

## Structural Change in Cost of Cultivation in Sugarcane Crop in Maharashtra State: Reality from Cost of Cultivation Data

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**ABSTRACT:** Research was conducted mainly to know the changes in; level of inputs use, price of inputs, cost of input use, share of input cost, cost of cultivation and profitability of sugarcane cultivation in Maharashtra state. Secondary time series data collected from State Agriculture Price Commission cell for the year 1980-81 to 2009-10 were analysed. Results revealed that, input use pattern has changed significantly. Human labour gets substituted for machine labour and use of sugarcane sets was increased with the development of new planting methods. Cost share of nutrient has reduced in total cost of cultivation and cost share of female, bullock and machine labour were increased. Prices of all inputs were increased over a period. The cost of cultivation was increased five times more than base year, mainly because of increase in the prices of critical inputs. Many years farmers have not earned even normal profit by cultivating sugarcane when output was valued over support price.

**Key words:** Sugarcane, Cost of cultivation, Cost share, Structural Change.

### INTRODUCTION

Structural changes in costs are due to changes in the quantity and quality of inputs associated with the technological progress and also due to their prices (Gurjar and Varghese, 2005). Scientists have reported that, there was increase in fixed cost, over capitalisation of farm operations due to increase in the prices of inputs, decrease in subsidies which has ultimately increased the cost of cultivation of major crops. (Kalamkar, 2003) Recent evidence showed that, farmers are not able to recover the cost of their production even in the irrigated crops like paddy and sugarcane crops. They reported that, this is not because of low yield but due to increase in cost of production. (Narayanamoorthy, 2006; Narayanamoorthy, 2007; Narayanamoorthy, 2012; Narayanamoorthy, 2013). Such phenomenon should be tested over period of time using temporal data on cost and returns. Cost of cultivation data available in various state government price policy reports are the good source, as it contains the rich information. (see; Rao, 2001; Sen and Bhatia, 2004). Hence an attempt was made to analyse temporal cost and return pattern regarding important cash crop of state i.e. sugarcane with

objective to examine the changes in cost of cultivation of sugarcane crops in the state.

### DATABASE AND METHODOLOGY

The study was based on state level estimates of cost of cultivation of Sugarcane crops in Maharashtra State. The cost of cultivation data for the period from year 1980-81 to 2010-11 were compiled from various reports of state agriculture price commission cell (APC Cell), Department of Agriculture and Cooperation, Mumbai. Simple tabular analysis was done to analyse the structural changes in the cost of cultivation of Sugarcane crops. Cost structure was analysed by working out the share of input cost in the total cost of cultivation. The changes in the structure of cost of cultivation were assessed by comparing the cost structure. The input use change, hike in prices of input, increase in cost of input use, rise of cost of cultivation and profitability of Sugarcane cultivation were estimated for different period of time. The tri annum ending period 1984-85 was considered as base period and TE 1989-90; TE 1994-95; TE 1999-00; TE 2004-05 and TE 2009-10 were preferred time period for analysis. The valuation of main product was made

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using the support price announced by government of India and profitability was worked over Cost-A, Cost-B and Cost-C out by subtracting respective cost from Value of Product. The major input i.e hired male labour, hired female labour, bullock labour, machine labour, seed, manures, nitrogen, phosphorous and potash were critically analysed.

## RESULTS AND DISCUSSIONS

The sugarcane is most important cash crop in the state. It is mostly cultivated in western region of Maharashtra where irrigation is not at all constraint for the farmers. In recent time many farmers' organisations are debating that, cost of cultivation of the crop was increased mainly because of increase in price of input. This observation was analysed for long term and results were reported under.

### Input Use

Changes in level of input use in sugarcane cultivation over the year in Maharashtra were presented in Table 1. The important input used in cultivation of

sugarcane were male labour, female labour, bullock labour, sugarcane sets, manures, nitrogen, phosphorous and potash. The use of male and female labour was reduced over the year. The use of bullock labour was slightly increased i.e 34 per cent over the base year 1984-85. During recent period of study i.e TE 2004-05 and TE 2009-10, farmers have substituted machine labour for human labour, so the use of human labour, both male and female labour has reduced. The use of sugarcane sets (i.e Planting material) was increased (i.e 68 per cent over the base year), this may be because of intensifying cultivation of sugarcane and development of new planting methods i.e paired row planting. The use of manures was reduced by farmers; this may possibly because of its availability and prices of manures. Among primary nutrient, use of nitrogen and potash was reduced and use of phosphorous was increased.

### Input Prices

Table 2 shows prices of important input, which were used in cultivation of sugarcane crop. The per day

**Table 1**  
Change in level of input use in sugarcane cultivation in Maharashtra state

Year	Male Labour	Female Labour	Bullock Labour	Machine Labour	Seed	Manures	Nitrogen	Phosphorous	Potash
Unit	Days/ha	Days/ha	Pair days/ha	Hours /ha	Kg/ha	Qtls/ha	Kg/ha	Kg/ha	Kg/ha
TE1984-85	235.61	100.90	17.71	--	--	68.47	260.20	85.41	69.63
Base Year	100	100	100	--	--	100	100	100	100
TE1989-90	137.15	81.34	13.85	--	4575	19.35	292.68	104.47	78.23
% change over base	58	81	78	--	100	28	112	122	112
TE1994-95	93.01	70.18	13.77	--	4876	13.29	258.55	112.73	73.72
% change over base	39	70	78	--	107	19	99	132	106
TE1999-00	83.12	63.97	14.78	--	7266	18.58	252.37	112.54	69.87
% change over base	35	63	83	--	159	27	97	132	100
TE2004-05	90.81	82.67	17.64	24.68	7279	38.98	216.45	110.00	72.56
% change over base	39	82	100	--	159	57	83	129	104
TE2009-10	99.78	84.50	24.09	8.39	7694	54.68	197.61	126.72	36.35
% change over base	42	84	136	--	168	80	76	148	52

**Table 2**  
Prices of important inputs used in sugarcane cultivation in Maharashtra state

Year	Male Labour	Female Labour	Bullock Labour	Machine Labour	Seed	Manures	Nitrogen	Phosphorous	Potash
Unit	Days/ha	Days/ha	Pair days/ha	Hours /ha	Kg/ha	Qtls/ha	Kg/ha	Kg/ha	Kg/ha
TTE1984-85	9.13	6.38	29.59	--	--	10.38	4.82	6.92	2.05
Base Year	100	100	100	--	--	100	100	100	100
TE1989-90	13.38	11.98	39.14	--	0.49	36.27	5.11	7.21	2.16
% change over base	147	188	132	--	100	349	106	104	105
TE1994-95	22.88	17.60	57.31	--	0.53	60.07	6.11	13.44	6.27
% change over base	251	276	194	--	109	579	127	194	306
TE1999-00	38.54	32.33	87.92	--	0.95	92.18	8.20	14.93	6.16
% change over base	422	507	297	--	194	888	170	216	300
TE2004-05	58.16	47.33	155.35	66.31	1.11	101.01	11.81	17.51	7.42
% change over base	637	742	525	--	227	973	245	253	361
TE2009-10	155.21	93.05	296.02	267.23	1.68	126.36	14.42	22.91	9.79
% change over base	1701	1458	1000	--	342	1217	299	331	477

**Table 3**  
**Cost of inputs used in sugarcane cultivation in Maharashtra state**

<i>Year</i>	<i>Male Labour</i>	<i>Female Labour</i>	<i>Bullock Labour</i>	<i>Machine Labour</i>	<i>Seed</i>	<i>Manures</i>	<i>Nitrogen</i>	<i>Phosphorous</i>	<i>Potash</i>
<i>Unit</i>	<i>Days/ha</i>	<i>Days/ha</i>	<i>Pair days/ha</i>	<i>Hours /ha</i>	<i>Kg/ha</i>	<i>Qtls/ha</i>	<i>Kg/ha</i>	<i>Kg/ha</i>	<i>Kg/ha</i>
<b>TE1984-85</b>	2150.33	644.08	524.04	104.70	2000.00	710.72	1253.29	591.32	142.97
Base Year	100	100	100	100	100	100	100	100	100
<b>TE1989-90</b>	1833.11	978.70	560.39	168.55	2028.56	700.75	1495.60	753.23	168.97
% change over base	85	152	107	161	101	99	119	127	118
<b>TE1994-95</b>	2080.18	1207.81	806.06	257.32	2570.04	764.51	1696.64	1565.12	443.68
% change over base	97	188	154	246	129	108	135	265	310
<b>TE1999-00</b>	3193.27	2062.76	1296.71	600.40	6911.65	1722.86	2072.44	1680.22	430.38
% change over base	149	320	247	573	346	242	165	284	301
<b>TE2004-05</b>	5323.20	3916.16	2968.23	1370.86	8095.81	2649.97	2519.86	1921.42	531.60
% change over base	248	608	566	1309	405	373	201	325	372
<b>TE2009-10</b>	15843.83	8729.58	6913.86	2320.31	12904.12	7345.52	2860.81	2899.98	339.83
% change over base	737	1355	1319	2216	645	1034	228	490	238

**Table 4**  
**Share of inputs cost in total cost of sugarcane cultivation in Maharashtra state**

<i>Year</i>	<i>Male Labour</i>	<i>Female Labour</i>	<i>Bullock Labour</i>	<i>Machine Labour</i>	<i>Seed</i>	<i>Manures</i>	<i>Nitrogen</i>	<i>Phosphorous</i>	<i>Potash</i>	<i>All</i>
<b>TE1984-85</b>	9.17	2.75	2.23	0.45	8.53	3.03	5.34	2.52	0.61	34.63
Base Year	100	100	100	100	100	100	100	100	100	100
<b>TE1989-90</b>	8.31	4.43	2.54	0.76	9.19	3.17	6.78	3.41	0.77	39.36
% change over base	91	161	114	169	108	105	127	135	126	114
<b>TE1994-95</b>	6.71	3.90	2.60	0.83	8.29	2.47	5.47	5.05	1.43	36.76
% change over base	73	142	117	184	97	82	102	200	234	106
<b>TE1999-00</b>	8.91	5.76	3.62	1.68	19.29	4.81	5.78	4.69	1.20	55.73
% change over base	97	209	162	373	226	159	108	186	197	161
<b>TE2004-05</b>	9.22	6.78	5.14	2.37	14.02	4.59	4.36	3.33	0.92	50.74
% change over base	101	247	230	527	164	151	82	132	151	147
<b>TE2009-10</b>	14.02	7.73	6.12	2.05	11.42	6.50	2.53	2.57	0.30	53.24
% change over base	153	281	274	456	134	215	47	102	49	154

wage rate for male labour, female labour and bullock pair was Rs. 9.13, 6.38 and 29.59 per day during TE 1984-85, which was now Rs. 155.21, 93.05 and 296.02 per day during TE 2009-10, respectively. Maximum hike in wage rate was observed in male labour followed by female labour and bullock labour. The rate of increase in wage was very sharp after TE 1999-00. Among nutrient group, prices of manures was increased utmost, this may be because of limited availability of manures in the region. The price of potash fertilizer was increased at a very high speed compared to phosphorous and nitrogen fertilizers. Price of sugarcane sets was increased least among all the input after nitrogen fertilizers.

### Cost of Input Use

Cost of input use in sugarcane cultivation presented in Table 3 revealed that, inputs become too costlier than before. Cost of input use was increased in all cases, but maximum increase was recorded in female labour followed by bullock labour, manures and male

labour. Least increase in cost was recorded in nitrogen use followed by potash and sugarcane sets. The raise in cost of input use was primarily because of increase in price of input especially for male labour, female labour, manures, nitrogen and potash. In case of bullock labour, sugarcane set and phosphorous, cost of input use was because farmers have increased use of these inputs and market prices of these inputs were increased also.

### Share of Inputs Cost

Share of inputs cost in total cost of sugarcane was showed in Table 4. The share of inputs cost was increased during study period in total cost of cultivation specially for male labour, female labour, bullock labour, machine labour, sugarcane sets, manures and phosphorous. Only share of nitrogen and potash was decreased in total cost of cultivation during TE 2009-10 compared to base year. The contribution of male labour in total cost of cultivation was 9.17 per cent during TE 1984-85. It was gradually

**Table 5**  
**Cost of cultivation and profitability of sugarcane crop in Maharashtra state**

Year	Cost-A	Cost-B	Cost-C	Yield	Price	Cost-A	Cost-B	Cost-C
Unit	Rs./ha	Rs./ha	Rs./ha	qtls/ha	Rs./qtls	Rs./ha	Rs./ha	Rs./ha
<b>TE1984-85</b>	14947 (63.74)	20720 (88.36)	23450	858	14	-2935	-8708	-11438
Base Year	100	100	100	100	100	100.00	100.00	100.00
<b>TE1989-90</b>	13256 (60.06)	19197 (86.98)	22071	776	20	2264	-3677	-6551
% change over base	89	93	94	90	147	-77.14	42.23	57.27
<b>TE1994-95</b>	17423 (56.22)	26818 (86.53)	30992	794	35	10367	972	-3202
% change over base	117	129	132	93	257	-353.22	-11.16	27.99
<b>TE1999-00</b>	28615 (79.86)	32065 (89.49)	35832	746	52	10177	6727	2960
% change over base	191	203	153	87	388	-346.75	-77.25	-25.88
<b>TE2004-05</b>	39729 (68.81)	49955 (86.52)	57735	741	71	12882	2656	-5124
% change over base	266	241	246	86	527	-438.91	-30.50	44.80
<b>TE2009-10</b>	75155 (66.51)	100676 (89.10)	112997	796	97	2057	-23464	-35785
% change over base	503	486	482	93	721	-70.09	269.45	312.86

Note: Figures in the parenthesis are contribution of Cost-'A' and 'B' expressed in per cent in overall cost of cultivation.

decreased and reached to 6.71 per cent during TE 1994-5 but after that it was again increased continuously and now it was 14.02 per cent during TE 2009-10. Share of female labour and bullock labour was 2.75 and 2.23 per cent during TE 1984-85, respectively. Its contribution was linearly increased and reached to 7.73 and 6.12 per cent during TE 2009-10, respectively. The role of machine labour was negligible during initial year but at this moment, it contributes 2.05 per cent to the total cost of cultivation. The cost share of sugarcane sets and manures were increased over the years and reached to 11.42 per cent and 6.50 per cent of total cost of cultivation during TE 2009-10. The cost share of phosphorous was initially increased up to TE 1994-95 and then after it was decreased and reached to 2.57 per cent. Kalamkar, 2011 also reported that, machine labour, human labour, bullock labour and planting material were the major cost item in sugarcane cultivation.

### Cost of Cultivation and Profitability

The cost of cultivation and profitability of sugarcane cultivation were presented in Table 5 revealed that, cost 'A', cost 'B' and cost 'C' was increased around five time higher than its base year cost. During base year i.e TE 1984-85, cost 'A', cost 'B' and cost 'C' was Rs. 14947, Rs. 20720 and Rs. 23450 per ha., which was increased to Rs. 75155, Rs. 100676 and Rs. 112997 per ha., respectively. The productivity of sugarcane was stagnated around 800 qtls per ha. The support price

of the crop was increased consistently over the period. It was Rs. 14 per quintal during TE 1984-85, rose to Rs. 97 per quintal during TE 2009-10. Around 721 per cent increase was recorded in support price. The gross returns from crop was estimated by multiplying main produce to the support price announced by the government and profitability were estimated over cost 'A', cost 'B' and cost 'C'. The profitability figures given in table 06 revealed that, cultivation of sugarcane crop was not at all profitable over cost 'C'. It means that, farmers have not earned super normal profit from cultivation of this crop. The profitability over cost 'B' was negative during TE 1984-85 and TE 1989-90. It has recorded positive net returns during TE 1994-95, TE 1999-00 and TE 2004-05 means that, during this period farmers have recovered both direct and indirect cost. This crop has recorded profitability over cost 'A' during all period of time.

### CONCLUSIONS

With the passes of time, the inputs requirement of the sugarcane crop has changed significantly and it has also reflected in input use pattern. Human labour gets substituted for machine labour and use of sugarcane sets was increased with the development of new planting methods. Prices of all inputs were increased but more increase was observed in wages of male labour. The share of female labour cost, bullock labour cost, machine labour cost *etc.* in total cost of cultivation was increased over period of time, where as share of nutrient i.e nitrogen, phosphorous and potash was

decreased. The cost of cultivation was increased mainly because of increase in the prices of critical inputs. The farmers have never earned super normal profit from cultivation of sugarcane crop.

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