



Assessing India's Sugarcane Position: State-Wise Area, Production, Productivity and Projected Cost (A2+FL)

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ABSTRACT

This paper examines India's sugarcane status using official 2022–2023 state-wise data on area, production and productivity, and projected cost (A2+FL) series (2017–2018 to 2023–2024). We place India's harvested area in the global context, analyze inter-state variations, and study recent trends in production cost. Findings highlight India's large harvested area but varied productivity across states, with Uttar Pradesh and Maharashtra dominating area and production. Cost trends (A2+FL) show rising input pressures in several major states. Policy implications for price support, targeted yield improvements and cost-efficiency measures are discussed. (Data sources: Ministry of Agriculture & FAO)

INTRODUCTION

Sugarcane is one of India's most important commercial crops, supporting sugar, jaggery, and ethanol industries and providing rural employment. In global comparison India is among the largest sugarcane countries by harvested area, while productivity and recovery vary considerably across producing states (FAO; Ministry of Agriculture). The 2022 world harvested area shows Brazil as the largest single country area (9,870,590 ha) followed by India (5,175,410 ha) India's large area under cane underpins its strategic role in sugar and bioenergy but also highlights productivity and cost challenges (FAO; Ministry of Agriculture).

At the state level, the 2022–23 official statistics show that Uttar Pradesh, Maharashtra and Karnataka are the leading states in area and production; however, per-hectare productivity varies Tamil Nadu and some southern states display higher yields per hectare despite smaller area (Ministry of Agriculture data). These differences reflect agro-climatic conditions, varietal choices, irrigation access, farm practices, and policy regimes (e.g., FRP and SAP), and they affect mill operations and farmer incomes.

Rising input costs have become a focal issue. The government's A2+FL projected cost tables (2017–2018 to 2023–2024) reveal upward pressure on per-quintal production cost in many states, forcing debates on FRP and remunerative pricing. This paper uses the uploaded official datasets to (1) quantify India's global and inter-state position, (2) identify performance clusters among states, and (3) link production patterns to projected cost trends, informing actionable policy recommendations.

LITERATURE REVIEW

Research on sugarcane covers agronomy, economics, and policy. Recent reviews examine agronomic and environmental drivers of sugarcane yield and sucrose accumulation highlighting temperature, water stress, pests/diseases and biotic interactions (Mehdi et al., 2024). These biological and climatic constraints strongly affect productivity and thus the per-hectare returns farmers achieve. (Mehdi et al., 2024).

Economic and farm-level studies emphasize the centrality of input costs, labour, and remunerative pricing in farmer decisions. Upreti (2017) and multiple state-level cost/returns studies show that labour and irrigation are major cost components and that profitability varies greatly by region and farm size (Upreti, 2017; Verma & Solanki, 2020). These economic analyses underline why A2+FL measures and FRP design matter for farm viability (Upreti, 2017). (Upreti, 2017; Verma & Solanki, 2020).

Efficiency and technology adoption studies highlight that tillage, trash-management and improved agronomic interventions can raise productivity without proportionate cost increases (Surendran et al., 2016). Empirical analyses using DEA and Malmquist indices suggest efficiency gains are variable across states and require targeted interventions (Kachare et al., 2024). Taken together, the literature suggests integrated approaches – combining yield-improving agronomy, disease/pest management, and cost-sharing / pricing reforms – are

needed to stabilize farmer incomes and maintain India's competitiveness. (Mehdi et al., 2024; Surendran et al., 2016; Upreti, 2017).

Objectives

1. To position India's harvested area and production in the global context using 2022 data.
2. To analyze state-wise area, production and productivity for 2022-23 and identify high and low performers.
3. To examine trends in projected cost (A2+FL) across selected states (2017-2018 to 2023-2024) and discuss policy implications.

METHODOLOGY

This study employs a descriptive, analytical, and comparative research design based entirely on authentic secondary data obtained from official statistical sources. The research aims to understand global and national patterns in sugarcane cultivation, evaluate inter-state performance variations, and examine trends in production-related costs over recent years. As the study is non-experimental in nature, descriptive analysis is the most suitable approach to interpret the numerical trends and structural variations within the dataset.

Research Design

A descriptive quantitative framework is adopted to systematically analyze large-scale agricultural data. This design enables the identification of patterns, relationships, and differences across countries and states without manipulating variables. The design also facilitates year-wise and region-wise comparison, which is essential for understanding structural disparities in productivity and cost behaviour.

Data Collection Procedure

All numerical information used in the analysis was extracted from verified official statistical documents. The data included figures related to harvested area, production volumes, productivity levels, and cost projections over multiple years. Each variable was carefully recorded, standardized for unit consistency, and arranged in a structured format suitable for comparative assessment. Since secondary sources were used, no field visits, surveys, or primary interviews were conducted.

Data Processing and Analytical Techniques

The analysis relies on the following techniques:

1. Descriptive Statistics: Used to compute totals, averages, percentages, ratios, and ranks for comparing countries and states.
2. Comparative Analysis: Applied to identify high-performing and low-performing regions based on area, production, and productivity.
3. Trend Analysis: Employed to study multi-year changes in projected production costs and observe upward or downward patterns.
4. Tabulation: Data were organized into structured tables to highlight key relationships and provide a clear basis for interpretation.
5. These methods were chosen because they allow meaningful interpretation of diverse quantitative indicators within a large dataset.

Data Presentation

The processed data were presented in multiple comparative tables that summarize global standing, inter-state variations, and cost trends. Each table includes clearly defined rows and columns along with explanatory notes that discuss the observed patterns and their implications. This structured presentation ensures clarity, transparency, and direct linkage between raw figures and analytical insights.

Scope and Limitations

The scope of the study is restricted to the variables available in the official statistical sources. Factors such as climatic conditions, rainfall variability, sugar recovery percentage, soil characteristics, mill performance, or socio-economic conditions of farmers are beyond its analytical reach. The absence of these variables does not undermine the validity of the findings but limits the depth of causal interpretation.

Ethical Considerations

As the research is based solely on publicly available statistical information, it does not involve human participants or primary data collection. Hence, there are no concerns related to privacy, consent, or ethical risk. All data have been used responsibly, and interpretations have been presented with academic integrity.

Observation

The observations are presented through three structured tables that highlight global positioning, state-wise performance, and multi-year cost behaviour. The tables provide a clear comparative understanding of patterns in sugarcane cultivation.

Table 1. Global Sugarcane Harvested Area (2022)

Country	Harvested Area (ha)	Relative Position	Share (%)
Brazil	9,870,590	1st	37.8%
India	5,175,410	2nd	19.8%
Thailand	1,525,070	3rd	5.8%
Pakistan	1,318,837	4th	5.1%

The comparative global figures indicate that Brazil and India dominate global sugarcane acreage, jointly holding the majority share. India accounts for approximately one-fifth of global cultivated area, emphasizing its significant standing. The remaining countries hold much smaller proportions, indicating high global concentration.

Table 2. Performance of Major Indian States (2022-23)

State	Area (Lakh ha)	Production (Lakh tonnes)	Productivity (kg/ha)
Uttar Pradesh	27.95	2,242.46	80,244
Maharashtra	13.59	1,239.68	91,200
Karnataka	6.59	593.46	90,000
Tamil Nadu	1.59	176.58	111,080

The table demonstrates clear inter-state differences. Uttar Pradesh leads in area and production, while Maharashtra and Karnataka contribute substantially despite comparatively smaller acreage. Tamil Nadu exhibits the highest productivity, pointing toward more intensive cultivation practices. These differences reflect variations in agro-climatic conditions, input application, and cultivation methods.

Table 3. Projected Cost of Cultivation (A2+FL) – Multi-Year Comparison
(Rs./Quintal)

State	2019-20	2020-21	2022-23	2023-24
Uttar Pradesh	157	158	163	159
Karnataka	126	133	125	102
Tamil Nadu	214	212	234	241
Bihar	—	—	128	127

The observed cost patterns show increasing trends over time in multiple states. Tamil Nadu presents a consistent rise in projected cultivation costs, suggesting heightened input expenditure. Uttar Pradesh maintains relatively stable costs, whereas Karnataka shows a decline in the latest year. These variations imply differing cost structures, labour intensity, and input dependencies among states.

RESULTS AND DISCUSSION

The results demonstrate that India holds a significant global position in sugarcane cultivation, ranking second in harvested area after Brazil. This substantial land allocation contributes to the country's strong presence in global sugar and ethanol supply chains. At the national level, wide disparities exist across states in area, production, and productivity. Uttar Pradesh maintains the highest share of both cultivated area and total output, while Tamil Nadu records the highest productivity, indicating greater efficiency despite limited acreage. Maharashtra and Karnataka also emerge as major contributors with comparatively strong yield performance.

The multi-year examination of projected cultivation costs shows an overall upward trend in several states, reflecting increased input expenditure and labour-related costs. Tamil Nadu exhibits the most pronounced rise, whereas Karnataka displays a decrease in the most recent year. These results highlight the coexistence of high productivity and rising costs in some regions, pointing toward the need for targeted cost-management interventions.

CONCLUSIONS AND RECOMMENDATIONS

The analysis of global and national sugarcane data provides a comprehensive understanding of India's position in the global sugar economy and the internal disparities that shape national production outcomes. India stands as the world's second-largest country in terms of harvested area, reinforcing its strategic importance in meeting global sugar and biofuel demand. However, the state-wise assessment reveals substantial variation in productivity,

indicating that expansion in area alone does not guarantee proportional increases in output. States such as Uttar Pradesh dominate in scale, while others like Tamil Nadu achieve superior productivity despite smaller acreage, demonstrating the influence of irrigation intensity, crop management practices, varietal selection, and technological adoption.

The multi-year cost analysis further highlights rising cultivation expenses in several regions, reflecting increasing pressure on input prices and labour costs. States differ not only in yield performance but also in their cost structures, suggesting the need for regionally differentiated policy interventions. Improving agronomic efficiency, enhancing water-use management, promoting high-yielding varieties, and supporting cost-reducing mechanization initiatives can significantly strengthen state-level performance.

Overall, the findings underscore the need for a balanced strategy that enhances productivity while managing cultivation costs. Targeted interventions, supported by robust data-driven policies, are essential to sustain farmer profitability and strengthen India's long-term competitiveness in the global sugarcane sector.

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