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Study on cost and returns of sugarcane production in Sitapur district of central plain in Uttar Pradesh

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Abstract
A study entitled "Study on Cost And Returns of Sugarcane Production in Sitapur District Of Central Plain In Uttar Pradesh" was carried out with the goal of determining the worth and significance of the sugarcane crop as well as the income and jobs it creates through its production, disposal. Analyze the main objectives were the cost & income measures of sugarcane cultivation. With the use of purposive cum random sampling, 100 respondents were chosen from the Parsendi block of the Sitapur district. Data were gathered using a scheduled programme and personal interviews. For the purpose of presenting the results, tabular and functional analyses were performed. Chosen respondents were divided into 69, 21, and 10 percent from marginal, small, and medium categories. The cost of cultivation per hectare increased with farm size, while revenue showed a substantial inverse connection with holding size, manures, fertilizers, and irrigation were shown to be statistically significant on the majority of farm sizes. Finally, it can be said that sugarcane is, in all respects, the best crop for farmers in the Sitapur district.

Keywords: Cost and returns

Introduction

Sugarcane (*Saccharum officinarum* L.) belongs to the family Gramineae (Poaceae) and is a grown crop in India. South East Asia and tropical South Asia are where they first appeared. Sugarcane is a natural, renewable resource for agriculture because it not only produces sugar but also biofuel, fiber, fertilizer, and numerous other environmentally friendly by-products. In India, sugarcane is a significant cash crop. The cultivation of sugarcane and the establishment of the sugar industry predate agriculture and have accompanied the rise of human civilization. Sugar and sugarcane are used and important in the socioeconomic environment of the country. At the moment, rural economies have developed sugarcane farming and the sugar industry, which are crucial to the socioeconomic development of rural areas (Raj *et al*., 2021) [6].
Sugarcane is a long-duration crop that occupies the land for 12-14 months from planting to harvesting. During this long period, the growers invest inputs profusely regarding capital, land, and labour by expecting the return only in harvesting time. Many farmers started to plant cane after harvesting one winter crop which helps to get better cane yield**.**
There are several types of varieties of sugarcane having tall perennial grasses belonging to the family Saccharum, tribe Andropogon which is used to produce sugar. The sugar cane plants grow to a height of 2-6 m (6-20 ft) and have stout, jointed, fibrous stalks that are rich in sucrose, which accumulates in the stalk internodes. It is indigenous to India, Southeast Asia, and New Guinea, where it grows in warm, temperate tropical climates. The plant is also grown for biofuel production, especially in Brazil, as the canes can be used directly to produce ethyl alcohol (ethanol). In India, sugarcane is the most important commercial crop which is grown over 2.57% of its gross cropped area. In India, the agro-climatic regions of sugarcane cultivation can be divided into two: tropical and sub-tropical. Globally India is the second largest producer of sugarcane after Brazil and accounts for about 25% of the world's production (Upreti and Singh, 2017) [7].
Sugarcane is grown in diversified climatic conditions. India is one of the largest sugarcane producers in the world, the country is producing around 300 million tonnes of cane per annum. Sugar is the second largest agro-processing industry in the country after cotton and textiles.

In India, about more than 50 million farmers, their dependent, and a large number of agricultural laborers are involved in sugarcane cultivation, harvesting, and ancillary activities constituting 7.5 percent of the rural population, and many workers are employed indirectly in processing (Kumar *et al*., 2014) [2]. Molasses is the chief by-product of the sugar industry and is the main raw material for alcohol production and alcohol-based industries in India. Nearly 1877.10 million tonnes of sugarcane were produced in the harvesting year 2017-18 worldwide. With the production of over 739.27 million tonnes in 2017-18, Brazil was the leader in Sugarcane production followed by India (341.20 million tonnes) and China (125.54 million tonnes). Production of sugarcane was 341.20 million tonnes in the year 2017-2018.Uttar Pradesh is the highest producer (162.34 million tonnes) followed by Maharashtra (72.64 million tonnes) and Karnataka (29.92 million tonnes) (Mishra *et al*., 2021a) [4].

The area under sugarcane cultivation is around 5.06 million hectares with an average yield of 67.43 tonnes/ha. Uttar Pradesh had the highest area under sugarcane cultivation in 2017-2018 (2.24 million hectares). Kerala has the highest productivity of 116.2 tonnes/ha (Raj *et al*., 2021) [6]. Global production of sugarcane in 2018 was 1.91 billion tonnes, with Brazil producing 39% of the world total, India with 20%, and China and Thailand producing about 6%. Worldwide, 26 million hectares were devoted to sugarcane cultivation in 2018. The average worldwide yield of sugarcane crops in 2018 was 73 tonnes per hectare, led by Pune with 121 tonnes per hectare. The theoretical possible yield for sugarcane is about 280 tonnes per hectare per year, and small experimental plots in Brazil have demonstrated yields of 236-280 tonnes of cane per hectare (Food and Agriculture Organization).

Sugarcane is a significant source of income for India and is accountable for the entire socioeconomic growth of the agricultural community. The states of Uttar Pradesh, Maharashtra, Tamil Nadu, Karnataka, and Gujarat produce the majority of the world's crops. Long-lived sugarcane produces a lot of biomasses and uses a lot of water. Each crop season typically involves 25 to 30 irrigation rounds. Except for the significant harvests in Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka and Pradesh, Haryana, Bihar, etc., sugar cane is grown from Kanyakumari in the south to Punjab in the north, with a heavier concentration in Uttar Pradesh. The second-largest agricultural sector in India is the sugar sector, behind the textile sector. It generates more than Rs.225 billion in taxes for the British government (Nandhini, 2017) [5].

The sugarcane growing may be broadly classified into two agro-climatic regions –subtropical and tropical. The subtropical zone includes four states: 1) Uttar Pradesh 2) Bihar 3) Punjab 4) Haryana. The tropical zones include five states i.e., 1) Maharashtra 2) Andhra Pradesh 3) Tamil Nadu 4) Gujarat 5) Karnataka (Mishra *et al*., 2021 b) [3].

The largest state for sugarcane production is Uttar Pradesh. The highest sugarcane production in Uttar Pradesh came from the Shamli district in the west U.P. region, which produced 1004.28quintals per hectare in 2020-21. District Sitapur covers an area of nearly 126320 ha total cultivated area which alone produces an optimum 71374190 quintal. A total cultivated area alone produces an optimum percentof 0.099 of the sugarcane produced in the state (Statistical report, U.P. 2021).

Sugarcane is one of the main sources of income and employment for the farmers in the study region, therefore knowledge about its location, production, and productivity is important. The sole crop that farmers in the study region plant for cash are the only one that gives them a significant income and employment (Jaiswal *et al*., 2017) [9].

Keeping this in view the proposed study entitled "Study on Cost and Return of Sugarcane Production in Sitapur District of Central Plain in Uttar Pradesh" assumes special significance. The main objective of studied were to work out the cost and return of sugarcane.

Methods
This empirical investigation of resource use efficiency has made extensive use of primary data. The schedules that have been pre-structured and pre-tested have been used to gather the farmers from the community. The population sample was drawn using a multi-stage stratified random sampling technique. By selecting the Sitapur district on purpose, the sampling process has begun.

First, a list of each of the 19 blocks in Uttar Pradesh's Sitapur district was created, along with an average ranking for sugarcane farming. Block Parsendi, which has the most sugarcane-growing land, was specifically chosen for this investigation. Thereafter, a list of all the villages in the parsendi block was created and placed in ascending order of the area planted with crops. From these lists a sample of 100 respondents were drawn following the proportionate allocation to the different categories. Under marginal farmers category 69, small famers 21 and medium farmers 10 have occurred out of hundred samples.

Period of Enquiry
The data pertained to agriculture year 2021-2022estimation of costs and returns used by verma *et al*., 2023

Cost A1: It includes costs and kind expenses actually incurred by cultivators which are as follows:
1. Wage of hired human labour
2. Charges for bullock labour
3. Hired labour charges of implements and machinery
4. Cost incurred on manures and fertilizers
5. Seeds
6. Plant protection chemicals
7. Irrigation charges
8. Land revenue
9. Depreciation, and
10. Repair charges on farm assets.

Cost A2: Cost A1 + Rent paid for leased in land.

Cost B1: Cost A2 + Interest on owned fixed capital assets.

Cost B2: Cost B1 + Rental value of owned land.

Cost C1: Cost B1 + Imputed value of family labour.

Cost C2: Cost B2 + Imputed value of family labour.

Cost C3: Cost C2 + 10% of cost C2 (managerial cost)

Gross Income = Value of total output.

Net Income = It is computed by deducting cost C3 from gross income.

Results and Discussion
Cost and return
The cost and return have been summarized in this part on the sample farms. Besides the estimate of total costs, on the basis of six cost concepts i.e., Cost A1/A2, cost B1, cost B2, cost

C1, C2, and cost C3, have been worked out for estimation of cost. Similarly, the various measures of farm profits, such as net income, family labour income, farm investment income, farm business income, input-output ratio
and resource use efficiency for sugarcane crops has also been worked out.

(a.) Per hectare costs of cultivation of sugarcane crop
Per hectare costs incurred on the various input factor in sugarcane production was worked out and are given in Table 1.

Table 1 indicate that costs of cultivation were highest on medium farms (Rs.51066.44), followed by small farms (Rs.49891.28) and small farms (Rs.47097.44) respectively. The overall average costs of cultivation were observed (Rs.48591.25) on sample farms.
The major component of the cost was human labour (34.17 percent), Machinery charge (18.18 percent), manure & fertilizers (16.18 percent), the rental value of owned land (12.35 percent), seed cost (5.90 percent), plant protection (1.71 percent) and irrigation charge (1.32 percent) respectively of the total cost of cultivation. Per hectare cost of cultivation was found of a positive trend with farm size.

Table 1: Per hectare costs of different inputs used in Sugarcane production (Rs.)

S. No.	Particulars	Size group of farms			Overall Average
		Marginal	Small	Medium	
1	Human Labour	16662.97 (14.84)	17362.75 (14.86)	17865.62 (14.92)	16930.19 (14.86)
	a. Family Labour	10752.65 (9.58)	7427.48 (6.36)	5577.64 (4.66)	9536.86 (8.37)
	b. Hired Labour	5910.32 (5.26)	9935.27 (8.50)	12287.98 (10.26)	7393.33 (6.49)
2	Machinery Charges/ Tractor Charges	8425.71 (7.51)	8748.08 (7.49)	9011.37 (7.53)	8551.97 (7.50)
3	Seed Cost	22175.46 (19.57)	23282.10 (19.93)	23754.23 (19.84)	22565.73 (19.80)
4	Manures and Fertilizers	11428.55 (10.18)	12201.39 (10.44)	12958.57 (10.82)	11743.85 (10.30)
5	Irrigation	9142.70 (8.14)	9766.51 (8.36)	10287.38 (8.59)	9388.17 (8.24)
6	Plant Protection	3572.02 (3.18)	3873.62 (3.32)	3962.20 (3.31)	3674.37 (3.22)
7	Total working capital	60654.76 (54.03)	65299.18 (55.90)	65551.39 (54.75)	62119.75 (54.51)
8	Interest on working capital @ 6%	3639.29 (3.24)	3917.5 (3.35)	3933.08 (3.29)	3727.19 (3.27)
9	Rental value of owned land	24000.00 (21.38)	24000.00 (20.54)	24000.00 (20.05)	24000.00 (21.06)
10	Interest on fixed capital	3014.47 (2.69)	3050.91 (2.61)	3062.96 (2.56)	3026.97 (2.66)
11	Sub-Total	102061.16 (90.91)	106203.31 (90.91)	108835.41 (90.91)	103608.44 (90.91)
12	Marginal Cost @ 10% of sub-total	10206.12 (9.09)	10620.33 (9.09)	10883.54 (9.09)	10360.84 (9.09)
	Grand Total	112267.28 (100.00)	116823.64 (100.00)	119718.95 (100.00)	113969.28 (100.00)

(Figure in parenthesis indicates the percentage of the total cost)

Table 2: Per-hectare cost and income measure from Sugarcane production on various costs concepts (Rs.)

Sl. No.	Particulars	Size group of farms			Overall Average
		Marginal	Small	Medium	
1	Cost A1/A2	64294.05	71724.92	76194.81	67044.61
2	Cost B1	67308.51	74775.83	79257.77	70071.58
3	Cost B2	91308.51	98775.83	103257.77	94071.58
4	Cost C1	78061.16	82203.31	84835.41	79608.44
5	Cost C2	102061.16	106203.31	108835.41	103608.44
6	Cost C3	112267.28	116823.64	119718.95	113969.28
7	Yield (qtl./ha.)	604.85	615.20	623.53	608.89
8	Gross Income	206647.00	210183.08	213029.02	208027.78
9	Net Income	94379.72	93359.44	93310.07	94058.50
10	Family Labour Income	115338.49	111407.25	109771.25	113956.21
12	Farm Business Income	142352.96	138458.16	136834.21	140983.17
12	Farm Investment Income	136442.64	128522.89	124546.23	133589.85
13	Cost of Production (Rs./Qtl.)	185.61	189.90	192.00	187.15
14	**Input - Output Ratio**				
a.	On the basis of Cost A1	1:3.21	1:2.93	1:2.80	1:3.11
b.	On the basis of Cost B1	1:3.07	1:2.81	1:2.69	1:2.98
c.	On the basis of Cost B2	1:2.26	1:2.13	1:2.06	1:2.21
d.	On the basis of Cost C1	1:2.65	1:2.56	1:2.51	1:2.61
e.	On the basis of Cost C2	1:2.02	1:1.98	1:1.96	1:2.01
f.	On the basis of Cost C3	1:1.84	1:1.80	1:1.78	1:1.83
15	B:C Ratio	1:1.19	1:1.25	1:1.28	1:1.21

(b.) Per hectare costs and income from the production of sugarcane crop
Table 2 revealed that on average cost A1/A2, cost B1, cost B2, cost C1, cost C2, and cost C3 came to Rs.67044.61, Rs.70071.58, Rs. 9407158, Rs. 79608.44, Rs.103608.44 and Rs. 113969.28 respectively.
On average, gross income was recorded at Rs. 208027.78 and net income came to Rs.94058.50. On medium farms, gross income was highest, which was recorded at Rs.213029.02,

followed by small farms at Rs. 210183.08 and lowest on marginal farms i.e., Rs.206647.00respectively.
The net income was highest on marginal farms Rs. 94379.72, followed by small farms Rs. 93359.44 and medium farms Rs.93310.07. On average family labour income, farm business income, and farm investment income were observed to be Rs. 113956.21, Rs.140983.17, and Rs. 133589.85, respectively. Family labour income was highest on medium farms followed by small and marginal farms &farm

investment income was highest on marginal farms followed by small farms and medium farms and farm business income was highest on marginal farms, followed by small farms and medium farms. On average, the cost of production per quintal and yield per hectare was estimated to be Rs. 187.15 per quintal respectively.

On an average input-output ratio regarding costs C3, C2, C1, B2,B1, and A2/A1 were recorded 1:1.83, 1:2.01, 1:2.61, 1:2.21, 1:2.98 and1:3.11 respectively. On the basis of cost, C3 input-output ratio was highest on marginal farms (1:3.21), followed by small (1:2.93) and medium (1:2.80) respectively. It may be concluded the costs of cultivation on different size group of farm increases with an increase in farm size. But net return per hectare was found of a negative trend with farm size. It was because of less increase in yield against the increased input factors at increasing size of farm.

Conclusion

For achieving the stipulated objectives, the Sitapur district was selected purposively. The selection of the sample for the study was made by using the purposive cum random sampling technique. In the Sitapur district out of the 6 tehsils of the selected district, Laharpur tehsil was selected purposively for the study. Out of the 19 blocks of selected tehsil, the Parsendi block was selected. Farmers were selected based on sugarcane cultivation in the region and five villages were selected randomly from the block. For the selection of a representative sample of respondents, they were classified into three strata *viz.*, below 1hectare (Marginal), 1 hectare to 2 hectares (Small), 2 hectares, and above hectares (Medium).

Cost estimation revealed that indicate the cost of cultivation, was highest on medium farms (₹119718.95), followed by small farms (₹116823.64) and marginal farms (₹112267.28), respectively. The overall average costs of cultivation were observed (₹113969.28) on sample farms. The major component of the cost was human labour (14.86 percent), machinery charges (7.50 percent), manure and fertilizer (10.30 percent), the recent value of owned land (21.06 percent), seed cost (19.80 percent), plant protection (3.22 percent) and irrigation charge (8.24 percent), respectively of the total cost of cultivation. Per hectare cost of cultivation was found of a positive trend with farm size.

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