21,831	28,231	10,600	4,200
LV Aus HL – Lentil HL	31,269	14,719	21,791	16,549	9,478
LV Aus MHL(NI) – Lentil MHL	42,430	17,247	21,664	25,184	20,766
Jute MHL – Lentil MHL	46,838	19,181	23,564	27,656	23,276
Jute HL – Mustard HL	41,958	19,828	25,716	22,129	16,243
Jute HL – Wheat HL	43,486	26,856	32,459	16,629	11,026
Sugarcane HL	51,664	30,227	35,820	21,437	15,844
Sugarcane MLL	56,034	30,527	36,558	25,507	19,476
Sugarcane MHL	57,779	34,008	41,153	23,770	16,625
Sugarcane HL + Gram	58,628	31,813	38,680	26,815	19,947
Sugarcane MLL + Gram	62,998	32,113	39,418	30,885	23,579
Sugarcane MHL + Gram	64,743	35,594	44,013	29,148	20,728
Sugarcane HL + Lentil	70,317	32,844	40,073	37,473	30,244
Sugarcane MHL + Lentil	76,432	36,625	55,406	39,806	31,025
Sugarcane MLL + Lentil	74,687	33,144	40,811	41,543	33,876
Sugarcane HL + Mustard	64,662	31,733	39,073	32,908	25,589
Sugarcane MHL + Mustard	60,259	39,222	46,512	32,735	25,446
Sugarcane MLL + Mustard	69,032	32,032	39,811	36,998	29,221
Jute HL – Lentil HL	38,908	17,810	23,895	21,096	15,013
MV Aus HL – Wheat HL	51,075	35,595	40,335	15,478	10,748

Note: Abbreviations have been mentioned in the previous Table.

Table 4 continued

Cropping patterns	Gross return (Tk./ha)	Cash cost (Tk./ha)	Full cost (Tk./ha)	Return over cash cost (Tk./ha)	Return over full cost (Tk./ha)
Irrigated :					
MV T. Aman MLL – Jute MLL	64,468	30,030	35,703	34,437	28,768
MV T. Aman MLL– MV Aus MLL	79,721	34,087	39,606	45,634	40,117
LV T. Aman MLL(I) – MV Aus MLL	74,841	32,858	37,138	41,984	37,704
Sugarcane HL	67,124	37,104	42,968	30,021	24,156
Sugarcane MLL	58,960	37,716	43,257	21,244	15,701
Sugarcane MHL	68,620	39,973	47,370	28,847	21,250
Sugarcane HL + Gram	74,088	38,690	45,828	35,399	28,259
Sugarcane MHL + Gram	65,924	39,302	46,119	26,622	19,804
Sugarcane MLL + Gram	80,509	41,004	48,763	39,505	31,746
Sugarcane HL + Lentil	77,613	40,333	47,512	37,280	30,101
Sugarcane MHL + Lentil	85,777	39,721	47,221	46,057	38,556
Sugarcane MLL + Lentil	74,854	39,893	47,763	34,960	27,091
Sugarcane HL + Mustard	71,958	39,222	46,512	32,735	25,454
Sugarcane MHL + Mustard	80,122	38,610	46,221	.41,512	33,901

Note: Abbreviations have been mentioned in the previous Table.

The study showed that non-irrigated cereal crops had higher returns at Thakurgaon than Chuadanga district. Irrigated cereal crops had higher returns at Chuadanga than Thakurgaon district except wheat. Non-irrigated sugarcane MHL had low returns at Thakurgaon than Chuadanga district. Irrigated sugarcane HL obtained higher returns at Chuadanga than Thakurgon district. Irrigated sugarcane MLL had higher gross margin at Chuadanga than irrigated sugarcane MLL at Thakurgaon. Lentil, mustard and gram intercrops with sugarcane at Chuadanga district have high potentials and promising economic returns.

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