Profit Ratio of Sugarcane Cultivation in India: A State Level Analysis

P. Padmavathi

Assistant Professor and Head, Department of Economics, Vidhyaa Giri College of Arts and Science, Puduvayal, Tamil Nadu, India.

ABSTRACT

This paper analyses the ratio of profitability over cost A2 and cost C2of sugarcane cultivation by using state-wise data covering the period of 1970-71 and 2016-17. The study has utilized the cost of cultivation survey data from various reports of Commission for Agricultural Costs and Prices (CACP) across the states in India. After the empirical testing of the data among seven major sugarcane cultivating states, there are only four states selected for the study namely Karnataka, Tamil Nadu, Uttar Pradesh and Maharashtra. The states have been divided into two distinct categories, viz. Larger Area Higher Productivity (LAHP) states and Larger Area Lower Productivity (LALP) states. Karnataka and Tamil Nadu have been chosen for larger area higher productivity states whereas Uttar Pradesh and Maharashtra were selected for larger area lower productivity states in India. The results of the study has shown that profit over cost A2and cost C2 are found to be positively high in Tamil Nadu, which is followed by Karnataka and Uttar Pradesh except Maharashtra state from 1970-71 to 2016-17.Further, the study reveals the ratio of costC2 to A2 is high in Uttar Pradesh as compared to compared to other states selected for the analysis. Finally, it has also found that the ratio of profit C2 to A2 is high in Karnataka state which is followed by Tamil Nadu, Uttar Pradesh except Maharashtra state for the entire period of the analysis.

Keywords: Cost of cultivation, Farm profitability, Profit ratio, Larger area higher productivity, Larger area lower productivity states.

Introduction

Sugarcane is one of the important commercial crops in the agricultural society of India. Among the major sugarcane producing countries of the world, India ranks second particularly in area and production. At present, it is cultivated in 4.44 million hectares with annual production of 306 million tonnes during 2016-17(GoI, 2018). Due to green revolution, production of agricultural commodities has mainly increased which led to reduction in the incidence of rural poverty about 28.11 per cent during 1972-73 and 2004-05(Ahluwalia, 1978). While major reason for increased indebtedness of the farmers were considered to be inconsistency and deficiency in income and at the same time farmers may not able to repay the debts on time (Darling, 1925; NSSO, 2005). Some of the studies have examined various causes for increased indebtedness of the farmers and also have found that decline in productivity of crops, imperfect market conditions and inadequate supply of institutional credit. Moreover, the studies stated that the major reasons for farmers suicides are stagnation in real income and rapid increase in input prices (Deshpande and Arora, 2010, Mahendra Dev and Rao, 2010). The study states that one time support programme would not be solved the

farmers' problem and especially who need enhanced income from cultivation of crops (Vaidyanathan, 2008). In view of these, there is a need to find out whether or not the sugarcane crop has been profitable to the farmers over the years. In order to answer this question, profitability related data on the sugarcane crop have been used from the cost of

Dr. P. Padmavathi, Assistant Professor and Head, Department of Economics, Vidhyaa Giri College of Arts and Science, Puduvayal, Tamil Nadu, India.

cultivation survey covering the period from 1970-71 to 2016-17. Besides analyzing the profitability of sugarcane crop across all major growing states, the present study attempts to find out the economics as well as the profitability and ratio of profit over cost A2 and cost C2 of sugarcane cultivation in Larger Area Higher Productivity (LAHP) states and Larger Area Lower Productivity (LALP) states during 1970-71 and 2016-17. Progressing further with the profitability of sugarcane crop, the study has taken a five-year interval from 1970-71 to 2016-17 (see, Table 1). The major objectives of the study are classified into three categories.

a) To analyze the profitability of sugarcane cultivation over cost A2 and cost C2 in relation to productivity during 1970-71 and 2016-17.

b) To evaluate the ratio of cost C2 to cost A2 of sugarcane crop from 1970-71 to 2016-17.

c) To find out the ratio of profit C2 to cost A2 in sugarcane cultivation during 1970-71 and 2016-17.

Methodology

The study was mainly carried out by using secondary data from Commission for Agricultural Costs and Prices covering the period of 1970-71 to 2016-17. In order to study the profitability of sugarcane crop, all the cost and income related data specifically on sugarcane cultivation has been compiled from CACP's publication on *Report on Price Policy for Sugarcane* of various years. First of all, totally seven major sugarcane cultivating states are taken for the study namely Andhra Pradesh, Haryana, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh and Uttarakhand in India. After the systematic analysis of the data, only four major sugarcane cultivating States has been selected for the study namely Karnataka, Tamil Nadu, Uttar Pradesh and Maharashtra state from 1970-71 to 2016-17. For larger area higher productivity states (LAHP), Karnataka and Tamil Nadu have been chosen for the study. Likewise, Uttar Pradesh and Maharashtra were selected for larger area lower productivity states (LALP) to the analysis. In order to find out whether the profitability of sugarcane crop cultivated under larger area higher productivity is in any way better than cultivated under larger area lower productivity conditions. The CACP uses different cost concepts (A1, A2, A2+FL, B1, B2, C1, C2, C2* and C3) for estimating costs and returns.

Among the different cost concepts, the present study has utilized only the cost A2 and cost C2 to find out the variations in profitability in relation to productivity of sugarcane cultivation. In order to see how the costs and returns have changed in real terms, the cost A2 and cost C2 were deflated by the consumer price index for agricultural labourers (CPIAL) with 1986-87 base. The profit was computed as gross value of output minus cost A2 and cost C2. Therefore, the major objective of the study is to find out the real change in profitability in relation to productivity in India. Therefore, it is important to study the issue of profitability in sugarcane crop in an in-depth manner using larger coverage of data to find out whether farmers reap any profit from crop cultivation. Issue of profitability by using temporal data only on sugarcane cultivation has studied by Dev and Rao (2010). Except this study, there are

no studies available by using cost of cultivation data covering sugarcane crop for the longer period with a specific focus on profitability in relation to productivity in India during 1970-71 and 2016-17. Particularly, sugarcane cultivating farmers have been facing reduction in productivity and also inadequate institutional credit supply. Keeping this in view, an attempt

Table 1: Profitability of Sugarcane Cultivated in LAHP (Tamil Nadu/Karnataka) and LALP States (Uttar Pradesh/Maharashtra) States, 1970-71 to 2016-17. (Rs/ha at 1986-87 prices)

States	Costs	1970-71	1975-76	1980-81	1985-86	1990-91	1995—96	2000-01	2005-06	2010-11	2015-16	2016-17
Karnataka (LAHP)	Cost A2	NA	NA	7873	4389	5323	6341	8768	11227	6412	6403	7079
	Cost C2	NA	NA	13081	10153	10438	13241	15267	20191	15297	12300	15472
	VOP	NA	NA	19104	24318	19951	24263	20704	33413	30559	15463	26026
	Profit A2	NA	NA	11231	19929	14628	17922	11936	22186	24147	9060	18947
	Profit C2	NA	NA	6023	14165	9513	11022	5437	13222	15262	3162	10553
	Ratio of Cost C2 to A2	NA	NA	1.66	2.31	1.96	2.09	1.74	1.80	2.38	1.92	2.19
	Ratio of Profit C2 to A2	NA	NA	0.53	0.71	0.65	0.61	0.45	0.60	0.63	0.60	0.56
Tamil Nadu (LAHP)	Cost A2	NA	NA	9582	7812	8676	9214	12600	12974	13199	14017	12986
	Cost C2	NA	NA	13535	12008	17459	15740	20801	21098	20046	21190	20619
	VOP	NA	NA	21878	19416	28108	29912	28879	28306	33856	30294	27625
	Profit A2	NA	NA	12296	11604	19432	20698	16249	15332	20657	16277	14640
	Profit C2	NA	NA	8343	7408	10649	14172	8078	7208	13810	9103	7006
	Ratio of Cost C2 to A2	NA	NA	1.41	1.53	2.01	1.71	1.65	1.63	1.51	1.51	1.59
	Ratio of Profit C2 to A2	NA	NA	0.67	0.63	0.54	0.68	0.49	0.47	0.66	0.56	0.48
Uttar Pradesh (LALP)	Cost A2	2597	2169	2629	2319	3346	3499	4035	4738	5049	5110	4400
	Cost C2	6048	4912	6587	5413	7811	9107	9326	11741	11844	12016	11318
	VOP	8774	6086	14485	10067	11855	11911	12479	18962	17859	18179	20712
	Profit A2	6177	3917	11856	7748	8509	8412	8444	14224	12810	13069	16312
	Profit C2	2726	1174	7898	4654	4044	2804	3153	7221	6015	6162	9394
	Ratio of Cost C2 to A2	2.32	2.26	2.50	2.33	2.33	2.60	2.31	2.48	2.34	2.35	2.57
	Ratio of Profit C2 to A2	0.44	0.30	0.66	0.60	0.47	0.33	0.37	0.51	0.46	0.47	0.58
Maharashtra (LALP)	Cost A2	7759	7465	11382	9319	8030	10613	10304	16646	13402	14078	10103
	Cost C2	12277	11071	16220	14115	12554	15301	15837	23982	22872	22805	17763
	VOP	21358	17390	23005	18076	15645	18030	14012	23163	31549	21910	22670
	Profit A2	13599	9925	11623	8757	7615	7417	3708	6517	18147	7832	12567
	Profit C2	9081	6319	6785	3961	3091	2729	-1825	-819	8677	-895	4907
	Ratio of Cost C2 to A2	1.58	1.48	1.42	1.51	1.56	1.44	1.53	1.44	1.70	1.62	1.76
	Ratio of Profit C2 to A2	0.66	0.64	0.58	0.45	0.40	0.37	0.49	-0.13	0.47	-0.11	0.39

Source: Computed using data from CACP (various years)

Note: Data not available for the year of 1970-71 to 1975-76; data from the nearest point used in the analysis owing to non-availability of data for some of the years.

is made to find out the profitability and also ratio of profit over cost A2 and cost C2 of sugarcane cultivation in four different states under conventional (flood) method of irrigation utilizing cost of cultivation data from 1970-71 to 2016-17.

Results, Analysis and Discussion

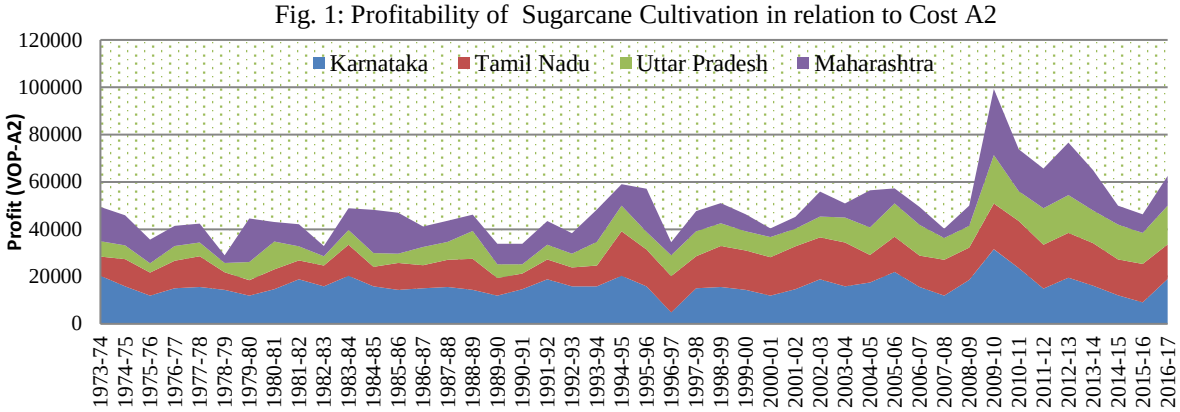
Sugarcane no doubt was considered to be the most productive and profitable crop over the years in the Indian farming system. It would be noted from Table 1 that change in profitability over cost A2 and cost C2 of sugarcane cultivation in LAHP and LALP states during 1970-71 and 2016-17. The profitability of sugarcane crop is observed to be extremely fluctuating in Karnataka state during 1970-71 and 2016-17. The cost A2 has decreased from Rs.7873/ha to Rs.7079/ha in Karnataka state during 1980-81 and 2016-17. At the same time, it reached maximum of about Rs. 11227/ha in 2005-06. The profit over cost A2 has risen from Rs.11231/ha to Rs. 19929/ha substantially because of increased value of output from Rs. 19104/ha to Rs. 24318/ha in Karnataka state in 1980-81 to 1985-86. And then it decreases to Rs.14628/ha in 1990-91 whereas the same reaches its peak of aboutRs.24147/ha during 2010-11. Similarly, the cost C2 has declined from Rs.13081/ha toRs.10438 from 1980-81 to 1990-91. During 1995-96 and 2005-06, it increases constantly from Rs.13241/ha to Rs.20191/ha respectively. It is found high about Rs. 20191/ha in2005-06. And then it starts to increase moderately from Rs.15297/ha to Rs. 15472/ha during 2010-11 and 2016-17.The profit over cost C2 in Karnataka state has found to be fluctuating throughout the period of analysis and profit reaped its hike about Rs. 15262/ha in 2010-11. It is noted that these profits are not at all increasing progressively all over the period of analysis (see, Acharya, 1992).

While comparing the profit over cost A2 in Karnataka state with their counterpart states was attained superior profit to the entire period of analysis which is mainly because of increase in value of output. A look at the entire period of analysis for Karnataka state from 1970-71 to 2016-17 reveals that the position of profitability of cost C2 has increased at decreasing rate during 1980-81 and 2000-01. Finally, it increases at decreasing rate from 2005-06 to 2010-11 because of increased value of output in sugarcane cultivation. The profit over cost C2 declined steeply at an increasing rate from Rs.3162/ha to Rs. 10553/ha during 2015-16 and 2016-17.The profitability over cost A2 and cost C2 of sugarcane cultivation are clearly presented in the Figures(1 &2) for the entire period of the analysis.

Besides analyzing the trends in profitability of sugarcane cultivation, we have examined the ratio of cost and profit C2 to A2 of the farmers from 1970-71 to 2016-17 in the four states considered for the analysis. Few studies have pointed out that the profitability of foodgrains and non-foodgrains crops have been showing a declining trend especially since early 1990s. And also it analyzed not only stagnancy in real income but also steep increase in input prices, the prices of the agricultural produce could be the significant reasons for farmers suicides (Narayanamoorthy, 2013). Hence, an attempt has been made to study the ratio of profitability in sugarcane cultivation during 1970-71 and 2016-17. It is an interesting fact that the Figures (3&4) depict the ratio of cost and profit C2 to A2 for different time periods for high and low productivity states of India. The study has shown that the efficient irrigation coverage is more significant than the farm input to achieve the desired profitability in sugarcane cultivating farmers in the future. While analyzing the ratio of cost C2 to A2, it is found high about Rs. 2.38 t/ha during 2010-11. However, it is stagnantly increased at a decreasing rate to entire period of the analysis. Similar to the above, the ratio of profit C2 to A2 is found to be higher about Rs. 0.71 t/ha during 1985-86. In conclusion, the sugarcane

farmers of fully irrigated LAHP state of Karnataka were able to reap substantial profits over cost A2 and cost C2 to the overall period of the analysis.

Fig. 1: Profitability of Sugarcane Cultivation in relation to Cost A2

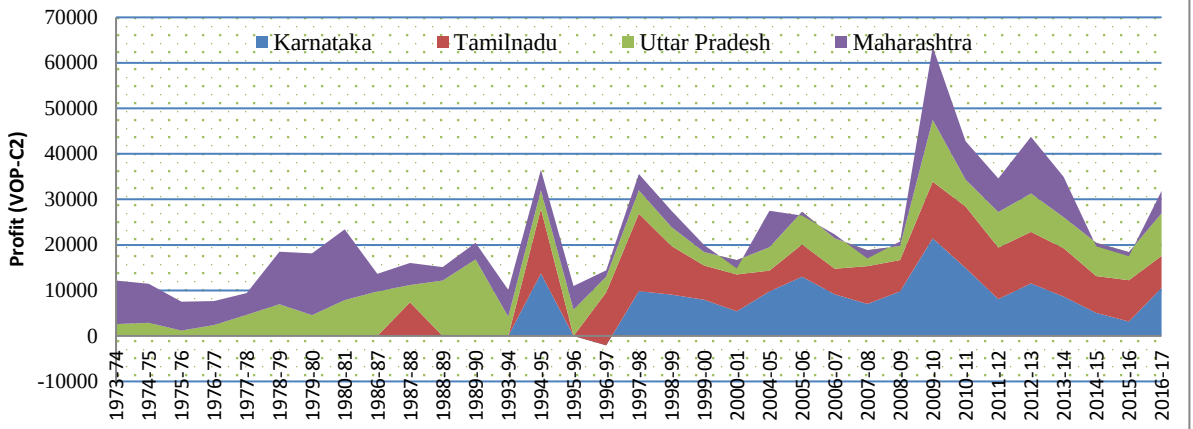


Similarly, Tamil Nadu is one of the highest states in productivity of sugarcane cultivation in India during 1970-71 and 2016-17. The cost A2 is increased from Rs. 9582/ha to Rs. 14017/ha which has shown an increasing trend to the entire period of the analysis. The value of output (VOP) is stagnantly risen at a decreasing rate about Rs. 21878/ha to Rs. 20619/ha during 1980-81 and 2016-17. While comparing the value of output for HALP states (Karnataka and Tamil Nadu), it is found to be high in Tamil Nadu state when compared to Karnataka state. Due to increase in value of output, profit over cost A2 increases from Rs. 12296/ha to Rs. 20698/ha during 1980-81 and 2010-11. It has attained highest profit about Rs. 20698/ha during 1995-96. It has also found to be stagnant to the entire period of analysis which is due to hike in value of output.

Finally, the profit over cost A2 decreases about Rs. 14640/ha in 2016-17. The cost C2 has shown an increasing trend to the entire period of the analysis which is high about Rs. 21190/ha in 2015-16.And then the profit over cost C2 in Tamil Nadu is high about Rs.14172/ha during 1995-96. The study has shown that the profit over cost A2 and C2 is stagnantly increased over the period of analysis. While comparing the value of output for HALP states (Karnataka and Tamil Nadu), it is found to be high in Tamil Nadu state when compared to Karnataka state. Further, the ratio of cost C2 to A2 is found to be high about Rs. 2.01/ha in 1990-91. Similarly, the ratio of profit C2 to A2 is high about Rs. 0.68/ha during 1995-96. However, the same is found low about Rs. 0.47/ha in 2005-06. The study has shown that the ratio of profit C2 to A2 which has only covered from Rs. 0.47/ha to Rs. 0.68/ha to the entire period of the analysis.

In order to understand the relationship between the cost A2 and cost C2, an attempt is made to analyze in brief. While comparing the profit over cost A2 and cost C2, the profit over cost A2 is always found to be high when compared to the profit over cost C2 throughout the period of analysis. This is due to the fact that cost A2 is only covered all actual expenses in cash and kind incurred in production by farmer (Cost A1) and rent paid for leased in land (cost A2). However, the cost C2 includes cost A2 with interest on value of owned fixed capital assets excluding land (cost B1), rental value of owned land (net of land revenue) and

Fig. 2: Profitability of Sugarcane Cultivation in relation to Cost C2



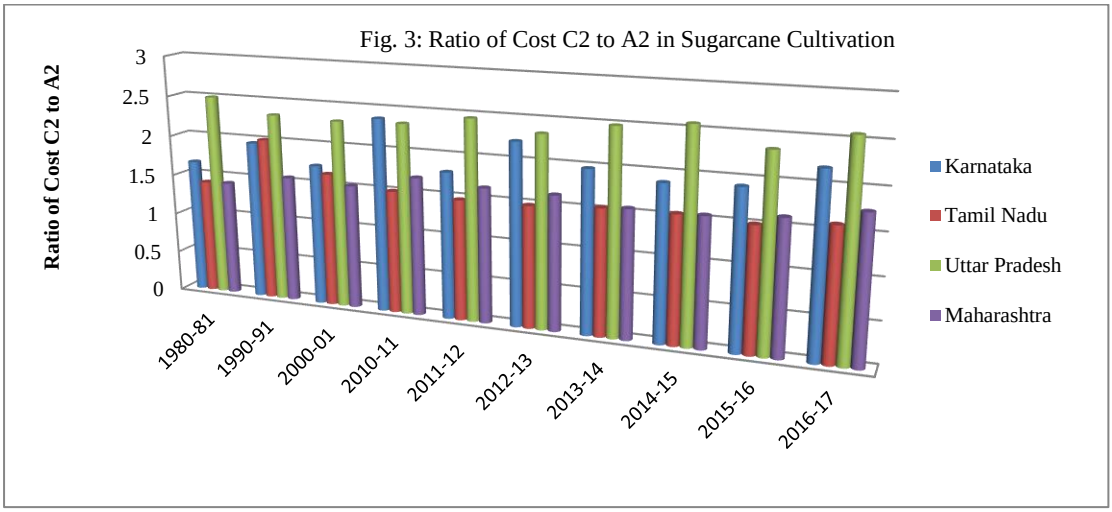
rent paid for leased-in-land (cost B2), imputed valued of family labour (cost C1) and imputed valued of family labour (cost B2). Cost C2* denotes cost C2 adjusted to take into account valuation of human labour at market rate or statutory minimum wage rate whichever is higher. Cost C3 denotes cost C2* with value of management input at 10 percent of total cost (C2*).The study has proved that human labour cost was found to be especially high in the following states namely Tamil Nadu,Karnataka, Maharashtra and Uttar Pradesh from 1973-74 to 2014-15 (Padmavathi and Narayanamoorthy, 2019).

Hence, the profit over cost C2 is found low when compared to the profit over cost A2 to overall period of the analysis. Whenever there is a crop loss due to natural disaster or calamities, monsoon failure and climatic change in India compensation is only paid on the basis of cost A2 to the farmers which is being covered few expenses in crops cultivation. Thus, the cost C2 is elaborately explained in detail. The remaining expenses except cost A2 are spend in hand by the farmers which make them to born in debt, live in debt and die in debt. It might be the cause for the farmers' suicides too. Recently, marginal and small farmers are worst affected due to monsoon failures and climate change and so on. In order to reduce the farmers' debt burden and also farmers' suicides in the country, the effect steps have to be taken by the Government. If the Government considers cost C2 for the farmers' compensation due to the above mentioned reasons, it would be good for the farmers' survival and also welfare. It not only protects the farmers' family but also the agriculture sector too which provides 43 percent employment opportunity to the total population of India. It also supplies raw-materials to the agro-based industries of the country. The study concludes that the imputed labour cost i.e., cost C2 has to be taken under consideration by Government for the evaluation of crop losses in future in order to safeguard the farmers of the country.

The analysis thus reveals that ratio of profitability in sugarcane cultivation in terms of cost A2 and cost C2 in Tamil Nadu state has widely fluctuated during 1970-71 to 2016-17. Uttar Pradesh and Maharashtra have been chosen for Larger Area Lower Productivity (LALP) states in India which is presented in the same Table 1. In Uttar Pradesh State, the cost A2 is stagnantly increased from Rs. 2597/ha to Rs. 2319/ha during 1970-71 and 1985-86. Further, it is consistently increased at a decreasing trend from Rs. 3346/ha to Rs. 4400/ha during the period of 1990-91 and 2016-17. Particularly, it is found to be high about Rs. 5110/ha in 2015-16. While analyzing the value of output (VOP) in Uttar Pradesh state, it has

also shown an increasing trend to the entire period of the analysis. It is found to be high about Rs. 18962/ha during 2005-06 whereas the same is low about Rs. 6086/ha in 1975-76.

Fig. 3: Ratio of Cost C2 to A2 in Sugarcane Cultivation



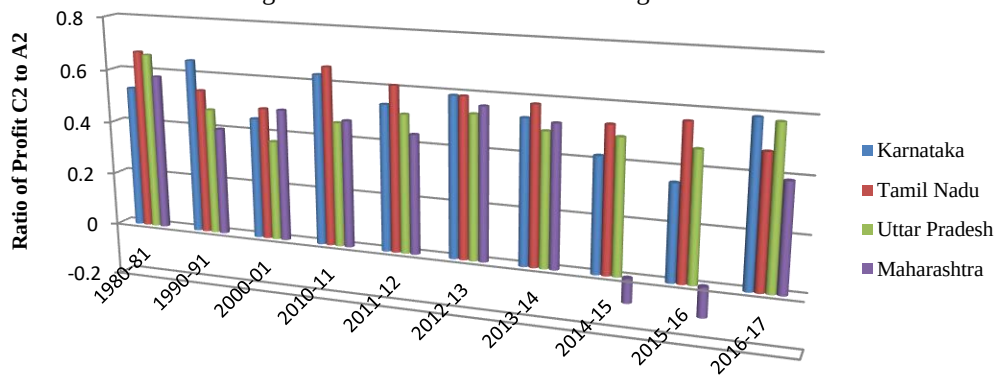
Moreover, the profit over cost A2 is decreased from Rs. 6177/ha to Rs. 3917/ha during 1970-71 and 1975-76. And it starts to increase at decrease rate about Rs. 7748/ha in 1985-86. Then it has found to be stagnant from Rs. 8509/ha to Rs. 8444/ha during 1990-91 to 2000-01. It is reaped peakedness of about Rs. 18962/ha during 2005-06 and it is declined at an increasing rate about Rs. 16312/ha in 2016-17.Similarly, the cost C2 of Uttar Pradesh state has stagnantly increased from Rs. 6048/ha in 1970-71 to Rs. 5413/ha in 1985-86. It is consistently increased at an increasing rate to the remaining periods of the study. Moreover, the profit over cost C2 is found to be stagnant throughout the period of analysis. It has reaped hike about Rs. 7898/ha during 1980-81. From 2005-06, it has shown substantially higher profit when compared to the previous periods of the study.

Furthermore, the ratio of cost C2 to A2 is high in Uttar Pradesh when compared to the remaining states considered for the study. It is mainly due to the fact that cost C2 is found to be high to the entire period of the analysis. Similar to the above, the ratio of profit C2 to A2 is also stagnant to overall period of the analysis. It has revealed that both the costs A2 and C2 is covered the profitability in between the ratio of about Rs. 0.30/ha to Rs. 0.66/ha throughout the period of the study. However, the study analyzed that Uttar Pradesh occupies one of the largest states in area and production of sugarcane cultivation but its productivity is comparatively lower than other states. An earlier study by Dhawan (1968) have noticeably mentioned largely irrigated sugarcane crop is only remunerative in Uttar Pradesh state. Finally, the study proved that the ratio of profit C2 to A2 is found to be low in Uttar Pradesh state when compared to Karnataka and Tamil Nadu states to the entire period of analysis.

Similarly to the above, in Maharashtra state, cost A2 is absolutely higher when compared to Uttar Pradesh state. It is stagnantly increased at a decreasing rate till the period of 1990-91. And then it reaps the peakedness of about Rs. 16646/ha during 2005-06. From 1995-96 to 2016-17, it is found to be increased tremendously but at a stagnant manner. Likewise, cost C2 is also high as compared to Uttar Pradesh state. It is increased at a decreasing rate from Rs. 12277/ha to Rs. 12554/ha during the period of 1970-71 to 1990-91. And then it is massively increased from Rs. 15301/ha to Rs. 23982/ha during 1995-96 and 2005-06. The value of output is found to be nearly doubled in Maharashtra state when compared to Uttar Pradesh state to the entire period of the analysis. The profit over cost A2 is

increased at decreasing rate from Rs. 13599/ha to Rs. 9925/ha during 1970-71 and 1975-76. Further, it increased about Rs. 11623/ha in 1980-81 and it starts to decrease consistently upto the period of 2000-01. It has reaped peakedness of about Rs. 18147/ha during 2010-11 and it declines about Rs. 12567/ha in 2016-17. But, the profit over cost C2 is reaped hike about Rs. 9081/ha in 1970-71. From 1985-86, it is tremendously decreased till it reaches a negative profit of about Rs. -1825/ha, Rs. -819/ha and Rs. -895/ha during 2000-01, 2005-06 and 2015-16. Recently, it is evaluated to be positive about Rs. 4907/ha in 2016-17.

Fig. 4: Ratio of Profit C2 to A2 in Sugarcane Cultivation



In Maharashtra state, cost A2 is absolutely higher than the cost C2 to the entire period of the analysis. The ratio of cost C2 to A2 has shown that the cost C2 is stagnantly fluctuated from Rs. 0.42/ha to 0.58/ha during 1970-71 and 2005-06. The remaining period of study only the cost C2 is found to be higher about Rs. 0.70/ha and Rs. 0.62/ha. Similarly, the ratio of profit C2 to A2 is found to be negative in Maharashtra state when compared to the others states. It is evaluated to be negative about Rs. -0.13/ha and Rs. -0.11/ha specifically in two periods of time during 2005-06 and 2015-16.While analyzing the profitability and ratio of profit over cost A2 and C2, it is especially found to be negative in Maharashtra state when compared to other states. The study has revealed that yield enhancing input cost and fixed cost were absolutely higher in Maharashtra state as compared to other selected states from 1973-74 and 2014-15. Likewise, human labour cost, Machine labour cost and bullock labour is also relatively higher in this state as compared to other states under study (Padmavathi and Narayanamoorthy,2019).

Table 2: Average of Cost A2, Cost C2 and VOP (1980-81 to 2016-17) for the Selected States

S. No.	Variable (Average)	States			
		Karnataka	Tamil Nadu	Uttar Pradesh	Maharashtra
1	Cost A2	7.31	11.81	3.76	12.35
2	Cost C2	14.22	18.46	10.13	19.33
3	VOP	23.38	28.11	16.22	22.83
4	Profit A2	16.07	16.30	12.46	10.48
5	Profit C2	9.16	9.65	6.09	3.50
6	Ratio of Cost C2 to A2	1.94	1.56	2.69	1.56
7	Ratio of Profit C2 to A2	0.57	0.59	0.48	0.33

Source: Computed using data from CACP (various years).

In this study, Profit is calculated by two methods (a) VOP – Cost A2 and (b) VOP – Cost C2. It is obvious that cost C2 is greater than cost A2. Hence, VOP in terms of cost C2 is always lesser than VOP in terms of cost A2. But, the proportions of cost A2 in total cost vary among the States selected for the study. The cost A2 is high in Maharashtra state, which is followed by Tamil Nadu state throughout the period of analysis. However, the same is found to be low in Uttar Pradesh state. Further, average profit over cost A2 is found high about Rs. 16.30/hain Tamil Nadu, followed by Karnataka state (Rs. 16.07/ha)to the entire period of analysis.This means that larger sums are spent on the market-based inputs in Tamil Nadu statebut the same isspent minimum of about in Uttar Pradesh state (see, Table 3). That means cost A2 has got direct impact on VOP. Moreover, average cost C2 is high about Rs. 19.33/ha in Maharashtra state which is followed by Tamil Nadu state (about Rs. 18.46/ha) during the study period. The ratio of cost C2 to A2 is high about Rs. 2.69/ha in Uttar Pradesh state as compared to other states during the study period. Whereas the same is found to be low about Rs. 1.56/ha in both states namely Tamil Nadu and Maharashtra states to the whole period of analysis. The average profit over cost C2 is high about Rs. 9.65/ha in Tamil Nadu which is followed by Karnataka state (Rs. 9.16/ha) to the entire period of analysis. But, the same is found to be low about Rs. 3.50/ha in Maharashtra state during the study period. The ratio of profit C2 to A2 is found to be high about Rs. 0.59/ha in Tamil Nadu state which is followed by Karnataka state (Rs. 0.57/ha) to the whole period of analysis. However, the same is low about Rs. 0.33/ha in Maharashtra state during the study period. Finally, the study found that cost A2 and VOP have got positive relationship and cost C2 and net VOP have got negative relationship (see, Table 1).

Table 3: The Percentage Share of Cost A2 in Total Cost C2 (1980-81 to 2016-17)

('000s in Rs/ha at 1986-87 prices)

S. No.	States	1980-81			2016-17		
		Cost A2	Cost C2	Cost A2/ Cost C2 (%)	Cost A2	Cost C2	Cost A2/ Cost C2 (%)
1	Karnataka	7873	13081	60.19	7079	15472	45.75
2	Tamil Nadu	9582	13535	70.79	12986	20619	62.98
3	Uttar Pradesh	2629	6587	39.91	4400	11318	38.88
4	Maharashtra	11382	16220	70.17	10103	17763	56.88

Source: Computed using data from CACP (various years).

Table 3 depicts the percentage share of cost A2 in total cost C2 during 1980-81 and 2016-17. In order to know the market based inputs contribution in total cost of cultivation, an attempt has been made to study among the selected states. The study shows that the market based inputs contribution is high in Tamil Nadu state which is followed by Maharashtra state s compared to others states. In terms of percentage, the variation is evaluated to be about 7.81 and 13.29 percent for Tamil Nadu and Maharashtra states respectively during 1980-81 and 2016-17. It has shown that input usage is reduced about 7.81 percent in Tamil Nadu to the entire period of analysis. But, in Maharashtra state, it is reduced at a higher degree about 13.29 percent during the study period. And then, the market based input usage in Karnataka state is about 60.19 percent in 1980-81 but the same is found to be about 45.75 percent, the variation is about 14.44 percent to the whole period of analysis. Among the states selected states, the study has shown that market based inputs usage is highly reduced about 14.44 percent in Karnakata state as compared to other states. Finally, in Uttar Pradesh state, market based input usage is found to be low from 39.91 to 38.88 percent, variation is about 1.03 percent during the period of study. In conclusion, the study reveals that market based inputs

usage is found to be high in Tamil Nadu state in absolute terms as compared to other states and the same is low in Uttar Pradesh state to the entire period of analysis.

Conclusion and Policy Implication

The present study has been conducted with the prime objective to analyze the status of profitability and ratio of profit over cost A2 and cost C2of sugarcane cultivation using the data of four major sugarcane cultivating states in India from 1970-71 to 2016-17. India is the second largest producer of sugarcane crop in the world but the state namely Maharashtra have confronted losses in the analysis. Although evaluating profitability over cost A2 in sugarcane cultivation was found positive to the states such as Karnataka, Tamil Nadu, Uttar Pradesh and Maharashtra to the entire period of the analysis. However, the profitability over cost C2isfound to be positive to the states like Karnataka, Tamil Nadu and Uttar Pradesh except Maharashtra state. The study not only analyzed profitability of sugarcane cultivation but also examined the ratio of cost C2 to A2 throughout the period of analysis. Finally, the study has revealed that ratio of profitC2 to A2 is negative in Maharashtra state as compared to other states selected for the analysis.

Hence, sugarcane is cash crop and farmers have to wait for the whole year to attain a remunerative price. If there are arrears in it, the sugarcane farmers have no option but to cultivate alternative crops. Recently, in Uttar Pradesh state, sugarcane arrears are found high as compared to other states in India. The profitability analysis of sugarcane crop clearly proves the fact that the sugarcane cultivated under conventional method of irrigation is not much remunerative (profitable) to the farmers, especially in larger area low productivity (LALP) states namely Uttar Pradesh and Maharashtra always rising cost due to human labour cost, farm inputs (yield enhancing input cost) and fixed cost which in turn escalating the overall cost of cultivation is found to be an another significant reason. At present, the compensation is paid to the farmers on the basis of cost A2 instead of cost C2 or cost C3 for the crop losses due to monsoon failures, climatic change and natural disasters. If it is paid on the basis of cost C2 or cost C3, it would be not only beneficial but also useful to the farmers in order to overcome from those above mentioned unavoidable circumstances in the agriculture sector. It protects the farmers' from suicides as well as debt problem. And then the states which suffer the most due to loss have to be identified and those states which are given prior attention by the policy interventionists of the Centre/State Government. Therefore, appropriate policy measures are to be taken by the Government which should be framed and also implemented to identify the suitability of sugarcane crop in order to increase its productivity and profitability in overall states of India. Some of the field level studies have proved that drip method of irrigation (DMI) can not only enhance the productivity and profitability of sugarcane but also reduced the total cost of cultivation in operations like irrigation, ploughing and preparatory works, seed and seed sowing, fertilizers, weeding and interculture (Narayanamoorthy, 1997 and 2005). The central and state agencies need to take rigorous efforts to popularize the methods of DMI and SSI (Sustainable Sugarcane Initiative) among the sugarcane cultivating farmers in order to reduce cost so as to enhance productivity of sugarcane and also farm income.

REFERENCES

Acharya, S. (1992), "Rate of Return in Indian Agriculture", *Economic and Political Weekly*, Vol. 27, No. 3, pp. 111-119.

Ahluwalia, M.S. (1978), "Rural Poverty and Agricultural Performance in India", *Journal of Development Studies,* Vol.14, No.2, pp.298-323.

CACP(various years), *Report of the Commission for Agricultural Costs and Prices,* Ministry of Agriculture, Government of India, New Delhi.

Darling, M.L. (1925), *The Punjab Peasant in Prosperity and Debt*, Oxford University Press, New Delhi.

Deshpande, R.S. and S.Arora(2010), *Agrarian Crisis and Farmer Suicides*, Sage Publications, New Delhi.

Dev, M.S. and A. Ranade (1998), "Raising Food Prices and Rural Poverty: Going Beyond Correlations",*Economic and Political Weekly*, Vol. 33, No. 39, pp. 2529-2536.

Dhawan,B.D. (1968), "Comparative Advantage of UP in Sugarcane",*Economic and Political Weekly*, Vol. 3, No. 44, pp. 1697-1698.

GoI(2018),*Agricultural Statistics at a Glance: 2018*, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.

Dev, M.S. and N.C. Rao (2010),"Agricultural Price Policy, Farm Profitability and Food Security", *Economic and Political Weekly*, Vol. 45, Nos. 26 & 27, pp.174-182.

Narayanamoorthy, A. (1997), "Drip Irrigation: A Viable Option for Future Irrigation Development", *Productivity,* Vol. 38, No. 3, pp. 504-511.

Narayanamoorthy, A.and R.S. Deshpande (2003),"Irrigation Development and Agricultural Wages: An Analysis Across States", *Economic and Political Weekly,* Vol.38, No. 35, pp. 3716-3722.

Narayanamoorthy, A.(2005), "Economics of Drip Irrigation in Sugarcane Cultivation: Case Study of a Farmer from Tamil Nadu", *Indian Journal of Agricultural Economics,* Vol. 60, No. 2, pp. 235-248.

Narayanamoorthy, A. (2013), "Profitability in Crops Cultivation in India: Some Evidence from Cost of Cultivation Survey Data", *Indian Journal of Agricultural Economics,* Vol. 68, No. 1, pp. 104-121.

NSSO (2005), *Situation Assessment Survey of Farmers: Indebtedness of Farmer Households,* ReportNo. 498, 59th Round (January-December, 2003), National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

Padmavathi. P and A. Narayanamoorthy (2019), “Productivity and Profitability Relationship in Sugarcane Cultivation: A State Level Analysis”, *Productivity*, Vol. 59, No. 4, pp.366-373.

Saleth, R.M.; S.D.Molden and I. Hussain (2003), "Water, Poverty and Gender: A Review of Issues and Policies", *Water Policy*, Vol. 5, Nos. 5&6, pp. 385-98.

Vaidyanathan, A. (2008), “Farm Loan Waiver: A Closer Look and Critique”, *The Hindu*, March 6, p. 11.