



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(9): 107-109
Received: 08-06-2026
Accepted: 12-07-2026

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Yield and economic performance of sugarcane growers in Vijayapura district of Karnataka: An empirical analysis

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9Sb.6495>

Abstract

Sugarcane is an important commercial crop in India, contributing significantly to farm income, rural employment, and agro-industrial development. Despite the availability of improved production technologies, sugarcane productivity and economic returns remain below potential levels in several regions, indicating the existence of considerable yield and performance gaps at the farm level. The present study was undertaken to assess the yield and economic performance of sugarcane growers and to analyze the extent of yield gap in Vijayapura district of Karnataka. An ex-post facto research design was adopted for the study. Indi and Sindagi taluks were purposively selected due to their larger area under sugarcane cultivation. A total sample of 120 sugarcane growers, comprising 60 small and 60 big farmers, was selected from six villages. Data were collected using a structured interview schedule. Yield performance was assessed through yield gap analysis, while economic performance was measured using cost of cultivation, gross income, net income, and benefit-cost ratio. The results revealed that the average cost of cultivation of sugarcane was ₹42,251 per acre, with a gross income of ₹94,020 per acre and net returns of ₹51,769 per acre. The overall benefit-cost ratio was 2.22, indicating that sugarcane cultivation is economically viable in the study area. Big farmers realized higher net returns (₹56,282 per acre) and benefit-cost ratio (2.29) compared to small farmers, reflecting better resource utilization and management practices. The yield gap was substantial, amounting to 52.75 per cent among small farmers and 46.79 per cent among big farmers, with a significant proportion of growers falling under medium to high yield gap categories. The study concludes that while sugarcane cultivation is profitable, bridging the yield gap through improved adoption of recommended technologies and strengthened extension support is essential for enhancing productivity and farm income.

Keywords: Sugarcane growers, economic performance, yield gap, small farmers, big farmers

1. Introduction

Agriculture continues to be a cornerstone of the Indian economy, playing a vital role in ensuring food security, generating employment, and sustaining rural livelihoods. Nearly two-thirds of India's population depends directly or indirectly on agriculture for its livelihood. The sector occupies about 43 per cent of the country's geographical area and contributes around 18.3 per cent to the national Gross Domestic Product, reflecting its enduring economic significance despite a relative decline in its share due to rapid growth in non-agricultural sectors. Indian agriculture is characterized by the cultivation of a diverse range of crops, including food grains, oilseeds, pulses, and commercial crops, among which sugarcane holds a prominent position owing to its high productivity, assured market, and strong agro-industrial linkages.

Sugarcane (*Saccharum officinarum*), belonging to the family Gramineae (Poaceae), is one of the most important commercial crops grown in India. At the global level, Brazil is the largest producer of sugarcane, followed by India, China, Mexico, and Thailand, with global production exceeding 650 million tonnes annually (Anonymous, 2021). In India, sugarcane forms the backbone of the sugar industry and also supports allied sectors such as jaggery, khandasari, and ethanol production, thereby contributing significantly to rural income and employment generation. The country produces about 35.5 crore metric tonnes of sugarcane annually, yielding nearly 3 crore metric tonnes of sugar, while domestic consumption was estimated at about 2.6

crore metric tonnes during 2020-21. Sugarcane occupies approximately 5.09 million hectares in India, with a production of 430.50 million metric tonnes and an average productivity of 82.50 tonnes per hectare.

Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh together account for nearly 90 per cent of the total sugar production in the country. Karnataka ranks as the third largest sugarcane-producing state, with about 4.23 lakh hectares under cultivation, producing 420.9 lakh metric tonnes and recording an average productivity of 96 tonnes per hectare. Within the state, major sugarcane-growing districts include Belagavi, Bagalkot, Vijayapura, Mandya, and Mysore. Vijayapura district occupies a significant position in sugarcane cultivation, covering an area of 38,920 hectares and supported by the presence of a sugar factory. The district records a production of about 4.32 lakh tonnes with an average productivity of 79 tonnes per hectare, which is comparatively lower than the state average.

Despite sustained research efforts over the past few decades leading to the development of improved varieties and recommended production technologies, the productivity and economic performance of sugarcane growers remain below their potential in several regions. The availability of scientifically proven technologies has not translated into commensurate gains at the farm level, largely due to gaps in awareness, partial or incorrect adoption of recommended practices, non-availability of critical inputs at the right time, and limited effectiveness of extension services. These constraints contribute to lower cane yields, reduced sugar recovery, and sub-optimal economic returns to growers.

Enhancing sugarcane yield and profitability therefore depends largely on the effective adoption of recommended production technologies and improved management practices. Farmers need to be adequately informed, motivated, and supported to adopt recent innovations in sugarcane cultivation. In this context, a comprehensive analysis of yield and economic performance of sugarcane growers is essential to identify existing performance levels and underlying constraints. The present study, conducted in Vijayapura district of Karnataka, is justified as it provides empirical evidence to support targeted extension interventions and policy measures aimed at improving productivity, profitability, and sustainability of sugarcane farming.

2. Methodology

The present study was carried out in Vijayapura district of Karnataka, which falls under the Northern Dry Zone of the state and is recognized as one of the major sugarcane-producing regions. Vijayapura district was selected purposively as sugarcane is cultivated extensively across all its taluks, namely Vijayapura, Basavana Bagewadi, Indi, Muddebihal, and Sindagi. Among these, Indi and Sindagi taluks were purposively selected for the study due to their relatively larger area under sugarcane cultivation compared to the other taluks. From each selected taluk, three villages with high sugarcane cultivation potential were identified, resulting in a total of six villages for the investigation.

An ex-post facto research design was adopted for the study, as the variables under consideration had already occurred and could not be manipulated by the researcher. This design was considered appropriate for systematically assessing yield and economic performance under existing field conditions. From each selected village, 20 sugarcane growers were chosen, comprising 10 small and 10 large farmers, using a proportionate random sampling procedure. Thus, the total sample size

consisted of 120 sugarcane growers drawn from two taluks and six villages. Data were collected using a well-structured interview schedule developed in consultation with experts in Agricultural Extension and Agronomy, ensuring content validity and relevance of the variables. Yield performance was assessed by estimating the yield gap, computed using the formula:

$$\text{Yield gap (\%)} = [(\text{Potential yield} - \text{Actual yield}) / \text{Potential yield}] \times 100.$$

Economic performance was measured through standard economic indicators such as gross income, net income, and benefit-cost (B:C) ratio. Gross income was calculated as the total value of sugarcane output, net income as the difference between gross income and total cost of cultivation, and the B:C ratio as the ratio of gross returns to total cost of cultivation (Sagar & G. M. Gaddi., 2021) (Shreya S. Hanji et.al., 2024) ^[11, 12].

The collected data were coded, tabulated, and analyzed using appropriate statistical tools, including frequency, percentage, mean, and standard deviation for descriptive analysis, and correlation analysis and Z-test for inferential interpretation.

3. Results and Discussion

Economic performance of Sugarcane growers

Table 1 presents data on the economic performance of both small and big sugarcane farmers. The total cost of production per acre was Rs 41,184 for small farmers and Rs 43,318 for big farmers. Small farmers achieved a gross income of Rs 88,440 per acre, while big farmers obtained a gross return of 99,660 Rs per acre. Consequently, the net returns for small farmers amounted to 47,256 Rs per acre, whereas big farmers garnered 56,282 Rs per acre in net returns. Small farmers exhibited a benefit-cost ratio of 2.14, while big farmers had a ratio of 2.29. (Priyanka Upreti & Alka Singh, 2017) ^[9]. Overall, the total cost of cultivation of sugarcane growers was 42,251 Rs per acre, with a gross return of 94,020 Rs per acre, resulting in net returns of 51,769 Rs per acre. Overall, the benefit-cost ratio for sugarcane growers was 2.22. (Elenchezian, et.al., 2024) ^[8]

Table 1: Economic performance of Sugarcane growers (n=120)

Sl. No.	Statements	Small farmers n ₁ =60	Big farmers n ₂ =60	Sugarcane growers n=120
1	Cost of production (Rs/acre)	41184	43318	42251
2	Gross income (Rs/acre)	88440	99600	94020
3	Net income (Rs/acre)	47256	56282	51769
4	B:C ratio	2.14	2.29	2.22

Yield gap analysis among Sugarcane growers

Yield gap refers to the difference between potential yield and actual farm yield of sugarcane. The potential yield of sugarcane is 78 tons/acre. But small farmers are getting actual yield of 36.85 tons/acre, which will lead to 41.15 tons/acre of yield gap as shown in Table 2. Big farmers are getting yield of 41.50 tons/acre, which shows 36.50 tons/acre of yield gap in that area (Divakaran, V. Keerthana & M. Udhayakumar. 2021) ^[4].

Small farmers had high yield gap compared to big farmers. The gap percentage was 52.75 per cent in small farmers and 46.79 per cent in big farmers. The higher yield gap may be a result lack of knowledge regarding advanced agricultural technologies, Poor management of pest and disease infestation and imbalanced nutrient application.

Table 2: Yield gap analysis among Sugarcane growers (n=120)

Category of farmers	Potential Yield (tons/acre)	Actual Yield (tons/acre)	Yield gap (tons/acre)	% of gap
Small farmers	78	36.85	41.15	52.75
Big farmers		41.50	36.50	46.79
Sugarcane growers		39.17	38.83	49.78

Overall yield gap among Sugarcane growers

The data in Table 3 indicates that overall yield gap among small and big sugarcane farmers. More than half of small farmers had high (58.34%) level of yield gap, followed by medium gap (30.00%) and low level of yield gap (11.66%). Where as in case of big farmers more than two fifth of big farmers had medium (41.66%) level of yield gap, followed by low gap (30.00%) and high level of yield gap (28.34%). When the pooled sample is considered, 43.33 per cent, 35.84 per cent and 20.83 per cent of sugarcane growers possessed high, medium and low level of yield gap respectively. This might be due to small farmers had limited knowledge about recommended technologies, lack of motivation and resource crunch compared to big farmers. Furthermore, there is a consistent, moderate level of production performance that consistently leads to lower yields. As a result, it is imperative to improve the knowledge of sugarcane growers and encourage the adoption of all recommended agricultural practices in order to narrow the yield gap. These results are in conformity with the findings of Singh.

Table 3: Overall yield gap among Sugarcane growers

Level of yield gap (%)	Small farmers (n1=60)		Big farmers (n2=60)		Sugarcane growers (n=120)	
	No.	%	No.	%	No.	%
Low (< 45.25)	07	11.66	18	30.00	25	20.83
Medium (45.25-54.27)	18	30.00	25	41.66	43	35.84
High (> 54.27)	35	58.34	17	28.34	52	43.33
Mean: 49.76 SD: 9.01						

4. Conclusion

The study concludes that sugarcane cultivation in Vijayapura district is economically profitable for both small and big farmers, with higher returns and benefit-cost ratios observed among big farmers due to better resource use and management practices. However, a substantial yield gap persists, particularly among small farmers, indicating underutilization of recommended production technologies. Strengthening extension support and improving adoption of scientific practices are essential to bridge the yield gap and enhance productivity and farm income sustainably.

Acknowledgements

A brief acknowledgement section may be given after the conclusion section just before the references. The acknowledgments of people who provided assistance in manuscript preparation, funding for research, etc. should be listed in this section. All sources of funding should be declared as an acknowledgement. Authors should declare the role of funding agency, if any, in the study design, collection, analysis and interpretation of data; in the writing of the manuscript. If the study sponsors had no such involvement, the authors should so state.

Competing interests

The authors express their sincere gratitude to the sugarcane growers of Vijayapura district, Karnataka, for their wholehearted cooperation and valuable information provided during the course of the study. The authors are also thankful to the faculty members of the Department of Agricultural Extension for their guidance, constructive suggestions and constant encouragement.

Authors' Contributions

The first author designed the study, developed the research framework, performed the statistical analysis, and prepared the first draft of the manuscript. The second author assisted in data collection, managed the analysis of the study, and contributed to interpretation of the results. The third author supervised the research work, guided the methodology, and managed the literature review. All authors read, reviewed, and approved the final manuscript.

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