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Costs and returns of sugarcane production: A micro level study of Samastipur and Begusarai districts of Bihar

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Abstract

Sugarcane is a prominent cash crop. Present investigation was carried out to assess costs and returns in sugarcane cultivation in two leading sugarcane growing districts, Samastipur and Begusarai in Bihar as Hasanpur Sugar mill is located in the study area. Multistage sampling technique was applied for selection of sample respondents. The result revealed that the total cost of sugarcane cultivation was estimated to be Rs. 154968.57/ha. The operational cost was found to be Rs.92079.63/ha, constituting 59.42% of the total cost. Overhead cost came out to be Rs. 62888.93/ha and accounted for 40.58% of the total cost of cultivation of sugarcane. It was also observed that the total cost of cultivation increased as the farm size increased. Human labour cost came out as an important cost with a share of 17.01% of the total cost followed by transportation charge 9.87%, seed cost 7.91%. Inter farm size-wise comparison of different item of cost revealed that the cost of human labour decreased with increasing farm size while expenditure on machine labour showed the reverse trend. The overall B:C were estimated to be 2.40, 2.25, 2.37, 1.54, 2.11, 1.42 and 1.29 on the basis of costs A₁, A₂, B₁, B₂, C₁, C₂, and C₃, respectively. B:C on the basis of cost C₃ for different size group of farms were found to be 1.19, 1.36, 1.18 and 1.44. Net return over Cost A₁ and cost A₂ for all the farm size groups was found to be Rs.128724.60/ha and Rs. 122729.50/ha, respectively and over Cost C₁, cost C₂ and cost C₃ were worked out to be Rs.115973.50, Rs. 65678.37 and Rs.50181.08 per hectare, respectively. Sugarcane production was found profitable in the study area. State government initiatives towards formation and implementation of state advised price (SAP) could also make sugarcane cultivation more remunerative. Being a labour intensive crop would certainly help in enhancing socio-economic status of poor peasants of India.

Keywords: Sugarcane, cost of cultivation, operational cost, overhead cost, net returns

Introduction

Sugarcane is one of the prominent cash crops. It is grown across more than 90 nations of the world and is cultivated on around 26 million hectares of land with a world-wide production of about 1.83 billion tones. India ranks second in the world in sugarcane production. Sugarcane cultivation engaged around 7.5% of the country's rural population and contributed to 10% of the agricultural GDP in 2010-11 (Solomon, 2016) [5]. The sugar industry is the second largest agro-based industry after textiles in the country and it has played an important role in enhancing employment and economic development of country (Ahmed and Rahman, 2014, Ahmad *et. al.*, 2018) [2, 1]. The sugar industry as a whole has supported 6 million farmers and their families (Verma, 2015). Sugar, jaggery, khandsari and many byproducts like molasses, bagasses, press mud and also certain renewable sources of green energy in the form of bioethanol and many other bio-based products are obtained from sugarcane. Hence, it is considered as the crop for the future (Upreti and Singh, 2017, Singh *et. al.*, 2018) [6, 4]

In India during 2017-18 sugarcane was cultivated in an area of 4.73 million hectares with a production of 376.90 million tonnes and productivity of 79.68 tonnes per hectare. There are two distinct regions for sugarcane cultivation in India. Firstly tropical region comprising cane producing southern states of Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu and secondly subtropical region comprising northern part of Bihar, Uttarakhand, Uttar Pradesh, Punjab and Haryana. Subtropical region, encompassing 55% of total cane area, contributes only 48% of total cane production, and 35% of total sugar production in the country, whereas tropical region covers 41% of the cane area, and contributes 49% of the cane production and 64% of sugar production. The domestic demand of sugar is hovering around 22-23 million

tonnes annually, whereas, the production of sugar in India during last five year was rotating about 24 to 26 million tonnes annually, that the country is self-sufficient with per capita consumption at 12 kg annually. Sugar industry is the only agro-based industry in the state and even its present position, it plays a significant role in the economy of the state, as about 5.0 lakh cultivators grow sugarcane and provides employments to approximately 50 thousand as unskilled and skilled workers annually. In crushing season of 2017-18, a total of 488.30 lakh quintals of sugarcane were crushed and only 11 sugar mills were operational in private sector with average recovery of 9.07% (Anonymous, 2018) [3].

In sub-tropical region, Bihar is the second largest sugarcane producing state next to Uttar Pradesh with an area and production of sugarcane being about 2.69 lakh hectares and 176.10 lakh tonnes, respectively in the year 2017-18. The total cultivated land in state is around 53 lakh hectares out of which about 3.0 lakh hectares (3.7%) is under sugarcane cultivation (Anonymous, 2018) [3].

In Bihar, West Champaran, Gopalganj, East Champaran, Sitamarhi, Siwan, Samastipur and Begusarai are the leading districts from the point of view of sugarcane production and sugar industry. These districts collectively account for nearly 70% of sugarcane area and 60% of annual production of the state. The current status of sugarcane production in the state is far from satisfactory. Due to various reasons, a considerable area of sugarcane shifted to other crops. The statement is equally true for sugar industry also. This is evident from the fact that out of 28 old sugar mills in the state, 16 are sick and closed and rest 12 are working all in the private sector.

However, in sugarcane producing areas, the farmers are facing many problems, with respect to sugarcane cultivation and marketing, low sugarcane price, lack of incentive and non-availability of training facilities for farmers etc. Considering the potential of the crop for enhancing the economic conditions of the farming community of the state, some studies have been conducted on various aspects of sugarcane cultivation in state. But majority of these studies are focused on agronomical aspects of sugarcane production. There are fewer studies dealing with the economic aspects of sugarcane production in Bihar situation. In the light of the above fact the present study was framed to investigate the cost and returns in producing sugarcane in two leading sugarcane producing districts Samastipur and Begusarai of Bihar.

Materials and methods

Samastipur and Begusarai districts were purposively selected for the study because Hasanpur sugar mill is located there and sugarcane cultivation is practiced by farmers in the study area. There are altogether twenty blocks in Samastipur and eighteen blocks in Begusarai district. A list of sugarcane growing blocks was prepared on the basis of sugarcane growing area and arranged in ascending order. Hasanpur and Cheria Bariarpur blocks were selected on the basis of area under sugarcane for the present study. After the selection of block, lists of all sugarcane growing villages were prepared in consultation with district agriculture officers of Samastipur and Begusarai districts. Two villages each from the selected blocks namely Birpur and Malhipur from Hasanpur and Sakarbasha and Khubhi from Cheria Bariarpur blocks were randomly selected.

For the selection of respondents, a complete list of sugarcane producing farmers of the selected villages was prepared and arranged in ascending order on the basis of operational holding. Further, divided into four size groups, that is

marginal (<1ha), small (1-2ha), medium (2-4 ha) and large (≥ 4 ha). Samples of 50 sugarcane growers were selected from each block randomly using probability proportional to size method. In this way altogether 100 sugarcane growers were selected for detailed study. Data related to production of sugarcane was collected through a well structured schedule on different aspects of inputs quantities used in sugarcane cultivation, prices of inputs, labour cost, implements charges etc to estimate the cost of cultivation of sugarcane.

Estimation of cost of cultivation

The cost concepts as adopted by Commission for Agricultural Costs and Prices (CACP) were used in estimating costs and returns. The costs incurred in the cultivation of sugarcane were estimated in terms of Cost A₁, Cost A₂, Cost B₁, Cost B₂, Cost C₁, Cost C₂, and Cost C₃. Here are the details of these costs.

Cost A₁:

- i. Value of hired human labour.
- ii. Value of own machinery labour.
- iii. Value of hired machinery charges.
- iv. Value of seed (both farm produced and purchased).
- v. Value of insecticides and pesticides.
- vi. Value of manure (owned and purchased).
- vii. Value of fertilizer.
- viii. Depreciation on implements and farm building.
- ix. Irrigation charges.
- x. Land revenue, cases and other taxes.
- xi. Interest on working capital.
- xii. Miscellaneous expenses (artisans etc.)

Cost A₂: Cost A₁ + Rent paid for leased in land.

Cost B₁: Cost A₁ + Interest on fixed capital assets (excluding land)

Cost B₂: Cost B₁ + Rental value of own land (net of land revenue) and rent paid for leased in land.

Cost C₁: Cost B₁ + Imputed value of family labour.

Cost C₂: Cost B₂ + Imputed value of family labour.

Cost C₃: Cost C₂ + cost of management (10% of cost C₂).

Estimation of cost of production

For the estimation of cost of production, the cost of cultivation was divided by the yield of main produce (i.e. Sugarcane).

Benefit – cost analysis

The cost and benefit were separately computed and the benefit side was divided by cost side to compute the B-C ratio.

Estimation of measure of profit

The following formulae were used for the estimation of measures of profit.

Gross returns

The actual price, at which sugarcane was sold by the farmers, was multiplied by the quantity of the output to arrive at gross returns of the farmer.

Farm Budget Model

1. Farm business income = Gross income - cost A₂
2. Family labour income = Gross income - Cost B₂
3. Net income = Gross income – cost C₂
4. Farm investment income = Farm business income - Imputed value of Family labour.

Results and Discussion

Cost of cultivation per hectare

With a view to have a deeper insight of the various components of cost structure in sugarcane cultivation, a detailed analysis of data related to the cost of different items used in the process of production of sugarcane were carried out and the results of analysis have been shown in Table 1.

The result revealed that total cost of sugarcane cultivation was estimated at Rs. 154968.57 per hectare. The operational cost per hectare on an average amounted to be Rs. 92079.63 constituting 59.42% of the total cost. Per hectare overhead

cost came out to be Rs. 62888.93 and accounted for 40.58% of the total cost of cultivation of sugarcane.

Across all the farm size groups it was observed that the total cost of cultivation of sugarcane amounted to Rs.141716.87, Rs.149373.01, Rs.167189.89 and Rs.161594.50 on marginal, small, medium and large farms, respectively. Out of the total cost, operational cost accounted for 62.53%, 58.98%, 56.21% and 60.41% on marginal, small, medium and large farms. It was found that overhead cost accounted for 37.47%, 41.02%, 43.79% and 39.59% on marginal, small, medium and large farms.

Table 1: Cost of cultivation of sugarcane (Rs/hectare) +

Particulars			Farm Size Group			Over all
		Marginal (<1ha)	Small (<1-2 ha)	Medium (2-4 ha)	Large (≥4 ha)	
A.	Operational Cost					
a	Labour cost					
1	Human Labour	30766.36 (21.71)	28696.36 (19.21)	24826.99 (14.85)	21160.55 (13.10)	26362.56 (17.01)
a	Family	14724.69 (10.39)	13587.38 (9.10)	10666.67 (6.38)	7446.15 (4.61)	11606.22 (7.49)
b	Hired	16041.67 (11.32)	15108.98 (10.11)	14160.32 (8.47)	13714.40 (8.49)	14756.34 (9.52)
2.	Transportation charge	17666.67 (12.47)	15263.96 (10.22)	16796.63 (10.05)	11461.45 (7.09)	15297.20 (9.87)
3.	Machine Labour	4500.00 (3.18)	4873.79 (3.26)	5478.77 (3.28)	8508.73 (5.27)	5840.32 (3.77)
Sub Total		52933.03 (37.35)	48834.11 (32.69)	47102.39 (28.17)	41130.73 (25.45)	47500.06 (30.65)
b	Material cost					
1.	Seed	9866.67 (6.96)	10121.36 (6.78)	12023.35 (7.19)	17008.34 (10.53)	12254.93 (7.91)
2.	Plant protection measure	3966.10 (2.80)	5453.21 (3.65)	6354.25 (3.80)	7315.00 (4.33)	5772.14 (3.72)
3.	Manure	4350.00 (3.07)	4366.21 (2.92)	6513.32 (3.90)	8410.19 (5.20)	5909.93 (3.81)
4.	Fertilizer	6060.83 (4.28)	7095.00 (4.75)	8514.21 (5.09)	9473.91 (5.86)	7785.98 (5.02)
5	Irrigation	7250.00 (5.12)	8014.56 (5.37)	8756.87 (5.24)	9184.50 (5.68)	8301.50 (5.36)
	Sub Total	31493.60 (22.22)	35050.34 (23.46)	42162.00 (25.22)	51391.94 (31.80)	40024.47 (25.83)
	Total (a+b)	84426.63 (59.57)	83884.45 (56.16)	89264.39 (53.39)	92522.67 (57.26)	87524.53 (56.48)
6	Interest on operational cost	4182.12 (2.95)	4217.82 (2.82)	4715.86 (2.82)	5104.59 (3.16)	4555.10 (2.94)
	Total operational cost	88608.75 (62.53)	88102.27 (58.98)	93980.25 (56.21)	97627.26 (60.41)	92079.63 (59.42)
B	Overhead cost					
1.	Land Revenue	274.82 (0.19)	287.50 (0.19)	292.20 (0.17)	295.30 (0.18)	287.45 (0.19)
2.	Depreciation	7732.58 (5.46)	9610.00 (6.43)	9719.44 (5.8)	17584.00 (10.88)	11161.50 (7.20)
3.	Rental Value of owned land	44300.00 (31.26)	44300.00 (29.66)	44300.00 (26.50)	44300.00 (27.41)	44300.00 (28.59)
4.	Interest on fixed capital	800.74 (0.57)	989.75 (0.66)	1001.16 (0.60)	1787.93 (1.11)	1144.89 (0.76)
	Rent paid for leased in -land	0.00 (0.00)	6083.48 (4.07)	17896.83 (10.70)	0.00 (0.00)	5995.08 (3.87)
	Sub total	53108.14 (37.47)	61270.73 (41.02)	73209.63 (43.79)	63967.24 (39.59)	62888.93 (40.58)
Total cost (A+B)		141716.87 (100.00)	149373.01 (100.00)	167189.89 (100.00)	161594.50 (100.00)	154968.57 (100.00)

Figures in the parentheses indicate percentage value

It was evident from the table that the total cost of cultivation increased as the farm size increase. The operational cost component of the total cost of cultivation of sugarcane also exhibited by and large, an increasing trend with increasing

farm size in terms of quantum. However the other component of total cost i.e. overhead cost did not show any definite trend with increase in farm size.

A higher cost of cultivation in case of large farmers was probably because of larger resource base of these farmers which enabled them to apply improved inputs in larger quantities. It was further evident from the table that out of the various cost items, human labour cost was comparatively high as it accounted for 17.01% of the total cost. Transportation charge emerged to be second most important operational cost and found to be 9.87% of total cost of sugarcane cultivation followed by seed cost which had a share of 7.91% in cost of cultivation. Irrigation and fertilizer were other important items of operational cost accounting for 5.36% and 5.02% of the total cost.

In fixed cost items, rental value of owned land was assessed to be 28.59% of the total cost followed by depreciation of farm machinery and farm buildings (7.20%). Inter farm size-wise comparison of different item of cost revealed that the cost of human labour decrease with increasing farm size while expenditure on machine labour showed the reverse trend. It was mainly because less use of human labour on larger farms was compensated by larger use of machine labour. The analysis further revealed that there was more use of family labour on smaller sized farm in comparison with large sized farm. Being resource-deficient smaller sized farms compensated lower use of machineries with larger use of family labour.

Cost of cultivation in terms of cost concepts

On the basis of the cost concepts as adopted by Commission for Agricultural Costs and Prices (CACP) the various costs incurred in production of sugarcane was examined and the results have been presented in Table 2.

Table revealed that the cost A₁ and cost A₂ for all the farm size was found to be Rs.91922.37 and Rs.97917.45 per hectare respectively. Cost B₁ and cost B₂ was worked out to be Rs.93067.26 and 143362.34 per hectare respectively. Cost C₁, cost C₂ and cost C₃ were computed to be Rs.104673.49, Rs. 154968.57 and 15496.86 per hectare, respectively. The cost A₂ of sugarcane per hectare was higher on small farms Rs. 111222.05 per hectare and lower on marginal farms was found to be Rs.81891.44 per hectare however it may be observed that under different categories of sample farms various concepts

like cost A₁, cost B₁, cost B₂, cost C₁, cost C₂ and cost C₃, it increased with increase in farm size.

Table 2: Cost of cultivation in terms of cost concepts (Rs./hectare)

Items	Marginal	Small	Medium	Large	Over all
Cost A ₁	81891.44	84412.40	93325.23	108060.42	91922.37
Cost A ₂	81891.44	90495.88	111222.05	108060.42	97917.45
Cost B ₁	82692.18	85402.15	94326.39	109848.36	93067.26
Cost B ₂	126992.18	135785.63	156523.22	154148.36	143362.34
Cost C ₁	97416.87	98989.53	104993.06	117294.50	104673.49
Cost C ₂	141716.87	149373.01	167189.89	161594.50	154968.57
Cost C ₃	155888.56	164310.31	183908.88	177753.95	170465.86
Gross Return	185205.72	224093.37	217455.34	255833.33	220646.94

B: C in terms of cost concepts

The benefit cost ratios of sugarcane were computed for different categories of sample farms which are presented on Table 3.

Table 3: B-C ratio in terms of cost concepts

B:C ratio over	Marginal	Small	Medium	Large	Overall
Cost A ₁	2.26	2.65	2.33	2.37	2.40
Cost A ₂	2.26	2.48	1.96	2.37	2.25
Cost B ₁	2.24	2.62	2.31	2.33	2.37
Cost B ₂	1.46	1.65	1.39	1.66	1.54
Cost C ₁	1.90	2.26	2.07	2.18	2.11
Cost C ₂	1.31	1.50	1.30	1.58	1.42
Cost C ₃	1.19	1.36	1.18	1.44	1.29

The benefit cost ratio indicates benefit on one rupee of investment in sugarcane cultivation. The benefit cost ratio was also assessed on the basis of various cost items like cost A₁, cost A₂, cost B₁, cost B₂, cost C₁, cost C₂ and Cost C₃. The overall B: C was obtained from Cost A₁ to cost C₃ i.e. 1:2.40 to 1:1.29, respectively. B:C was maximum in case of Cost A₁ for all the farm size groups.

Returns from sugarcane cultivation

Analyses of farm business model of sugarcane production, was computed for different categories of farms and are presented in Table 4.

Table 4: Results of farm business model of sugarcane production for the study area

Yield and Income	Marginal	Small	Medium	Large	Overall
Cost of cultivation (Rs/ha)	141716.87	149373.01	167189.89	161594.50	154968.57
Yield (q/ha)	608.02	733.21	724.19	836.67	725.52
Rate (Rs./q)	304.60	305.63	300.27	305.77	304.06
Gross Returns (Rs/ha)	185205.72	224093.37	217455.34	255833.33	220646.94
Net Return (Rs./ha)	43488.85	74720.36	50265.45	94238.83	65678.37
Cost of production (Rs./q)	233.08	203.72	230.86	193.14	213.60
Farm business Income (Rs/ha)	103314.28	133597.50	106233.28	147772.90	122729.49
Family labour Income (Rs/ha)	58213.54	88307.75	60932.12	101684.98	77284.60
Farm investment Income (Rs/ha)	88589.59	120010.12	95566.61	140326.75	111123.27

It may be observed from the table that on an average, productivity of sugarcane was 725.52 quintal per hectare. It was higher on large farms (836.67 quintal per hectare) and lower on marginal farms (608.02 quintal per hectare).

Average gross return incurred at the market rate of Rs.304.06 per quintal to be Rs.220646.94 for overall farm size group. Farm business income, family labour income and farm investment income was worked out to be Rs.122729.49, Rs.77284.60 and Rs.111123.27 per hectare respectively. Analysis of cost of production revealed that on an average, it amounted to be Rs 213.60 per quintal for sugarcane on the sample farms. It may be pointed out that the cost of

production of sugarcane was lower on large farm (Rs.193.14) which increases to Rs.233.08 on marginal farms.

Returns from sugarcane cultivation in terms of cost concepts

The net returns over various costs from production of sugarcane were worked out for different categories of sample farms and are presented in Table 5.

In case of net return per hectare over Cost A₁ and cost A₂ for all the farm size groups was found to be Rs.128724.60 and Rs. 122729.50 respectively. Cost B₁ and cost B₂ was worked out to be Rs. 127579.70 and Rs. 77284.60 per hectare,

respectively. Cost C₁, cost C₂ and cost C₃ were worked out to be 115973.50, Rs. 65678.37 and Rs. 50181.08 per hectare respectively. The net return analysis was also carried out for different categories of farms and was found in the range of Rs. 147772.90 to 78079.38 per hectare for large farm size and Rs.103314.30 to Rs. 29317.16 per hectare for marginal farms, respectively.

Table 5: Returns over different costs. (Rs/ha)

Net return over	Marginal	Small	Medium	Large	Overall
Cost A ₁	103314.30	139681.00	124130.11	147772.90	128724.60
Cost A ₂	103314.30	133597.50	106233.29	147772.90	122729.50
Cost B ₁	102513.50	138691.20	123128.95	145985.00	127579.70
Cost B ₂	58213.54	88307.74	60932.12	101685.00	77284.60
Cost C ₁	87788.85	98989.53	112462.28	138538.80	115973.50
Cost C ₂	43488.85	74720.36	50265.45	94238.83	65678.37
Cost C ₃	29317.16	59783.06	33546.46	78079.38	50181.08

Conclusion

On the basis of foregoing results it may be inferred that the total cost of sugarcane cultivation was estimated to be Rs. 154968.57 per hectare. The operational cost per hectare on an average amounted to Rs.92079.63 constituting 59.42% of the total cost. Per hectare overhead cost came out to be Rs. 62888.93 and accounted for 40.58% of the total cost of cultivation of sugarcane.

Across all the farm size groups it was observed that the total cost of cultivation of sugarcane amounted to Rs.141716.87, Rs.149373.01, Rs.167189.89 and Rs.161594.50 on marginal, small, medium and large farms, respectively. Out of the total cost, operational cost accounted for 62.53%, 58.98%, 56.21% and 60.41% and overhead cost incurred to be 37.47%, 41.02%, 43.79% and 39.59% for marginal, small, medium and large farms. It was also observed that the total cost of cultivation increased as the farm size increased. The operational cost components also exhibited by and large, an increasing trend with increasing farm size in terms of quantum. However, overhead cost did not show any definite trend. Human labour cost came out as an important cost with a share of 17.01% of the total cost. Transportation charge emerged to be second most important item of operational cost as it claimed 9.87% in total cost of sugarcane cultivation followed by seed which had a share of 7.91% in cost of cultivation.

The most important items of fixed cost were found to be the rental value of owned land claiming 28.59% of the total cost followed by depreciation (7.20%). Inter farm size-wise comparison of different item of cost revealed that the cost of human labour decreased with increasing farm size while expenditure on machine labour showed the reverse trend. It was mainly because less use of human labour on larger farms was compensated by larger use of machine labour. The analysis further revealed that there was more use of family labour on smaller sized farms in comparison with large sized farms.

The benefit cost ratio was also estimated on the basis of various cost concepts such as cost A₁, cost A₂, cost B₁, cost B₂, cost C₁, cost C₂ and Cost C₃. The overall B:C were estimated to be 2.40, 2.25, 2.37, 1.54, 2.11, 1.42 and 1.29 on the basis of costs A₁, A₂, B₁, B₂, C₁, C₂, and C₃, respectively. B:C on the basis of cost C₃ for different size group of farms were found to be 1.19, 1.36, 1.18 and 1.44.

An average, productivity of sugarcane was estimated to be 725.52 quintal per hectare. It was higher on large farms

(836.67 quintal per hectare) and lower on marginal farms (608.02 quintal per hectare). The overall gross return from sugarcane was observed to be Rs.220646.94. overall farm business income, family labour income and farm investment income was worked out to be Rs.122729.49, Rs.77284.60 and Rs.111123.27 per hectare respectively. Cost of production was estimated to be Rs. 213.60 per quintal for sugarcane on the sample farms. The analysis pointed out that the cost of production of sugarcane was lower on large farm (Rs.193.14/q) and it was Rs.233.08 per quintal for marginal farms.

Net return over Cost A₁ and cost A₂ for all the farm size groups was found to be Rs.128724.60/ha and Rs. 122729.50/ha, respectively and over Cost C₁, cost C₂ and cost C₃ were worked out to be Rs.115973.50, Rs. 65678.37 and Rs.50181.08 per hectare, respectively. Net return was also carried out for different farm sizes over cost C₃ and it was assessed to be Rs. 29317.16, Rs. 59783.06, Rs.33546.46 and Rs. 78079.38 per hectare, respectively for marginal, small, medium and large farm sizes.

Sugarcane production was found profitable in the study area. It has also been perceived that state government machinery has also taken appreciable initiatives towards formation and implementation of state advised price (SAP) so as to make sugarcane cultivation more remunerative for farming community. Sugarcane is the prime material for production of all major sweeteners in the country and Government is adopting various initiatives to boost the production of sugarcane. There seems to be an important perspective for development of sugarcane in the country. The cultivation of sugarcane may be made more productive and profitable, which would certainly help in achieving the objective of doubling the farmers' income and also enhancing socio-economic status of poor peasants of India.

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