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## Costs, returns and profitability of sugarcane with drip and surface irrigation in Pune district

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### Abstract

Present study was designed to measure input use cost, return and profitability in sugarcane production of Pune district of Maharashtra state. In present investigation the sample of 64 sugarcane growers were selected from study area which input-output data collected based on *annual* cropping season in the year 2015-16. Use of nitrogen, phosphorous and potash was 315.33 kg, 145.04 kg and 144.77 kg on surface sugarcane farms, respectively. While use of nitrogen, phosphorous and potash was 194.81 kg, 90.52 kg and 90.40 kg, respectively on drip sugarcane farms. Use of irrigation was higher as 11620.24 cubic meters in surface sugarcane farm while that was 6553.68 cubic meters in drip sugarcane farm. Cost-C was highest Rs. 193177.47 on drip farm followed that of Rs. 164498.02 on surface farm. Returns from main produce were higher Rs. 360888.00 in drip sugarcane farm as compared with Rs. 242924.00 on surface sugarcane farm. The returns from by produce were higher Rs. 15402.00 in drip farms as compared with Rs. 11764.00 in surface sugarcane farms. Output-input ratio was higher as 1.95 on drip sugarcane farms than that of 1.55 on surface sugarcane farms, because production was greater on drip irrigation farm as compared to surface irrigation farm. Per tonne cost of sugarcane production was higher Rs. 2200.00 on surface sugarcane farms, while that was Rs. 1083.73 in drip sugarcane farms.

**Keywords:** Cost, returns, profitability, output-input, sugarcane

### Introduction

Sugarcane (*Saccharum officinarum*) belongs to family *Graminae*. It is now widely accepted that India is the original home of *Saccharum species*. The cultivated canes belong to thin, hardy north Indian types *Saccharum barberi* and *Saccharum sinense* and thick, juicy noble canes *Saccharum officinarum*. Sugarcane is one of the traditional crops grown abundantly in the state of Maharashtra. In India, geographical area of 328 million hectares less than 45 per cent area is cultivated of this cultivated area only 35 per cent i.e. 65 million hectare gets irrigation. In sugarcane cultivation irrigation is given after 15-20 days interval. In regard to water conservation in sugarcane cultivation, drip irrigation method is used, it save the irrigation water. Drip irrigation is defined as the application of water through point or line sources (emitters) on or below the soil surface at a small operating pressure.

In year 2015-16 India occupying area under sugarcane 49.4 lakh hectares with an annual production of 3484.48 lakh MT. In India, among states Uttar Pradesh has the largest acreage (2.13 million hectare) under sugarcane. Maharashtra by commanding 0.77 million hectare under the crop holds next spot. Tamil Nadu, Karnataka, Gujarat, Andhra Pradesh, Uttarakhand, Bihar, Haryana, Punjab and Madhya Pradesh are other important states for sugarcane cultivation. Maharashtra occupying area under sugarcane 9.868 lakh hectares with an annual production of 692.353 lakh MT. Most of the sugarcane is grown on black lava soil with the help of irrigation. Most production comes from Ahmednagar, Kolhapur, Pune, Nashik, Solapur, Sangli, Satara, Osmanabad and Aurangabad. Pune district comes under medium recovery and high productivity zone. Area under sugarcane was 1.184 lakh hectares with 122.854 lakh MT production.

### Methodology

Multistage sampling design was adopted in selection of district, tehsils, villages and sugarcane growers. In first stage, Pune district was purposively selected. In the second stage Indapur and Daund tehsils of Pune district were selected on the basis of the highest area under sugarcane. In the third stage Bawada, Kati, Bhodani and Diksal villages from Indapur and Rajegaon, Khanota, Alegaon and Chincholi-Swami villages from Daund tehsil were selected. In fourth stage, from the list of sugarcane growers, 8 sugarcane growers (*viz.* 4 each from drip and surface irrigation) were randomly selected from each village. In this way, from Pune district 64 sugarcane growers (*viz.* 32 each from drip and surface irrigation) were selected for the present study.

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The techniques like tabular analysis and different concepts were used to analyze the data.

## Results and discussion

### 1. Per hectare physical inputs and outputs in sugarcane cultivation

Use of hired human labour was higher 100.79 man days on surface sugarcane farms as compared to 90.37 man days on drip sugarcane farms. Use of bullock labour was 10.58 pair days on drip sugarcane farm and 12.34 pair days on surface sugarcane farms. Use of machine power was 13.31 hours on drip sugarcane farms and 13.07 hours on surface sugarcane farms. The use of sugarcane setts was higher as 3.24 tonne in case of drip sugarcane farm as compared to 3.00 tonne in case of surface sugarcane farm. Regarding use of manures was the highest i.e. 3.05 tonne on drip farm as compared to surface farm i.e. 2.81 tonne. Use of nitrogen, phosphorous and potash

was 315.33 kg, 145.04 kg and 144.77 kg on surface sugarcane farms, respectively. While use of nitrogen, phosphorous and potash was 194.81 kg, 90.52 kg and 90.40 kg respectively on drip sugarcane farms. The use of plant protection for surface sugarcane farm was found to be more 2.89 litre/ha while in case of drip sugarcane farms, it was 2.81 litre/ha.

Use of irrigation was higher as 11620.24 cubic meters in surface sugarcane farm while that was 6553.68 cubic meters in drip sugarcane farm. It was inferred that, there was water saving in drip sugarcane farm. Use of family human labour was found to be 61.57 man days for surface sugarcane farms and 52.92 man days for drip sugarcane farms. It was also observed that, main produce of sugarcane was higher 164.04 tonne per ha on drip sugarcane farms as compared to 110.42 tonne per hectare on surface sugarcane farms, while the by produce of drip was higher 18.12 tonne as compared to 13.84 tonne of surface..

**Table 1:** Per hectare physical input or output in drip and surface sugarcane cultivation

Particulars	Unit	Sugarcane growers	
		Drip	Surface
INPUT			
1. Hired human labour	man day	90.37	100.79
2. Bullock labour	pair day	10.58	12.34
3. Machine power	Hours	13.31	13.07
4. Sugarcane setts	Tonne	3.24	3.00
5. Manure	Tonne	3.05	2.81
6. Nitrogen	Kg	194.81	315.33
7. Phosphorous	Kg	90.52	145.04
8. Potassium	Kg	90.40	144.77
9. Plant protection	Litre	2.81	2.89
10. Irrigation	m <sup>3</sup>	6553.68	11620.24
11. Family human labour	man day	52.92	61.57
12. OUTPUT			
13. Main produce	Tonne	164.04	110.42
14. By-produce	Tonne	18.12	13.84

### 2. Per hectare cost of cultivation of sugarcane

Cost-C was the highest Rs. 193177.47 on drip farm followed that of Rs. 164498.02 on surface farm. The share of rental value of land was the highest 32.45 per cent on drip farm that of 25.79 per cent on surface farm. Among the various items of expenditure, share of drip sugarcane farm was followed by hired human labour 9.35 per cent, bullock labour 2.73 per cent, machine power 2.75 per cent, sugarcane setts 4.19 per cent, manure 2.36 per cent, fertilizer 17.95 per cent, irrigation 10.75 per cent, interest on working capital 8.26 per cent and family human labour 5.48 per cent with compared to surface sugarcane farm percentage expenditure on followed by rental value of land 25.79 per cent, hired human labour 12.25 per cent, bullock labour 3.75 per cent, machine power 3.18 per cent, sugarcane setts 4.56 per cent, manure 2.56 per cent, fertilizer 8.41 per cent, irrigation 18.58 per cent, interest on working capital 9.82 per cent and family human labour 7.49 per cent.

### 3. Profitability in sugarcane production

The returns from main produce was higher Rs. 360888.00 in drip sugarcane farm as compared with Rs. 242924.00 on surface sugarcane farm. The returns from by produce was higher Rs. 15402.00 in drip farms as compared with Rs. 11764.00 in surface sugarcane farms. Gross return was higher i.e. Rs. 376290.00 on drip sugarcane farms and Rs. 254688.00 on surface sugarcane farms. It was clear that, higher farm business income, family labour income and net profit was Rs. 260358.43, Rs. 193696.53 and Rs. 183112.53 on drip sugarcane farms, respectively. On the contrary, farm business income, family labour income and net profit Rs. 147740.75, Rs.102503.98 and Rs. 90189.98 was observed on surface sugarcane farms, respectively, which was less as compared to drip irrigation.

It was found that; output-input ratio was higher as 1.95 on drip sugarcane farms than that of 1.55 on surface sugarcane farms also per tonne cost of sugarcane production was higher Rs. 2200.00 on surface sugarcane farms, while that was Rs. 1083.73 in drip sugarcane farms.

**Table 2:** Per hectare cost of cultivation of drip and surface sugarcane cultivation

Sr. No. Particulars	Sugarcane growers			
	Drip		Surface	
	Rs/ha	Per cent	Rs/ha	Per cent
1. Hired human labour	18074.00	9.35	20158.00	12.25
2. Bullock labour	5290.00	2.73	6170.00	3.75
3. Machine power	5324.00	2.75	5228.00	3.18
4. Sugarcane setts	8100.00	4.19	7500.00	4.56
5. Manure	4575.00	2.36	4215.00	2.56
6. Fertilizer	34676.73	17.95	13830.72	8.41
7. Plant protection	1967.00	1.02	2023.00	1.23
8. Irrigation	20775.16	10.75	30561.23	18.58
9. Land revenue	149.25	0.07	165.38	0.11
10. Incidental charges	328.50	0.17	399.88	0.24
11. Interest on working capital (13%)	15968.64	8.26	16161.79	9.82
12. Depreciation on capital assets @ 10%	703.29	0.36	534.25	0.32
13. Cost-A (item 1 to 12)	115931.57	60.01	106947.25	65.01
14. Rental value of land	62690.13	32.45	42420.44	25.79
15. Interest on fixed capital (11%)	3971.77	2.06	2816.33	1.71
16. Cost-B (cost-A+ item 14 to 15)	182593.47	94.52	152184.02	92.51
17. Family human labour	10584.00	5.48	12314.00	7.49
18. Cost-C (cost-B + item 17)	193177.47	100	164498.02	100

**Table 3:** Profitability in sugarcane production (Rs/ha)

Sr.No. Particulars	Sugarcane growers	
	Drip	Surface
1. Returns from main produce	360888.00	242924.00
2. Returns from by produce	15402.00	11764.00
3. Gross returns (item 1+2)	376290.00	254688.00
4. Cost-A	115931.57	106947.25
5. Cost-B	182593.47	152184.02
6. Cost-C	193177.47	164498.02
7. Farm business income		
8. (Gross returns minus Cost-A)	260358.43	147740.75
9. Family labour income		
10. (Gross returns minus Cost-B)	193696.53	102503.98
11. Net profit		
12. (Gross returns minus Cost-C)	183112.53	90189.98
13. Output-input ratio		
14. (Gross return divided by Cost-C)	1.95	1.55
15. Per tonne cost of production		
16. (Cost-C minus by produce value divided by main produce)	1083.73	2200.00

### Conclusions

1. Per hectare total cost of sugarcane i.e. cost C was Rs. 193177.47 in which contribution of cost A and cost B were Rs. 115931.57 and Rs. 182593.47 for drip and cost C was Rs. 164498.02 in which contribution of cost A and cost B were Rs. 106947.25 and Rs. 1152184.02 for surface, respectively.
2. Drip sugarcane was higher profitable than surface.
3. Output-input ratio of drip sugarcane was 1.95 while that of surface was 1.55.

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