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Cost economic analysis of sugarcane cultivation in Kanpur Nagar district of Uttar Pradesh

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Abstract

The present study was conducted to examine the economics of sugarcane cultivation in Kanpur Nagar district of Uttar Pradesh during the agricultural year 2025–2026. A purposive-cum-multistage random sampling technique was employed for the selection of respondents, and a total of 100 sugarcane growers were selected from Patrai block. The selected farmers were categorized into marginal, small, and medium farm groups. Primary data were collected through personal interviews with the help of a pre-structured schedule, while secondary data were obtained from official records, journals, and published reports. The study analyzed the cost structure, returns, profitability, and input-output relationship in sugarcane cultivation by applying standard cost concepts such as Cost A1, B1, B2, C1, C2, and C3. The findings revealed that the overall average total cost of cultivation (Cost C3) was estimated at ₹74,230.03 per hectare, whereas the average gross income was recorded at ₹1,74,841.13 per hectare. Human labor, seed, machinery charges, and rental value of land constituted the major components of cultivation cost. Medium farms incurred higher production costs but also achieved greater productivity and profitability compared to marginal and small farms. The average yield of sugarcane was observed to be 529.82 quintals per hectare, and the average net return over Cost C3 was estimated at ₹1,00,611.09 per hectare. The overall benefit-cost ratio was found to be 1.35, indicating that sugarcane cultivation was economically viable and profitable in the study area.

Keywords: Sugarcane cultivation, cost of production, profitability, benefit-cost ratio, farm income

Introduction

Sugarcane was recognized as one of the most significant commercial crops in the agricultural economy due to its extensive contribution to industrial development, rural employment, and farmers' income. It was cultivated widely in tropical and subtropical regions because of its adaptability to diverse climatic conditions and its high economic value. India was considered one of the leading producers of sugarcane in the world, and the crop played a crucial role in supporting sugar industries, jaggery production, ethanol manufacturing, and several agro-based enterprises. The cultivation of sugarcane was characterized by high labor and input requirements, which contributed substantially to employment generation in rural areas. In addition, sugarcane by-products such as bagasse, molasses, and press mud were utilized in power generation, alcohol production, and organic manure preparation, thereby enhancing its industrial importance. The productivity and profitability of sugarcane cultivation were influenced by factors such as irrigation facilities, seed quality, fertilizer application, technological adoption, and market accessibility. Despite its economic significance, sugarcane cultivation was constrained by rising production costs, delayed payments to farmers, water scarcity, and fluctuating market prices. Therefore, the study of sugarcane production and marketing was considered essential for understanding its economic viability and identifying measures for sustainable agricultural development.

Research Methodology

The study employed a purposive-cum-multistage random sampling technique for the selection of respondents from the Kanpur Nagar district in order to obtain a representative and diversified sample of sugarcane growers. Initially, Kanpur Nagar district was purposively selected as the study area to reduce logistical difficulties and save time for the researcher. Among the various blocks of the district, Patrai block was chosen because of its considerable area under sugarcane cultivation, which made it suitable for the investigation. A complete list of villages in Patrai block was prepared, and five per cent of the villages with significant sugarcane cultivation potential were randomly selected. Thereafter, ten per cent of the total sugarcane farming households from the selected villages were randomly chosen, resulting in a final sample of 100 farmers. The selected respondents were further categorized into three landholding groups, namely marginal (below 1 hectare), small (1–2 hectares), medium (4–10 hectares). Primary data were collected through personal interviews conducted with the respondents using a pre-structured and well-designed interview schedule. Secondary information was obtained from official reports, published books, research journals, and records available at the district and block offices. The entire data collection process was carried out during the agricultural year 2025–2026, and the collected information was analyzed with suitable statistical techniques to derive meaningful interpretations and conclusions.

Analytical Tools

Cost of Sugarcane Production.

Cost - A1

- Value of hired human labor
- Value of hired bullock labor
- Value of owned bullock labor
- Value of owned machinery labor
- Hired machinery charges
- Value of seed (purchased)
- Value of insecticide and pesticide
- Value of manures (owned and purchased)
- Value of fertilizer
- Depreciation on implements and farm buildings
- Irrigation charge
- Land revenue, cases and other taxes
- Interest on working capital
- Miscellaneous expenses (artisans etc.)

Cost A2: Cost A1 +rent for leased in land.

Cost B1: Cost A1 + interest on value of owned fixed capital

assets (excluding land).

Cost B2: Cost B1 + rental value of owned land (net of land revenue) and rent paid for leased –in land.

Cost C1: cost B1 + imputed value of family labor.

Cost C2: cost + imputed value of family labor

Cost C2*: Cost C2 adjusted to take into account valuation of human labor at market rate or statutory minimum wage rete whichever is higher

Cost C3: Cost C2* + value of management input at 10%of total cost (C2*) Cost C is the total cost of cultivation.

- **Farm business income** = Gross income – Cost A1 or A2
- **Family labor income** = Gross income – Cost B
- **Net income** = Gross income – Cost C
- **Farm investment income** = Farm business income – Imputed value of family labor.

Gross Income

- Benefit: Cost ratio = Total cost

Results and Discussion

Table 1: Costs per hectare of various inputs used in the production of sugarcane (Rs.)

S. No.	Particulars	Size group of farms			
		Marginal (50)	Small (37)	Medium (13)	Overall average
1	Human Labour	15189.38 (21.06)	149999.54 (19.96)	17279.19 (21.23)	15377.51 (20.72)
a.	Family Labour	8955.36 (12.42)	36439.36 (4.85)	1532.84 (1.88)	6311.70 (8.50)
b.	Hired Labour	6234.02 (8.64)	113569.18 (15.11)	15746.35 (19.35)	9065.81 (12.21)
2	Machinery Charges	5898.34 (8.18)	68099.68 (9.06)	6812.02 (8.37)	6308.50 (8.50)
3	Seed	13509 (18.73)	143889.14 (19.14)	15492.55 (19.04)	14037.10 (18.91)
4	Manure and fertilizer	4816.31 (6.68)	51249.39 (6.82)	5817.83 (7.15)	5038.16 (6.79)
5	Irrigation	4842.98 (6.72)	52189.23 (6.94)	5434.29 (6.68)	5037.77 (6.79)
6	Plant Protection/Intercultural	1236.15 (1.71)	13029.47 (1.73)	1365.05 (1.68)	1273.50 (1.72)
7	Total working capital	45492.16 (63.08)	478419.63 (63.66)	52200.93 (64.15)	47072.54 (63.41)
8	Interest on working capital	1819.68 (2.52)	19139.66 (2.55)	2088.0372 (2.57)	1882.90 (2.54)
9	Rental value of land	15000 (20.80)	150009.15 (19.96)	15000 (18.43)	15000.00 (20.21)
10	Interest on fixed capital	3249.00 (4.51)	35669.35 (4.74)	4689.00 (5.76)	3526.41 (4.75)
11	Sub total	65561.00 (90.91)	683219.68 (90.91)	73978.00 (90.91)	67481.85 (90.91)
12	Managerial Cost@10% of sub-total	6556 (9.09)	68329.68 (9.09)	7398.00 (9.09)	6748.18 (9.09)
	Grand total	72116.93 (100.00)	751539.42 (100.00)	81375.76 (100.00)	74230.03 (100.00)

Table 1: The table revealed the cost structure of sugarcane cultivation per hectare across different farm size groups. The overall average total cost of cultivation was estimated at ₹74,230.03 per hectare. Among the various cost components, total working capital constituted the largest share, accounting for 63.41 per cent of the total cost, followed by rental value of land (20.21 per cent) and managerial cost (9.09 per cent). Human labor emerged as a major expenditure item, contributing 20.72 per cent of the total cost, with hired labor accounting for a greater share than family labor in overall cultivation expenses. Seed cost also represented a significant proportion, constituting 18.91

per cent of the total expenditure, indicating the importance of quality planting material in sugarcane production. Expenditure on machinery charges, manure and fertilizers, and irrigation collectively formed an important share of the production cost, reflecting the intensive input requirements of the crop. Medium farms recorded the highest overall cultivation cost per hectare, followed by small and marginal farms. The findings suggested that sugarcane cultivation was highly capital intensive and required substantial investment in labor, seed, machinery, and land resources for achieving higher productivity.

Table 2: Measures of per - hectare coat and profits of Sugarcane (Rs.)

S. No.	Particulars	Size group of farms			
		Marginal (50)	Small (37)	Medium (13)	Overall average
1	Cost A ₁ /A ₂	38356.49	46111.94	52756.13	42643.74
2	Cost B ₁	41605.49	49677.94	57445.13	46170.15
3	Cost B ₂	56605.49	64677.94	72445.13	61170.15
4	Cost C ₁	50560.85	53321.30	58977.97	52481.85
5	Cost C ₂	65560.85	68321.30	73977.97	67481.85
6	Cost C ₃	72116.93	75153.42	81375.76	74230.03
7	Yield l/ha.	511.32	534.36	602.14	529.82
8	Gross Income	168735.60	176338.80	198706.20	174841.13
9	Net return over cost C ₃	96618.67	101185.38	117330.44	100611.09
10	Family Labour Income	112130.11	111660.86	126261.07	113670.98
11	Farm Business Income	130379.11	130226.86	145950.07	132197.39
12	Farm Investment Income	121423.75	126583.50	144417.23	125885.69
13	Cost of production (q/ha.)	141.04	140.64	135.14	140.20
14	Benefit Cost Ratio	1.34	1.35	1.44	1.35
15	Input- output ratio				
a	on the basis of Cost A ₁	4.40	3.82	3.77	4.13
b	On the basis of cost B ₁	4.06	3.55	3.46	3.82
c	On the basis of Cost B ₂	2.98	2.73	2.74	2.87
d	On the basis of Cost C ₁	3.34	3.31	3.37	3.33
e	On the basis of Cost C ₂	2.57	2.58	2.69	2.59
f	On the basis of Cost C ₃	2.34	2.35	2.44	2.35

Table 2: The table presented the per hectare costs and profitability measures of sugarcane cultivation across different farm size groups. The findings indicated that the overall average Cost C₃ was estimated at ₹74,230.03 per hectare, while the average gross income was recorded at ₹1,74,841.13 per hectare. Medium farms incurred the highest cultivation cost as well as the highest gross income compared to marginal and small farms. The average yield of sugarcane was observed to be 529.82 quintals per hectare, with medium farms achieving the highest productivity level of 602.14 quintals per hectare. Net returns over Cost C₃ were estimated at ₹1,00,611.09 per hectare on average, indicating that sugarcane cultivation was highly profitable. Family labor income, farm business income, and farm investment income were also found to be higher on medium farms, reflecting better resource utilization and management efficiency. The average cost of production was calculated at ₹140.20 per quintal, whereas medium farms recorded the lowest cost of production, suggesting economies of scale in cultivation. The overall benefit-cost ratio was estimated at 1.35, indicating that every rupee invested in sugarcane cultivation generated ₹1.35 as returns. Similarly, the input-output ratios across different cost concepts further confirmed the economic viability and profitability of sugarcane cultivation in the study area.

Conclusion

The study concluded that sugarcane cultivation played a significant role in enhancing the agricultural economy and farmers' income in the study area. The analysis of cost and return structure indicated that sugarcane cultivation was a capital-intensive enterprise requiring substantial investment in labor, seed, machinery, irrigation, and fertilizers. Among the various cost components, working capital, human labor, rental value of land, and seed constituted the major share of total cultivation expenses. The findings further revealed that medium farms incurred comparatively higher cultivation costs; however, they achieved greater productivity, higher

gross income, and superior profitability due to better resource utilization and economies of scale. The overall average yield of sugarcane was estimated at 529.82 quintals per hectare, while the average gross income and net return over Cost C₃ were recorded at ₹1,74,841.13 and ₹1,00,611.09 per hectare, respectively. The benefit-cost ratio of 1.35 demonstrated that sugarcane cultivation remained economically feasible and remunerative across all farm categories. The study also highlighted that medium farmers earned relatively higher family labor income, farm business income, and farm investment income compared to marginal and small farmers. Furthermore, the lower cost of production observed on medium farms reflected improved operational efficiency and better adoption of production practices. Despite the profitability of sugarcane cultivation, farmers continued to face challenges such as rising input prices, high labor costs, irrigation dependency, and fluctuations in market returns. Therefore, the study suggested the need for policy support in the form of timely input supply, improved irrigation facilities, access to modern technology, and assured remunerative prices to strengthen the sustainability and profitability of sugarcane cultivation, particularly for marginal and small farmers.

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