SHORT COMMUNICATION

COMPARATIVE ECONOMIC ANALYSIS OF VALUE ADDED PRODUCTS OF SUGARCANE IN NORTH COASTAL ZONE OF ANDHRA PRADESH STATE, INDIA

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Abstract

The present study conducted during 2014-2015 in the North Coastal Zone of Andhra Pradesh State was an attempt to work out costs and returns for value added products of sugarcane, viz. sugar, jaggery and juice to advocate profitable and sustainable value chain to sugarcane growers. Multistage sampling technique was adopted in selecting the sampling units at various levels and conventional tabular analysis and benefit to cost ratio (BCR) were employed to estimate the costs and returns in cane products and to assess their value chain. Response-Priority Index (RPI) was utilized to estimate the consumer preferences towards various attributes of jaggery products. Results of the study indicated that cost of sugarcane cultivation is the prime factor in the various value added products. Among these products, sugarcane juice production (BCR=2.09) was found more profitable than jaggery (BCR=1.14) and cane supplied to factories (BCR=1.07). Technical and financial feasibility studies in relation to keeping quality of cane juice are needed to produce it on large scale.

Key words : Sugarcane, sugar, jaggery, juice, value added products

India ranked second in sugarcane with an area of 5.01 Mha and production of 352.14 Mt but ranked 37th in productivity with 70.26 t/ha in the world during 2014 (FAOSTAT 2016). In India, sugarcane occupies 2.6% of the total cropped area. Andhra Pradesh (A.P.) State ranked sixth in the country during 2014-15 with an area of 0.14 Mha, production of 10 Mt and productivity of 71.85 t/ha. However, the area in the state had decreased from 0.21 Mha in 2006-07 to 0.14 Mha in 2014-15 (Anonymous 2016). One of the reasons for this downtrend appears to be lack of profitability in sugarcane cultivation for sugar production. This is because while sugarcane price is fixed by the government based on cost of cultivation and other related factors, same is not true with jaggery which is subjected to greater price fluctuations. Prevailing jaggery price

determines the supply of sugarcane to the factory or its conversion to jaggery (Naidu and Reddy 1993). Among value added products that can serve as alternatives to realize quick returns, sugarcane juice is produced seasonally and on a small scale. Cultivation for jaggery, both in solid and liquid forms, is another viable alternative in the light of its increased consumption in recent times owing to health consciousness. The present study was conducted to work costs and returns of sugarcane production, compare the costs and returns of value added products of sugarcane and assess consumer preferences about value added products.

The study was conducted during 2014-2015 in the North Coastal Zone (NCZ) of A.P. located between 17°15′ to 19°54′ of North Latitude and 82°50′ to 84°50′ of East Longitude. NCZ comprising three districts, viz. Srikakulam, Vizianagaram and

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Visakhapatnam was selected due to its higher base of sugarcane production in the state. Multistage sampling technique was adopted in selecting the sampling units at various levels. All sugarcane growing *mandals* in each district were listed and two *mandals* with the largest area were selected. All the villages in the selected *mandals* were listed and two villages were selected randomly from each *mandal* making a sample size of 12 villages. Ten sugarcane growers were selected at random from each village thus making up the sample size to 120 farmers. One sugar factory located in each district was selected and only operational costs were worked out for calculating costs and returns in sugar production. Opinions about jaggery were collected from a random sample of 20 consumers per each district making a consumer sample size of 60. Thus, the total sample size including both producers and consumers was 180. Simple averages were used to work out the farm household particulars, labour utilization on sample farms, cost of cultivation of sugarcane and cost of production of jaggery. Benefit to cost ratio (BCR) was calculated as the ratio of Gross returns (GR) to total cost (TC) incurred.

Response-Priority Index (RPI) was calculated as per (Rao 2011) as a product of proportion of responses (PR) and priority estimate (PE), where PR for the ith constraint will give the ratio of number responses for a particular preference to the total responses.

Costs and returns in cultivation of sugarcane

The total cost of cultivation of sugarcane per ha was ₹ 1,84,902 which includes the variable cost (Cost A) of ₹ 1,37,091 and fixed cost of ₹ 47,811 accounting for 74.2% and 25.8% of the total cost

respectively (Table 1). Further, out of the total operational cost (Cost A1) (₹ 1,29,945), 71% (₹ 92,261) was incurred on labour charges and 29% (₹ 37,684) was spent on materials which showed the significance of labour charges. Among the operational costs, harvesting and transporting charges (₹ 34,183) were the highest (26.3%) followed by seed material and planting (18.2%) cost (₹ 23,655) and farm yard manure and fertilizer application (13.1%) cost (₹ 17,010) which once again showed the magnitude of labour charges in cost of cultivation.

Total returns was ₹ 1,42,500 resulting in BCR on total cost as 0.77 and on operating cost as 1.10. Thus, farmers are incurring loss by producing sugarcane. This necessitates the farmers to contemplate the production of various value added products. Rao (2012) reported the total cost of cultivation as ₹ 1,47,454 in NCZ of A.P. during 2008-09. Thus in the six year intervening period, the escalation in total cost was about ₹ 37,448 (25.4%) which was apparently due to increase in labour charges and fertilizer prices.

Comparative economics of value added products of sugarcane

The profitability of cane supply to sugar factory for sugar production vis-à-vis jaggery production was worked out on the basis of BCR for the study period.

(i) Sugar production

The cost of raw material, i.e. sugarcane, was the prime variable cost accounting for 60.98% of the operating cost of sugar production whereas the other overhead charges accounted for 29.02% (Table 2). Obviously, cost of sugarcane is an important factor in deciding the price

Table 1. Cost of cultivation (per ha) of sugarcane

S. No.	Operation	Cost	
		₹	%
1	Land Preparation	7,255	5.58
2	Seed material and planting	23,655	18.20
3	FYM and Fertilizers application	17,010	13.09
4	Intercultivation & Weeding	16,850	12.97
5	Irrigation Charges	6,250	4.81
6	TT Propping	12,342	9.50
7	Plant Protection	12,400	9.54
8	Harvesting & Transport	34,183	26.31
Cost A1		1,29,945	100
Interest on working Capital		7,147	
Cost A		1,37,091	
A2 (A1+Rent paid for leased in Land)		1,29,945	
A2 + Family Labour		1,37,493	
B1 (A1+Interest on Capital Assets)		1,29,945	
B2 (B1+Rental Value of Owned Land)		1,60,545	
C1 (B1+Family Labour)		1,37,493	
C2 (B2+Family Labour)		1,68,093	
C3 (C2+10% of C2)		1,84,902	
Yield (t/ha)		75	
Cost (₹ /t)		2,465	
Total returns		1,42,500	
BCR		0.77	
BCR (on Cost A1)		1.10	

of sugar. BCR was 1.07, only when returns from by-products, viz. bagasse, filter cake (bio-earth), molasses (ethanol) and cogeneration (power) were taken into consideration, indicating that sugar factories are running on low profit. BCR for only sugar production was 0.89 indicating that factories will incur a loss of 11 paisa per every rupee of investment if they produce only sugar. Overall, it seems apparent that sugar factories should lay more emphasis on by - products and explore alternative uses for them.

(ii) Jaggery production

Sugarcane was the prime variable cost accounting for 67.5% of the total cost of jaggery production (Table 3). For preparing 100 kg of jaggery, the total cost incurred was ₹2,816, out of which 67.4, 17.7 and 14.8% costs were incurred on sugarcane and additives (₹1900), labour charges (₹500) and machine rent (₹416), respectively. The BCR was 1.14 indicating that jaggery farmers are making profits of 14 paisa for one rupee of investment. Anjugam et al. (2007) estimated the net income

Table 2. Costs and returns in sugar production

Component	Quantity (t)	Unit rate (₹/t)	Costs (₹)	Returns (₹)
Sugarcane	1	2,000	2,000	
Processing charges			1,280	
Sugar	0.1	29,200		2,920
Bagasse	0.28	900		252
Filter cake (Bioearth)	0.04	125		5
Molasses (Ethanol)	0.037	4,000		148
Power	45.5 watt	3.85 (per watt)		176
Total			3,280	3,501
BCR			1.07	

realized from jaggery production as ₹ 14,138 in western zone of Tamil Nadu, which was higher than that of cane produced for sugar factories. This is in conformity with present findings that jaggery production (BCR=1.14) is more profitable than sugar production (BCR=1.07). Rao et al. (1998) reported that BCRs for solid and powder forms of jaggery were 1.4 and 1.8, respectively. Further, cubes and powder forms will result in additional income of ₹6,000-8,000 and ₹20,000-25,000 per acre, respectively.

(iii) Sugarcane juice production

The total cost incurred for preparing sugarcane juice of 575 liters from 1 t of sugarcane was ₹6,600. Of this, sugarcane and additives, machine rent and maintenance, and labour constituted 65.9, 28.8, and 5.3%, respectively. BCR was arrived as 2.09 (Table 4) which indicated that sugarcane juice makers are gaining profits of ₹1.09 per rupee of investment. Rao (2010) reported that during 2007-08, BCR for sugarcane juice production was 1.73.

Table 3. Costs and returns in jaggery production

Component	Quantity (t)	Unit rate (₹/t)	Costs (₹)	Returns (₹)
Sugarcane	1	1,900	1,900	
Materials & machines			416	
Labour	2 M+1W*		500	
Jaggery	0.1	32,000		3,200
Total			2,816	3,200
BCR			1.14	

*M - men, W-women

Table 4. Costs and returns in sugarcane juice production

Component	Quantity (t)	Unit rate (₹/t)	Costs (₹)	Returns (₹)
Sugarcane	1	1,900	1,900	
Materials & machines			4,350	
Labour	2	175	350	
Juice	575 liters	₹6/ Glass (250 ml)		13,800
Total			6,600	13,800
BCR			2.09	

The increased BCR in the present study could be due to the rise in retail price of sugarcane juice.

Thus, among the value added products of sugarcane, sugarcane juice was found most profitable followed by jaggery and sugar with BCRs of 2.09, 1.14 and 1.07 respectively. But, the major constraint with sugarcane juice is its seasonal demand with two to three months of sales, apart from its small scale operations. Further, keeping quality of sugarcane juice is a major constraint from technical angle.

Consumer preference estimates

To narrow down to one value added product of sugarcane, a quick survey among the consumers was conducted. Highest consumer preference was for jaggery. Consumers from three districts were asked to list priority-wise five major preferences they opt for selecting jaggery. Maximum responses in respective priorities were enumerated and Response-Priority Index (RPI) was constructed by taking into consideration maximum responses and their respective priorities (Table 5). The highest value of RPI was for small quantities (0.81). The other preferences were taste (0.73), attractive colour (0.64), accessibility (0.29) and neat packing (0.22). Thus, jaggery producers should keep in mind that consumers prefer small quantities like 1 kg, 500 g, 250 g, etc. rather than age-old lumps, to earn more profits.

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Table 5. Response-Priority Index (RPI) for consumer preference about jaggery

S. No.	Constraint	RPI	Rank
1	Small quantities	0.81	I
2	Taste	0.73	II
3	Attractive colour	0.64	III
4	Accessibility	0.29	IV
5	Neat packing	0.22	V

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