

Economics and Efficiency of Sugar Processing by Sugar Factory and Gur Making by the Country Crusher

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ABSTRACT

A study was conducted in the mills and millzones of North Bengal, Rajshahi and Kushtia Sugar mills during 1981-82. The juice recovery by weight was 55.41% in the country crushers and 70.99% in the Sugar Mills. Sugar loss in bagasse % cane was 105.59% higher in the country crushers than the Sugar Mills. This work indicated a high net profit (Tk. 3994.01) obtained from each m. ton of sugar produced by the Sugar Mills (if sold as free sale) compared to net loss of Tk. 1,289.88 in the owner operated country crusher and Tk. 1799.36 in the rented country crusher from each m. ton of gur manufactured.

INTRODUCTION

The agro-based sugar industry stand second to jute industries in Bangladesh. On an average about 66% of total cane production is processed by the country crushers and only 20% by the Sugar Mills. The rest is used for seed, chewing etc. in the country (Anon., 1979a).

Gur is manufactured by the cane growers. The country crusher is partially mechanized under the cottage industry sector with unsophisticated equipments. Some gur concentrated areas are located at Rajshahi and Kushtia districts. The present study was conducted to study the economics of sugar and gur processing during the year 1981-82 with the following objectives :

- (i) To estimate the cost of sugar production by the sugar Mills,
- (ii) To estimate the cost of gur production by country crushers,
- (iii) To estimate and to compare juice extraction efficiencies by sugar factories and country crushers.

MATERIALS AND METHODS

Three Sugar Mills (North Bengal, Kushtia and Rajshahi Sugar mills) and twenty nine country crushers were selected from the concentrated gur production areas. Ten country crushers of the North Bengal Sugar Mills Zone under P. S. Lalpur and Boraigram, nine crushers from Rajshahi Sugar Mills Zone under P. S. Putia

in the district of Rajshahi and ten country crushers from Kushtia Sugar Mills Zone under P. S. Kushtia and Mirpur in the district of Kushtia were selected. In twenty nine country crushers, fifteen were owner operated and the rest were rented by the growers. The bagasse, juice extraction and juice analyses of three Sugar Mills and twenty nine country crushers were done seperately for determining and comparing their efficiencies.

For working out the economics of sugar processing, various cost components were collected from sugar mills records. The similar data for gur processing were collected from country crushers. All these data were grouped into fixed and variable costs, collected from country crushers. For country crushers the interest on capital was calculated and the original price of the items was obtained from the growers to estimate their "seasonal depreciation" according to the actual durability of the items in years. This seasonal depreciation and interest on capital were added to account the fixed capital costs and the variable inputs included the labour (human and bullock), cane and fuel costs. Marketing costs like transport of gur was included in cost components. In rented crushers, rent of crushers were included in cost components instead of depreciation cost of country crushers, tools and equipments.

Fixed capital input in the sugar mills consists of depreciation on building & machineries, permanent salary & wages, other factory overheads, taxes, interest payable, vehicle repair and maintenance, printing and stationery, insurance, head office overheads, levy for sugarcane research. Variable inputs included cane cost, wages to seasonal labourers, rail and road freight on cane, loading and unloading of cane, mechanized cultivation, maintenance of cane hauling vehicles, other raw materials, chemicals & packing, incidental costs etc. Duties and taxes were paid directly to the Government and it was also calculated as a cost component. Data on the juice extraction efficiencies of twenty nine country crushers and three sugar mills were assessed by crushing cane and measuring total juice extracted, analysing sugar loss in bagasse percent cane and lost undiluted juice percent fibre. The analyses were done at sugar mills and the parameters were calculated according to the following formulae (Anon.,1970).

Sugar loss in bagasse % cane = $\text{Sugar \% bagasse} \times \text{bagasse \% cane}$.

Lost undiluted juice percent fibre = $\frac{\text{Brix \% bagasse} \times 10,000}{\text{Brix of primary juice} \times \text{fibre \% bagasse}}$.

The analyses were done on the current market price. The cost of various commodities and power, during the period of study (1981-82 season) were as follows:

(a) Cost of Cane/m. ton	= Tk.402.00		
(b) Cost of Sugar/m. ton	=	Whole saler rate	= Tk. 12864.00
		Free sale rate	= Tk. 14472.00
		Government rate	= Tk. 12455.30
(c) Cost of Gur/m. ton	=	NBSM zone	= Tk. 4556.00
		KSM "	= Tk. 4288.00
		RJSM "	= Tk. 4690.00

- (d) Cost of Labourers/day/labour=Tk. 15.00
- (e) Cost of Bullock power/day/ =Tk. 20.00
Bullock pair
- (f) Depreciation @ Tk. 10%
- (g) Fuel cost=Tk. 149.81/m. ton.
- (h) Rent of Crusher per m. ton of cane crushing=Tk. 26.80

RESULTS AND DISCUSSION

Economics of Processing :

The manufacturing costs for one m. ton of gur and sugar are presented in Tables 1, 2 & 3 respectively. The fixed and variable costs for sugar production were higher than those of gur production due to higher capital intensity, use of costly material for clarification of sugar and higher percentages of duties and taxes paid to the Government (i. e. 17.99% of duties and taxes of total cost for each m. ton of sugar). The study reveals that for each m. ton of sugar, the highest net profit was obtained when sugar was sold on free sale (Tk. 3198.04 at NBSM, Tk. 4209.48 at KSM, Tk. 4574.76 at RJSM) followed by sales to wholesalers/growers (Tk. 1590.05 at NBSM, Tk. 2601.49 at KSM, Tk. 2966.77 at RJSM) and sales to Government was the least profitable (Tk. 1181.35 at NBSM, Tk. 2192.79 at KSM, Tk. 2558.07 at RJSM) (Table 3).

Table 1. Cost per m. ton of Gur produced by the owner of Country Crusher (1981-82) of NBSM and RJSM.

Particulars	NBSM Zone (Tk.)	% of total cost	RJSM Zone (Tk.)	% of total cost	Mean (Tk.)	% of total cost
(A) Variable Cost						
(a) Cane cost	4377.78	70.72	3943.62	69.97	4160.70	70.37
(b) Wages to labourer	909.86	14.70	860.82	15.27	885.20	14.97
(c) Bullock power cost	342.77	5.53	286.76	5.09	314.90	5.33
(d) Fuel cost	344.11	5.56	315.17	5.60	329.64	5.57
(e) Total precessing cost	5974.52	96.51	5406.37	95.93	5690.44	96.24
(B) Fixed Cost						
(f) Depreciation cost of country crusher	71.56	1.16	71.56	1.27	71.56	1.21
(g) Depreciation cost of bullock, tools and equipments.	90.58	1.46	90.58	1.61	90.58	1.53
(h) Total fixed cost	162.14	2.62	162.14	2.88	162.14	2.74
(i) Marketing cost	53.60	0.87	67.00	1.19	60.30	1.02
(j) Total cost	6190.26	100.00	5635.51	100.00	5912.88	100.00
(C) Gross receipts						
(i) Main products (gur)	4556.00		4690.00		4623.00	
Net profit(+)/Loss(-)	1634.26		945.51		1289.88	

Table 2. Cost per m. ton of Gur produced by the rented country crushers (1981-82) of NBSM and KSM.

Sl. No.	Particulars	NBSM Zone (Tk.)	% of total cost	KSM Zone (Tk.)	% of total cost	Mean (Tk.)	% of total cost
A. Variable Cost							
a)	Cane cost	4442.10	69.95	4164.72	68.37	4303.54	69.17
b)	Wages to labourer	854.38	13.45	845.81	13.89	850.10	13.66
c)	Bullock power cost	272.56	4.29	295.34	4.85	283.81	4.57
d)	Fuel cost	360.46	5.68	369.30	6.06	365.02	5.87
e)	Rent of crusher	296.14	4.66	277.65	4.56	287.03	4.61
	Total precessing cost	6225.64	98.03	5952.82	97.73	6089.50	97.88
B. Fixed Cost							
f)	Depreciation cost of bullock power	71.56	1.13	71.56	1.17	71.56	1.15
g)	Total fixed cost	71.56	1.13	71.56	1.17	71.56	1.15
h)	Marketing cost	53.60	0.84	67.00	1.10	60.30	0.97
i)	Total cost	6350.80	100.00	6091.38	100.00	6221.36	100.00
C. Gross receipts							
j)	Main product (gur)	4556.00		4288.00		4422.00	
	Net profit(+)/Loss(-)	-1794.80		-1803.38		-1799.36	

The study indicates that gur production was losing concern to the growers due to lower prices of gur in the country. The production costs of gur could not be covered by the prices received by the gur markers (Tables 1 & 2). Net loss to owner operated country crusher by producing one m. ton of gur was Tk. 1634.26 at North Bengal Sugar Mills Zone and Tk. 943.51 at Rajshahi Sugar Mills Zone (Table 1). Net loss to the rented country crusher was Tk. 1794.80 at North Bengal Sugar Mills Zone and Tk. 1803.38 at Kushtia Sugar Mills Zone (Table 2). In fixed cost components of gur production, depreciation cost of country crusher, depreciation cost of bullock power, tools and equipments were found almost same to the owner operated country crusher. In variable cost, the cost of cane was the highest followed by the wages to labourer in gur production (Tables 1 & 2). In fixed cost component of sugar processing, amount of permanent salaries and wages were the highest and in variable cost, the amount of cane cost was the highest.

Juice Extraction Efficiency :

The present study revealed that juice extracted by the country crushers from cane was 55.50% at NBSM Zone, 58.31% at RJSM Zone and 52.43% at KSM Zone (Table 4). The juice recovery was maximum when the crusher had a good grooving and was abjusted to a gap of about 0.70mm in the middle of the roller. Juice recovery in this case was almost 60%. Crusher with worn-put grooving gave lower juice recovery (Anon., 1979b).

Table 3. Cost per m. ton of Sugar produced at NBSM, KSM and RJSM (1981-82).

Particulars	NBSM (Tk.)	% of total cost	KSM (Tk.)	% of total cost	RJSM (Tk.)	% of total cost	Mean (Tk.)	% of total cost
A. Processing cost								
1. Fixed cost	2483.02	21.67	2459.70	23.42	1931.74	19.14	2291.48	21.45
2. Variable cost	7052.42	61.55	6121.92	58.28	6239.04	61.81	6471.13	60.56
3. Processing cost	9535.44	83.22	8581.62	81.70	8170.78	80.95	8762.61	82.01
4. Duties and Taxes	1922.36	16.78	1922.36	18.30	1922.36	19.05	1922.36	17.99
Total cost	11457.80	100.00	10503.98	100.00	10093.14	100.00	10684.97	100.00
B. Gross receipts (if sold to Government)								
1. Main product (sugar)	12455.30		12455.30		12455.30		12455.30	
2. By-product (Molasses)	183.85		131.32		115.24		143.47	
3. By-product (Bagasse)	—		110.15		80.67		63.61	
4. Total receipts	12639.15		12696.77		12651.21		12662.38	
5. Net Profit	1181.35		2192.79		2558.07		1977.41	
C. Gross receipts (if sold to whole saler/grower)								
1. Main product (sugar)	12864.00		12864.00		12864.00		12864.00	
2. By-product (Molasses)	183.85		131.32		115.24		143.47	
3. By-product (Bagasse)	—		110.15		80.67		63.61	
4. Total receipts.	13047.85		13105.47		13059.91		13071.08	
5. Net profit	1590.05		2601.49		2966.77		2386.11	
D. Gross receipts (if sold as free sale)								
1. Main product (sugar)	14472.00		14472.00		14472.00		14472.00	
2. By-product (Molasses)	183.84		131.32		115.24		143.47	
3. By-product (Bagasse)	—		110.15		80.67		63.61	
4. Total receipts	14655.84		14713.46		14667.90		14679.08	
5. Net profit	3198.04		4209.48		4574.76		3994.01	

Table 4. Comparison of juice extraction efficiencies of three Sugar Mills and 29 Country Crushers.

Items	Sugar Mills			Mean	Country Crushers			Mean	% of increase (+)/ decrease of (-) country crushers over sugar mills
	NBSM	RJSM	KSM		NBSM	RJSM	KSM		
Juice extraction %	68.38	71.48	73.10	70.99	55.50	58.31	52.43	55.41	— 21.95
Sugar/Gur (recovery) %	7.57	8.35	8.37	8.10	9.15	10.11	9.70	9.65	+ 19.14
Lost undiluted juice % fibre	68.95	58.87	73.14	66.99	160.73	124.00	126.68	137.14	+104.72
Sugar loss in bagasse % cane	1.71	1.26	1.33	1.43	3.11	2.78	2.93	2.94	+105.59

Juice recovery (by weight) was 68.38% at NBSM, 71.48% at RJSM and 73.10% at KSM (Table 4). The average juice recovery is reported to be about 88.90% in the Sugar Mills in Bangladesh (Anon., 1978). However, juice recovery was 21.95% higher in the Sugar Mills than in the country crushers (Table 4).

On an average 19.14% higher recovery (main product) was obtained by the country crushers than the NBSM, RJSM and KSM (Table 4). The higher total gur recovery with country crusher was probably due to the presence of such materials like glucose, fructose and other impurities which were mixed with sucrose in the gur (Anon., 1979b). In Sugar Mills these sugars (glucose+fructose) are almost lost because they are turned into molasses. Lost undiluted juice percent fibre was found higher and more than double in the country crusher (i.e. 104.72%) than that of the Sugar Mills.

The work suggests that though sugar manufacturing is much costlier than gur, the former is profitable and the latter is a losing concern (Tables 1, 2 & 3). Results also showed 105.59% higher sugar loss in the bagasse % cane of the country crushers than in the Sugar Mills (Table 4). Sugar loss in bagasse % cane was 1.43% in the Sugar Mills and 2.94% in the county crushers. The difference between the parameters of county crusher and sugar mills of sugar loss in bagasse % cane was 1.51%. Hence the gur making process by the country crusher, even though gives some temporary cash relief to the growers, is a great national loss.

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