



**Research Paper**

# Cost benefit analysis of sugarcane cultivation in Bhandara district

■ **K. J. PATIL, N. V. SHENDE, AMRUTA S. JANGALE AND P. V. SHENDE**

See end of the paper for authors' affiliations

Correspondence to :

**AMRUTA S. JANGALE**

Department of  
Agricultural Economics  
and Statistics, College of  
Agriculture, NAGPUR (M.S.)  
INDIA

Email : [swabhimani09@gmail.com](mailto:swabhimani09@gmail.com)

**Paper History :**

**Received** : 16.02.2017;

**Revised** : 11.07.2017;

**Accepted** : 23.07.2017

**ABSTRACT** : The present study on cost benefit analysis of sugarcane cultivation in Bhandara district was undertaken in Sakoli, Pavani and Tumsar tehsils of Bhandara district in the year 2014-15 with a view to socio-economic characteristics of sugarcane farmers, examine input used, cost structure and returns in production of sugarcane. The present study is based on total 90 sugarcane farmers. The nature of data based on primary data with personal interview method. The cropping intensity was 181.92 per cent at overall level. The highest cropping intensity observed in large type of land holding, *i.e.* 200.00 per cent. The per hectare cost of production (Cost  $C_2$ ) of sugarcane during the year 2014-15 for the overall level was Rs.92949.02 and average per hectare gross returns were Rs.148101.01. The average net returns obtained at an overall basis were Rs.55324.98. The input-output ratio on an overall basis was 1.59. The average cost of production per tonne for sugarcane was Rs.1172.25. The major constraints faced in the farmers of sugarcane was low level of productivity (87.22%) whereas in marketing of sugarcane the major constraint expressed by sample farmers was low FRP prize (82.22%).

**KEY WORDS** : Sugarcane, Cost, Benefit, Constraint

**HOW TO CITE THIS PAPER** : Patil, K. J., Shende, N. V., Jangale, Amruta S. and Shende, P. V. (2017). Cost benefit analysis of sugarcane cultivation in Bhandara district. *Internat. Res. J. Agric. Eco. & Stat.*, **8** (2) : 255-263, DOI : 10.15740/HAS/IRJAES/8.2/255-263.

## INTRODUCTION :

Sugarcane (*Saccharum officinarum* L.) belongs to family gramineae and originated to tropical south Asia and south east Asia. Sugarcane is a renewable, natural agriculture resource because it provides sugar besides biofuel, fibre, fertilizer and myriad of by-products with ecological sustainability. Sugarcane juice is used for making white sugar, brown sugar (*Khandhasari*), jaggary (*Gur*) and ethanol. Sugarcane is important cash crop grown in India. Out of major sugarcane producing states in India, Uttar Pradesh ranks first in terms of area under sugarcane and Tamil Nadu ranks first in terms of

productivity. In Uttar Pradesh area under sugarcane cultivation was 22.28 lakh hectares contributing 50 per cent to total sugarcane production of the country during the year 2013-14. The production of sugarcane crop has accelerated the process of capital formation and modernization of agriculture with resultant effect an improved economy of farmers However, in view of the important of sugarcane cultivation the present study was conduct to know per hectare cost and profitability of sugarcane production. India is the world's largest sugar consumer. World consumption of sugar stood at 1706.00 lakh tonnes of which India's share was 248.00 lakh tonnes during the year 2014-15 (Dept. of Food and Public

Distribution). Total export of sugar from India was 541.5 lakh tonnes in 2014-15. *i.e.* sixth largest having a share of 2.76 per cent in total global export. The per capita consumption of white sugar in India increased substantially from 12.9 kg in the 2000-01 to 21 kg in the 2010-11 (Anonymous, 2014). Maharashtra rank 2<sup>nd</sup> in sugarcane production, while Uttar Pradesh ranks 1<sup>st</sup> in area and production of sugarcane. During the year, 2014-15 area under sugarcane cultivation in Maharashtra was 10.48 lakh ha with an annual production of 818.70 lakh MT. Bhandara district comes under low recovery and high productivity zone. In the year 2013-14 area under sugarcane cultivation in Bhandara district was 5746.11 hectare with production of 191300 MT. Whereas productivity of sugarcane in Bhandara district was 65.96 tonnes per hectare. The area under sugarcane in the selected tahsil was Tumsar, Sakoli and Pavni were 1202.00 ha, 988.50 ha and 1340.10 ha, respectively in the year 2014-2015 (Joint Director of Agriculture, Nagpur).

An objective of proposed study was to study the socio-economic characteristics of sugarcane cultivators and to estimate the cost and returns and resource use efficiency in sugarcane cultivation and to identify the constraints in production of sugarcane.

## MATERIALS AND METHODS :

It comprises of collection of data, sampling technique, design of schedule, analysis of data on analytical tools to interpret the result. The different techniques used and method adopted in the study are described under the following subheads.

### Sampling design :

For selection of farmers, multi-stage sampling design was employed. There are four types of sugarcane cultivation *viz.*, preseasonal, suru, ratoon and adsali. Suru cultivation was selected for present study.

### Selection of villages :

At the first stage of multi-stage sampling design, three tahsil were selected on the basis of potential area under sugarcane cultivation. Sakoli, Pavani, Tumsar were highest area under sugarcane cultivation *i.e.* 1319.71 ha, 1136.36 ha and 1141.79, respectively. Hence, these three tahsil were selected for the present study.

### Nature and sources of data :

For evaluating the specific objectives of the study, necessary primary data were obtained from the sample farmers through personal interview with the help of pre-tested and well structured schedule. The data so collected pertained to the *Kharif* season of the agriculture year 2014-15.

### Analytical tools

For the purpose of achieving the objective of the study, the collected data are subjected to the statistical analysis. Cost concepts: These includes cost  $A_1, A_2, B_1, B_2, C_1, C_2$  and  $C_3$ .

### Regression analysis :

The Cobb-Douglas production function was found to be best fit as the partial regression co-efficients,  $R^2$  was maximum and minimum error sum of square was least. It is expressed in  $Y = ax_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8} x_9^{b_9} x_{10}^{b_{10}}$

Y = Yield in tonnes per hectare

a = Intercept

$X_1$  = Human labour (days/ha)

$X_2$  = Machinery (hours/ha)

$X_3$  = Bullock pair (days/ha)

$X_4$  = Number of sets (per/ha)

$X_5$  = Manure (qt./ha)

$X_6$  = Nitrogen (kg./ha)

$X_7$  = Phosphorus (kg./ha)

$X_8$  = Plant protection (Rs./ha)

$X_9$  = Area under crop (ha)

$X_{10}$  = Irrigation (Rs./ha)

u = Error term.

## RESULTS AND DATA ANALYSIS :

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Land utilization pattern of selected sugarcane farmers :

Land utilization indicates the area of land actually utilize in different purpose like crop production, irrigated, unirrigated etc. The land utilization pattern of selected sugarcane farmers are presented in Table 1.

Table 1 revealed that, on and overall the gross crop area were found 3.43 hectare while 95.62 per cent area

Table 1: Land utilization pattern of selected sugarcane farmers					(Area in ha.)
Sr. No.	Particulars	Size of holding			Overall
		Small	Medium	Large	
1	Average total land holding	1.28 (100.00)	2.94(100.00)	6.07(100.00)	3.43(100.00)
2.	Current fallow	0.019(1.48)	0.076(2.58)	0.157(2.58)	0.084(2.44)*
3.	Net cultivated area	1.09(85.15)	2.86(97.27)	5.91(97.36)	3.28(95.62)
4.	Area sown more than once	1.00(78.12)	2.50(85.03)	5.91(97.36)	3.13(91.25)
5.	Irrigated area	0.70(54.68)	1.75(59.52)	3.87(63.75)	2.45(71.42)
6.	Gross cropped area	2.09	5.36	11.82	6.42
7.	Cropping intensity (%)	191.74	187.41	200.00	195.73

(Figures in parenthesis indicate the percentage to the total) \*indicate significance of value at P=0.05

Table 2 : Per hectare cost of cultivation of small size group of sugarcane farmers							
Sr. No.	Items		Units	Qty.	Price per unit	Cost Rs.	Per cent
1.	Hired human labour	Male	Days	33.51	169.05	5664.86	6.00
		Female	Days	31.88	123.36	3932.71	4.17
		Total	Days	65.39	146.77	9597.57	10.17
2.	Bullock labour	Hired	Days	2.90	561.23	1627.56	1.73
		Owned	Days	2.35	436.11	1024.85	1.09
		Total	Days	5.25	252.61	2652.41	2.81
3.	Machine labour	Hired	Hrs.	2.37	753.10	1784.84	1.89
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	2.37	753.10	1784.84	1.89
4.	Seed (Sets)		No	27106.2	0.73	19787.52	20.98
5.	Manure		Ton.	4.15	211.71	878.60	0.93
6.	Fertilizer	N	Kg.	234.07	23.51	5503.07	5.83
		P	Kg.	75.32	24.78	1866.45	1.98
		K	Kg.	121.08	24.27	2939.14	3.12
		Total					10308.66
7.	Irrigation		Rs.			8755.42	9.28
8.	Incidental		Rs.			122.20	0.13
9.	Plant protection		Rs.			1900	2.01
10.	Repairs		Rs.			166.23	0.18
11.	Depreciation		Rs.			649.49	0.69
12.	Land revenue		Rs.			132.05	0.14
13.	Int. on wor. cap. @ 6%		Rs.			3077.44	3.26
14.	Cost A <sub>1</sub>		Rs.			59812.43	63.40
15.	Rent paid for leased land		Rs.			0	0.00
16.	Cost A <sub>2</sub>		Rs.			59812.43	63.40
17.	Int.on fixed capital @ 10%		Rs.			2982.29	3.16
18.	Cost B <sub>1</sub>		Rs.			62794.72	66.56
19.	Rental value of land (1/6 of GP-Land revenue)		Rs.			25540.93	27.07
20.	Cost B <sub>2</sub>		Rs.			88335.65	93.64
21.	Family labour Charges	Male	Days	27.65	200.06	5531.68	5.86
		Female	Days	3.14	150.03	471.11	0.50
		Total	Days	30.79	194.95	6002.79	6.36
22.	Cost C <sub>1</sub>		Rs.			68797.51	72.93
23.	Cost C <sub>2</sub>		Rs.			94338.44	100.00
24.	Cost C <sub>3</sub>		Rs.			103772.84	
25.	Yield main		-	90.61	1700	154037.9	
26.	Cost of production/tonne		-			1145.26	

under cultivable land, followed by 91.25 per cent area sown more than ones. The cropping intensity found under small, medium and large groups of farmers were 191.74, 187.41 and 200.00 per cent, respectively. No particular time of trend observed in cropping intensity of sugarcane farmer. At overall level the cropping intensity was 195.73 per cent.

#### Per hectare cost of cultivation of sugarcane :

The share each items in the total cost provides necessary due to economizing costs. The cost has determined on the basis of standard cost concept *i.e.* cost  $A_1$ ,  $A_2$ , cost  $B_1$ ,  $B_2$ , cost  $C_1$ ,  $C_2$  and  $C_3$  the different

cost concepts have different utilities in research.

It is revealed from the Table 2 that, the per hectare cost of production at cost  $A_1$ ,  $A_2$  is 59812.43 Rs., cost  $B_1$  is 62794.72 Rs., whereas cost  $B_2$  is 88335.65 Rs. and cost  $C_1$  is 68797.51 Rs., cost  $C_2$  is 94338.44 Rs. whereas cost  $C_3$  is 103772.84 Rs. Which indicate the 10 per cent as a managerial cast. The major share of cost of cultivation goes towards cost ' $A_1$ ' and cost  $A_2$  (63.40%). The per hectare yield obtained by small farmers was 90.61 tonnes with gross return of Rs. 154037.9. In case of small size group the per tonne cost of production was Rs. 1145.26.

**Table 3 : Per ha cost of cultivation of medium size group of sugarcane farmers**

Sr. No.	Items	Units	Units required	Price per unit	Cost Rs.	Per cent	
1.	Hired human labour	Male	Days	29.18	165.38	4825.78	5.98
		Female	Days	29.24	126.16	3688.91	4.57
		Total	Days	58.42	145.74	8514.69	10.55
2.	Bullock labour	Hired	Days	1.62	560.33	1128.05	1.40
		Owned	Days	2.08	435.33	1200.84	1.49
		Total	Days	3.7	629.42	2328.89	2.89
3.	Machinelabour	Hired	Hrs.	3.42	745.41	2549.30	3.16
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	3.42	745.41	2549.30	3.16
4.	Seed (Sets)	No	26661	0.75	19995.75	24.78	
5.	Manure	ton.	3.4	209.33	711.73	0.88	
6.	Fertilizer	N	Kg.	163.62	23.69	3847.63	4.77
		P	Kg.	69.81	22.43	1566.18	1.94
		K	Kg.	85.37	24.26	2071.70	2.57
		Total				7485.51	9.28
7.	Irrigation	Rs.			6890.22	8.54	
8.	Incidental	Rs.			154.23	0.19	
9.	Plant protection	Rs.			2137.46	2.65	
10.	Repairs	Rs.			219.75	0.27	
11.	Depriciation	Rs.			332.12	0.41	
12.	Land revenue	Rs.			244.02	0.30	
13.	Int. on wor. cap. @ 6%	Rs.			2804.33	3.47	
14.	Cost $A_1$	Rs.			49542.22	61.39	
15.	Rent paid for leased land	Rs.			0	0.00	
16.	Cost $A_2$	Rs.			49542.22	61.39	
17.	Int. on fixed capital @ 10%	Rs.			3216.86	3.99	
18.	Cost $B_1$	Rs.			52759.08	65.37	
19.	Rental value of land (1/6 of GP-Land revenue)	Rs.			25213.7	31.24	
20.	Cost $B_2$	Rs.			77972.78	96.62	
21.	Family labour Charges	Male	Days	12.45	200.05	2490.64	3.09
		Female	Days	1.60	150.15	240.25	0.30
		Total	Days	14.05	194.36	2730.89	3.38
22.	Cost $C_1$	Rs.			55489.97	68.76	
23.	Cost $C_2$	Rs.			80703.67	100.00	
24.	Cost $C_3$	Rs.			88774.03		
25.	Yield main	-	89.85	1700	152746.7		
26.	Cost of production/tonne	-			988.02		

Table 3 revealed that, the per hectare cost of production at cost  $A_1$ ,  $A_2$  is Rs. 49542.22, cost  $B_1$  is Rs. 52759.08, whereas cost  $B_2$  is Rs.77972.78 and cost  $C_1$  is Rs.55489.97, cost  $C_2$  is Rs. 80703.67 whereas cost  $C_3$  is Rs.88774.03. The major share of cost of cultivation goes towards cost ' $A_1$ ' and cost  $A_2$  63.40 per cent. Cost ' $B_1$ '

contributes to 65.37 per cent, cost  $B_2$  contribute 96.62 per cent to the total cost *i.e.* cost ' $C_2$ '. The per hectare yield obtained by small farmers was 89.85 tonnes with gross return of Rs. 152746.7. In case of medium size group the per tonne cost of production was Rs. 988.02.

Table 4 revealed that, the per hectare cost of

**Table 4 : Per ha cost of cultivation of large size group of sugarcane farmers**

Sr. No.	Items	Units	Units required	Price per unit	Cost Rs.	Per cent	
1.	Hired human labour	Male	Days	78.71	162.85	12817.92	13.16
		Female	Days	60.28	118.12	7120.27	7.31
		Total	Days	133.99	148.80	19938.19	20.46
2.	Bullock labour	Hired	Days	0.00	0.00	0.00	0.00
		Owned	Days	0.00	0.00	0.00	0.00
		Total	Days				0.00
3.	Machinelabour	Hired	Hrs.	5.81	750.33	4359.41	4.47
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	5.81	750.33	4359.41	4.47
4.	Seed (Sets)	No	29181.9	0.73	21302.78	21.87	
5.	Manure	Ton.	4.03	212.68	857.14	0.88	
6.	Fertilizer	N	Kg.	195.50	24.38	4767.34	4.49
		P	Kg.	92.90	24.84	2307.84	2.37
		K	Kg.	90.92	22.54	2049.88	2.10
		Total				9125.06	9.37
7.	Irrigation	Rs.			4412.09	4.53	
8.	Incidental	Rs.			212.20	0.22	
9.	Plant protection	Rs.			2284.79	2.35	
10.	Repairs	Rs.			368.64	0.38	
11.	Depreciation	Rs.			240.93	0.25	
12.	Land revenue	Rs.			278.46	0.29	
13.	Int. on wor. cap. @ 6%	Rs.			3457.31	3.55	
14.	Cost $A_1$	Rs.			66837.00	68.60	
15.	Rent paid for leased land	Rs.			0	0.00	
16.	Cost $A_2$	Rs.			66837.00	68.60	
17.	Int.on fixed capital @ 10%	Rs.			3024.33	3.10	
18.	Cost $B_1$	Rs.			69861.33	71.71	
19.	Rental value of land (1/6 of GP-Land revenue)	Rs.			25513.37	26.19	
20.	Cost $B_2$	Rs.			95374.7	87.89	
21.	Family labour Charges	Male	Days	9.70	200.03	1940.31	1.99
		Female	Days	1.11	100.06	111.06	0.11
		Total	Days	10.81	189.76	2051.37	2.11
22.	Cost $C_1$	Rs.			71912.7	73.81	
23.	Cost $C_2$	Rs.			97426.07	100.00	
24.	Cost $C_3$	Rs.			107168.67		
25.	Yield main	-	91.03	1700	154751.00		
26.	Cost of production/tonne	-			1177.28		

production at cost  $A_1$ ,  $A_2$  is Rs. 66837.00, cost  $B_1$  is Rs. 69861.33, whereas cost  $B_2$  is Rs. 95374.7 and cost  $C_1$  is Rs. 71912.7, cost  $C_2$  is Rs. 71912.7 whereas cost  $C_3$  is Rs. 107168.67. The major share of cost of cultivation goes towards cost ' $A_1$ ' and cost  $A_2$  (68.60%). Cost ' $B_1$ ' contributes to 71.71 per cent, cost  $B_2$  contribute 87.89 per cent to the total cost *i.e.* cost ' $C_2$ '. The share of family labour was 2.11 per cent. The per hectare yield

obtained by small farmers was 91.03 tonnes with gross return of Rs. 154751.00. In case of large size group the per tonne cost of production was Rs. 1177.28.

Table 5 revealed that, the per hectare cost of production at cost  $A_1$ ,  $A_2$  is Rs. 60935.52, cost  $B_1$  is Rs. 63941.52, whereas cost  $B_2$  is Rs. 88470.79 and cost  $C_1$  is Rs. 68419.75, cost  $C_2$  is Rs. 92949.02 whereas cost  $C_3$  is Rs. 102243.92. The major share of cost of cultivation goes

**Table 5 : Per ha cost of cultivation of large size group of sugarcane farmers**

Sr. No.	Items	Units	Units required	Price per unit	Cost Rs.	Per cent	
1.	Hired human labour	Male	Days	78.71	162.85	12817.92	13.16
		Female	Days	60.28	118.12	7120.27	7.31
		Total	Days	133.99	148.80	19938.19	20.46
2.	Bullock labour	Hired	Days	0.00	0.00	0.00	0.00
		Owned	Days	0.00	0.00	0.00	0.00
		Total	Days				0.00
3.	Machinelabour	Hired	Hrs.	5.81	750.33	4359.41	4.47
		Owned	Hrs.	0.00	0.00	0.00	0.00
		Total	Hrs.	5.81	750.33	4359.41	4.47
4.	Seed (Sets)	No	29181.9	0.73	21302.78	21.87	
5.	Manure	Ton.	4.03	212.68	857.14	0.88	
6.	Fertilizer	N	Kg.	195.50	24.38	4767.34	4.49
		P	Kg.	92.90	24.84	2307.84	2.37
		K	Kg.	90.92	22.54	2049.88	2.10
		Total				9125.06	9.37
7.	Irrigation	Rs.			4412.09	4.53	
8.	Incidental	Rs.			212.20	0.22	
9.	Plant protection	Rs.			2284.79	2.35	
10.	Repairs	Rs.			368.64	0.38	
11.	Depreciation	Rs.			240.93	0.25	
12.	Land revenue	Rs.			278.46	0.29	
13.	Int. on wor. cap. @ 6%	Rs.			3457.31	3.55	
14.	Cost $A_1$	Rs.			66837.00	68.60	
15.	Rent paid for leased land	Rs.			0	0.00	
16.	Cost $A_2$	Rs.			66837.00	68.60	
17.	Int. on fixed capital @ 10%	Rs.			3024.33	3.10	
18.	Cost $B_1$	Rs.			69861.33	71.71	
19.	Rental value of land (1/6 of GP-Land revenue)	Rs.			25513.37	26.19	
20.	Cost $B_2$	Rs.			95374.7	87.89	
21.	Family labour Charges	Male	Days	9.70	200.03	1940.31	1.99
		Female	Days	1.11	100.06	111.06	0.11
		Total	Days	10.81	189.76	2051.37	2.11
22.	Cost $C_1$	Rs.			71912.7	73.81	
23.	Cost $C_2$	Rs.			97426.07	100.00	
24.	Cost $C_3$	Rs.			107168.67		
25.	Yield main	-	91.03	1700	154751.00		
26.	Cost of production/tonne	-			1177.28		

towards cost 'A<sub>1</sub>' and cost A<sub>2</sub> (65.56%). Cost 'B<sub>1</sub>' contributes to 68.79 per cent, cost B<sub>2</sub> contribute 95.18 per cent to the total cost *i.e.* cost 'C<sub>2</sub>'. The share of family labour was 4.82 per cent. The per hectare yield obtained by small farmers was 87.22 tonnes with gross return of Rs. 148101.01 In case of large size group the per tonne cost of production was Rs. 1172.25.

**Per hactre cost and return from sugarcane is given below :**

The cost and return structure per hectare of agricultural production, helps the farmer in mapping adjustment in the organization and thereby secure the optimum level of production and income. The per hectare cost and returns from sugarcane is presented

It is revealed that from the Table 6 that overall level average gross return worked out to Rs.148274. The net return obtain at various costs were Rs. 87338.48 at cost 'A<sub>1</sub>', Rs. 59803.21 at cost 'B<sub>2</sub>' 55324.98 at cost 'C<sub>2</sub>'. This means sugarcane crop appeared to be good form monitory benefits. The highest input- output ratio at cost 'C<sub>2</sub>' was recorded in large size group *i.e.*1.89 and

lowest input- output ratio at cost 'C<sub>2</sub>' was recorded large size group. At overall level the input-output ratio at cost 'C<sub>2</sub>' was 1.59. The input-output ratio which is an indicator of economic efficiency in crop production for the crop and other discussion indicated that sugarcane registered input-output ratio 2.15 means this is profitable. The input-output ratio at cost 'C<sub>3</sub>' was found highest in medium size of farmers *i.e.* 1.72. It was better for all size of holding as well as for overall *i.e.* 1.45. It indicate that the sugarcane cultivation was profitable at cost 'C<sub>3</sub>' also, which include managerial cost. Hence, the hypothesis is accepted here *i.e.* The sugarcane cultivation is profitable venture in Bhandara district.

**Resource use efficiency in sugarcane production :**

One of the objectives of present investigation was to study resource use efficiency in sugarcane production this objective accomplished through the production function analysis. The Cobb-Douglass production function was estimated to analyze the relationship between inputs on the output. The estimated production functions are presented in the Table 7.

**Table 6 : Per hectare cost and return from sugarcane**

		Size group			(Rs./ha)
Sr. No.		Small	Medium	Large	Overall
<b>Particulars</b>					
1.	Yield (Tonne/ha)	90.61	89.85	91.03	87.22
2.	Price (Tonne/ha)	1700	1700	1700	1700
3.	Value of main produce	154037	152745	154751	148274
4.	Value of by-produce	0.00	0.00	0.00	0.00
5.	Total produce	154037	152745	154751	148274
<b>Total cost</b>					
1.	Cost 'A <sub>2</sub> '	59812.43	49542.22	66837.00	60935.52
2.	Cost 'B <sub>2</sub> '	88335.65	77972.78	95374.07	88470.79
3.	Cost 'C <sub>2</sub> '	94338.44	80703.67	97426.07	92949.02
4.	Cost 'C <sub>3</sub> '	103772.84	88774.03	107168.67	102243.92
<b>Net return over</b>					
1.	Cost 'A <sub>2</sub> '	94224.57	103202.8	87914	87338.48
2.	Cost 'B <sub>2</sub> '	65701.35	74772.22	59376.93	59803.21
3.	Cost 'C <sub>2</sub> '	59698.56	72041.33	57324.93	55324.98
4.	Cost 'C <sub>3</sub> '	50264.16	63970.97	47582.33	46030.08
<b>Input-output ratio</b>					
1.	Cost 'A <sub>2</sub> '	2.57	3.08	2.31	2.43
2.	Cost 'B <sub>2</sub> '	1.74	1.95	1.62	1.67
3.	Cost 'C <sub>2</sub> '	1.63	1.89	1.58	1.59
4.	Cost 'C <sub>3</sub> '	1.48	1.72	1.44	1.45

The estimated parameter of expenditure does not shown any positive or negative significant at five per cent of probability level for selected sugarcane farmer. The estimated parameters of expenditure on bullock labour, seed (setts) were significant at 5 per cent of probability level for sugarcane farmer. Co-efficient of multiple

determination ( $R^2$ ) was 0.31 for sugarcane production function.

Return to scale are increasing, constant or diminishing accordingly as the same of regression co-efficient is greater than equal to or less than unity. The sum of regression co-efficient was found to 0.5224 for

**Table 7 : Cobb-Douglas production function for sugarcane cultivation in Bhandara district**

Particular	Co-efficient	Standard error	t- value
Intercept	-0.3539	0.6599	-0.5363
Human labour ( $X_1$ )	-0.0025	0.0849	-0.0299
Bullock labour ( $X_2$ )	0.0513*	0.0174	2.9449*
Machine ( $X_3$ )	0.0175	0.0219	0.7982
Nitrogen ( $X_4$ )	0.1038	0.0618	1.6784
Phosphrous ( $X_5$ )	-0.0538	0.0361	-1.4894
Mannure ( $X_6$ )	0.0052	0.0050	1.0403
Seed (setts) ( $X_7$ )	0.4993**	0.1299	3.8417**
Plant protection ( $X_8$ )	-0.0673	0.0677	-0.9941
Area under crop ( $X_9$ )	0.0806	0.0432	1.8628
Irrigation ( $X_{10}$ )	0.0371	0.0335	1.1060
Co-efficient of determination ( $R^2$ )		0.3140	
bi		0.5224	
Deviation from unity		0.4776	
F value		3.6161	
Return to scale indicate by test of significance		Decreasing	

\* and \*\* indicate significance of value at  $P=0.05$  and  $0.01$ , respectively

**Table 8: Constraints face by farmer in cultivation of sugarcane**

Sr. No.		No. of farmer (n=90)	Percentage to total farmers	Rank
<b>Production level</b>				
1.	Inadequate irrigation water during summer season	24	26.66	XII
2.	Inadequate supply of recent released varieties	36	40.00	VI
3.	Less availability of human labour	51	56.66	II
4.	Lack of knowledge about improved cultivation practices	28	31.11	X
5.	Irregular supply of fertilizers	42	46.66	V
6.	High cost of fertilizer	49	54.44	III
7.	Low level of productivity	79	87.77	I
8.	Lack of financial facility	20	22.22	XIII
9.	Infestations by insect and pest	47	52.22	IV
10.	High cost of pesticide	35	38.88	VII
11.	Non-availability of improved implements	31	34.44	IX
12.	Irregular supply of electricity	33	36.66	VIII
13.	Attack of wild animal on crop	27	30.00	XI
<b>Marketing level</b>				
1.	Low FRP	74	82.22	I
2.	Irregular bill by factory	57	63.33	III
3.	High harvesting cost	63	70.00	II
4.	Delay in harvesting	37	41.11	IV



sugarcane cultivation in Bhandara district. In order to see whether or not return to scale were constant, the sum of regression co-efficient tested of their division than unity it was observed that 0.4776 was not significantly different than unity and thus, indicated decreasing return to scale in case of sugarcane cultivation in Bhandara district.

#### Constraints in production of sugarcane :

All the selected sugarcane farmers were interviewed for the problems they faced for production and marketing of sugarcane. The information regarding the important problems faced by the farmers is presented in Table 8.

The Table 8 revealed that, low level of production was major problem which was expressed by 87.77 per cent farmers. Less availability of human labour was expressed by 56.66 per cent farmers. While in marketing constraints low FRP cost was expressed by 82.22 per cent farmers. High harvesting was expressed by 70.00 per cent farmers and less availability of human labour was expressed by 56.66 per cent farmers.

#### Conclusion:

On the basis of results obtained from the study, following conclusions are drawn.

- Average size of holding was 3.43 hectare.
- The cropping intensity was highest in large large group (200.00 %) followed by small size group (191.74%). At overall level the cropping intensity was 195.73 (%).
- The net return obtained on overall basis was Rs. 87338.48. It was highest in medium size group *i.e.* Rs. 103202.8.
- The economics of sugarcane production indicated that sugarcane cultivation is profitable with input-output ratio on overall basis 1:1.59 at cost 'C<sub>2</sub>'.
- The input-output ratio was highest in medium size group *i.e.* 1:1.89 at cost 'C<sub>2</sub>'.
- The regression co-efficient of bullock labour and setts (seed) was significant in Cobb-Douglas production function at overall level.
- Low level of productivity (87.77 %) was identified to be major problem in regarding to production.

#### Policy implication :

The efforts need to be made for increasing area

under sugarcane cultivation by adopting modern technology, providing high yielding varieties and adopting mechanization in many practices. As the sugarcane crop is newly introduced in Bhandara district due to establishment of sugar industry in this area. Thus, it is suggested to educate the farmer regarding improved agronomic practices in Bhandara district. The sugarcane crop may improve the economic condition of farmer in the region. It is need to concentrate on price policy of sugarcane in this region by the state government.

#### Authors' affiliations:

**K. J. PATIL AND N. V. SHENDE**, Department of Agricultural Economics and Statistics, College of Agriculture, NAGPUR (M.S.) INDIA

**P. V. SHENDE**, Agriculture Research Station (Dr. PDKV), CHANDRAPUR (M.S.) INDIA

#### LITERATURE CITED :

- Bhongle, D. B., Rupkumar, K. and Mahalle, Y. P. (1995). Resource use efficiency in sugarcane production. *Maharashtra J. Agrilc. Econ.*, **7** (1) : 39-45.
- Jawanjal, B. G., Naik, V. G., Talathi, J. M., Malave, D.B. and Wagale, S. A. (2014). Resource use efficiency in sugarcane production in Konkan region (M.S.). *Agric. Update*, **9**(4): 556-570.
- Lahoti, S.R., Chole, R.R. and Rathi, N. R. (2010). Constraints in adoption of sugarcane production technology. *Agric. Sci. Digest*, **30** (4) : 270-272.
- Nagpure, S. C., Thakare, A. B., Khandare, A. P. and Patil, R. K. (2004). Economics of sugarcane production in Vidarbha region of Maharashtra State. *Rural India*, **67** (6-7) : 123-125.
- Patil S. R. (2015). Cost benefits analysis of sugarcane cultivation of Walwatahsil. *Indian Stream Res. J.*, **5** (3) : 1-6.
- Prakash, K. and Muniyandi, B. (2014). An economic analysis of sugarcane cultivation in Madurai district of Tamil Nadu. *Agric. Situ. India*, **71** (7) : 7-16.
- Singh, S., Dutt, T. and Satyapriya (2013). Adoption gaps and constraints analysis of sugarcane cultivation in Bulandshahr district of Uttar Pradesh. *Progress. Res.*, **8**: 109-111.
- Singh, Teshukumar H.L., Jawala, Subhash Kumar and Sachan, Sharad (2014). Cost and returns of sugarcane production at different size groups of farms in district Meerut. (U. P.), India. *Annl. Agri-Bio Res.*, **19** (3) : 561- 565.