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AN ECONOMIC ANALYSIS OF SUGARCANE WITH DRIP AND SURFACE IRRIGATION IN VILLUPURAM DISTRICT

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Abstract

The purpose of this study was to determine the input use cost, return, and profitability associated with the production of sugarcane in the Villupuram District in the state of Tamil Nadu. In the current study, a representative sample of 64 sugarcane farmers from the research area was chosen to have their input-output data collected for analysis based on the annual cropping season of the years 2020–21. On surface sugarcane plantations, the respective amounts of nitrogen, phosphate, and potash that were used were 315.33 kilogrammes, 145.04 kilogrammes, and 144.77 kilogrammes. On drip sugarcane fields, the amounts of nitrogen, phosphate, and potash that were used were 194.81 kilogrammes, 90.52 kilogrammes, and 90.40 kilogrammes, respectively. The use of irrigation was significantly higher in surface sugarcane farms at 11620.24 cubic metres, while it was significantly lower in drip sugarcane farms at 6553.68 cubic metres. The cost-C was highest for the drip farm at Rs. 193177.47, followed by the cost-C for the surface farm at Rs. 164498.02. Returns from the principal crop were significantly greater in drip sugarcane farms, amounting to Rs. 360,888.00 in comparison to Rs. 242,924.00 in surface sugarcane farms. In drip sugarcane farms, the returns on yield were higher, coming in at Rs. 15402.00 per acre, as opposed to Rs. 11764.00 per acre in surface sugarcane farms. Because production was stronger on drip irrigation farms in comparison to surface irrigation farms, the output-input ratio was higher on drip sugarcane farms, coming in at 1.95, than it was on surface sugarcane farms, which had a ratio of 1.55. The cost of producing sugarcane per tonne was significantly higher on surface sugarcane farms, coming in at Rs. 2200.00, whereas the cost was just Rs. 1083.73 on drip sugarcane farms.

Keywords: Economics, Profitability, Output-input, Sugarcane

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Introduction

The Graminaceae plant family includes sugarcane, often known as Saccharum officinarum. It is now generally agreed that India is the place where Saccharum species were first cultivated. The farmed canes include the thin, north Indian kinds Saccharum barberi and Saccharum sinense as well as the thick, noble canes of the Saccharum officinarum species, which are known for their high juice content. One of the traditional crops that is grown in large quantities throughout the state of Tamil Nadu is sugarcane. In India, the country has a total land area of 328 million hectares, but only around 45 percent of that is cultivated land; of the cultivated land, only about 35 percent, or 65 million hectares, receive irrigation. When growing sugarcane, irrigation is typically performed every 15–20 days at regular intervals. In order to reduce the amount of water used for irrigation while growing sugarcane, the drip irrigation method is utilised. This helps conserve water. The application of water through point or line sources (emitters) on or below the soil surface at a low operating pressure is what's known as drip irrigation. In the 2020–21 agricultural year, India had a total area under sugarcane cultivation of 49.4 lakh hectares, producing 3.48 million metric tonnes annually. In India, the state of Uttar Pradesh is responsible for the cultivation of the most land (2.13 million hectares) dedicated to sugarcane. Taking the second-place rank is Tamil Nadu, which has 0.77 million hectares under crop cultivation. Other notable states for the cultivation of sugarcane include Tamil Nadu, Karnataka, Gujarat, Andhra Pradesh, Uttarakhand, Bihar, Haryana, Punjab, and Madhya Pradesh. Sugarcane is grown over 9.868 million hectares in Tamil Nadu, and the state's yearly production of sugarcane is 692.353 million metric tonnes. The vast majority of sugarcane is cultivated with the assistance of irrigation on black lava soil. The cities of Ahmednagar, Kolhapur, Pune, Nashik, Solapur, Sangli, Satara, Osmanabad, and Aurangabad are responsible for the majority of production. The Villupuram District is classified as having a medium rate of recovery and a high level of productivity. Sugarcane was grown on a total of 1.184 million hectares, and 122.854 million metric tonnes were produced.

Methodology

The selection of districts, taluks, villages, and sugarcane growers was carried out using a sample technique with many stages. The first stage involved the deliberate selection of the Villupuram District. In the second round, two taluks within the Villupuram District were chosen for having the greatest amount of land devoted to sugarcane cultivation. In the third stage, a random selection was made for each of the four villages in each of the two

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taluks. In the fourth step, eight sugarcane farmers were chosen at random from the list of sugarcane growers in each community. This included four farmers who used drip irrigation and four farmers who used surface irrigation. In this manner, 64 sugarcane growers from the Villupuram District were chosen for the present study, specifically 32 from the drip irrigation group and 32 from the surface irrigation group. In order to conduct an analysis of the data, several methods, including tabular analysis and various ideas, were applied.

Results and discussion

Per hectare physical inputs and outputs in sugarcane cultivation

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

Particulars	**Unit**	**Sugarcane growers**	
		Drip	**Surface**
INPUT			
Sugarcane setts	Tonne	3.24	3.00
Hired human labour	man day	90.37	100.79
Family human labour	man day	52.92	61.57
Machine power	Hours	13.31	13.07
Nitrogen	Kg	194.81	315.33
Phosphorous	Kg	90.52	145.04
Potassium	Kg	90.40	144.77
Bullock labour	pair day	10.58	12.34
Manure	Tonne	3.05	2.81
Plant protection	Litre	2.81	2.89
Irrigation	m^3	6553.68	11620.24
OUTPUT			
Main produce	Tonne	164.04	110.42
By-produce	Tonne	18.12	13.84

On surface sugarcane farms, the use of hired human labour was 100.79 man days, which is significantly greater than the 90.37 man days recorded on drip sugarcane farms. On drip

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sugarcane farms, bullock labour was utilised for 10.58 pair days, while on surface sugarcane farms, it was utilised for 12.34 pair days. On drip sugarcane farms, 13.31 hours of machine power were used, while on surface sugarcane farms, 13.07 hours of machine power were used. In the instance of a drip sugarcane farm, the amount of sugarcane setts used was 3.24 metric tonnes, which is greater than the amount of setts used (3.00 metric tonnes) in the case of a surface sugarcane farm. The amount of manure applied to the drip farm was 3.05 tonne, which was significantly more than the amount applied to the surface farm, which was 2.81 tonne. On surface sugarcane plantations, the respective amounts of nitrogen, phosphate, and potash that were used were 315.33 kilogrammes, 145.04 kilogrammes, and 144.77 kilogrammes. On drip sugarcane fields, the amounts of nitrogen, phosphate, and potash that were used were 194.81 kilogrammes, 90.52 kilogrammes, and 90.40 kilogrammes, respectively. It was determined that the amount of plant protection used on surface sugarcane farms was greater than 2.89 litres per hectare, whereas the amount used on drip sugarcane farms was 2.81 litres per hectare.

The use of irrigation was significantly higher in surface sugarcane farms at 11620.24 cubic metres, while it was significantly lower in drip sugarcane farms at 6553.68 cubic metres. It was deduced that drip irrigation for sugarcane resulted in significant water savings. It was discovered that surface sugarcane farms used an average of 61.57 man-days worth of family labour, but drip sugarcane fields used just 52.92 man-days worth of family labour. It was also found that the main production of sugarcane was greater on drip sugarcane farms, at 164.04 tonne per ha, as opposed to 110.42 tonne per ha on surface sugarcane farms. On the other hand, the byproduct of drip sugarcane farms was higher at 18.12 tonne as compared to 13.84 tonne of surface.

Per hectare cost of cultivation of sugarcane

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**
Sugarcane setts	8100.00	4.19	7500.00	4.56
Hired human labour	18074.00	9.35	20158.00	12.25

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Family human labour	10584.00	5.48	12314.00	7.49
Machine power	5324.00	2.75	5228.00	3.18
Bullock labour	5290.00	2.73	6170.00	3.75
Fertilizer	34676.73	17.95	13830.72	8.41
Manure	4575.00	2.36	4215.00	2.56
Plant protection	1967.00	1.02	2023.00	1.23
Irrigation	20775.16	10.75	30561.23	18.58
Land revenue	149.25	0.07	165.38	0.11
Incidental charges	328.50	0.17	399.88	0.24
Interest on working capital (13%)	15968.64	8.26	16161.79	9.82
Depreciation on capital assets @ 10%	703.29	0.36	534.25	0.32
Cost-A (item 1 to 12)	115931.57	60.01	106947.25	65.01
Rental value of land	62690.13	32.45	42420.44	25.79
Interest on fixed capital (11%)	3971.77	2.06	2816.33	1.71
Cost-B (cost-A+ item 14 to 15)	182593.47	94.52	152184.02	92.51
Cost-C (cost-B + item 17)	193177.47	100	164498.02	100

The cost-C for the drip farm was the highest, coming in at Rs. 193177.47, while the cost-C for the surface farm was Rs. 164498.02. When compared to the share of the rental value of land that was found on surface farms, drip farms had a rental value share that was 32.45 percent higher. Share of drip sugarcane farm was followed by hired human labour (9.35 percent), bullock labour (2.73 percent), machine power (2.75 percent), sugarcane setts (4.19 percent), manure (2.36 percent), fertiliser (17.95 percent), irrigation (10.75 percent), interest on working capital (8.26 percent), and family human labour (5.48 percent) with compared to surface sugarcane farm percentage expenditure, followed by rental value of land (25.79 percent). The share of drip sugarcane farms was followed by hired human labour (9.35 percent).

Profitability in sugarcane production

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

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

In the drip sugarcane farm, the principal produce brought in a return of Rs. 360,888.00, which was significantly larger than the return of Rs. 242,924.00 on the surface sugarcane farm. The revenue generated by the produce was much greater in drip sugarcane farms, at Rs. 15402.00, when compared to Rs. 11764.00 in surface sugarcane farms. On drip sugarcane farms, the gross return was 376290.00 rupees, which was much greater than the surface sugarcane farms' return of 254688.00 rupees. It was obvious that the greater farm business income, family labour income, and net profit on drip sugarcane farms were, respectively, Rs. 260358.43, Rs. 193696.53, and Rs. 183112.53. On the other hand, it was found that surface sugarcane fields had lower farm business revenue, family labour income, and net profit of correspondingly Rs. 147740.75, Rs. 102503.98, and Rs. 90189.98 when compared to drip irrigation. It was discovered that the output-to-input ratio for drip sugarcane farms was 1.95, which was significantly greater than the 1.55 recorded for surface sugarcane farms. Additionally, the cost of producing sugarcane per tonne was significantly higher on surface sugarcane farms, coming in at Rs. 2200, while it was just Rs. 1083.73 on drip sugarcane farms.

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Conclusions

Cost C was Rs. 193177.47 per hectare, with cost A and cost B contributing Rs. 115931.57 and Rs. 182593.47, respectively, for drip irrigation; cost C was Rs. 164498.02 per hectare, with cost A and cost B contributing Rs. 106947.25 and Rs. 1152184.02, respectively, for surface irrigation; and the overall cost of growing sugarcane was Rs. 193177.47 per hectare. The revenue from drip sugarcane was significantly higher than that of surface cane. The ratio of output to input for drip sugarcane was 1.95, but it was 1.55 for surface sugarcane.

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