

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 869-874

Received: 21-04-2026
Accepted: 25-05-2026

Indexed Journal
Peer Reviewed Journal

Major constraints affecting sugarcane cultivation in Andhra Pradesh: Suggestions to enhance area

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6k.3788>

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Abstract

Sugarcane is an important commercial crop cultivated in Andhra Pradesh and constitutes one of the major agricultural crops alongside paddy, pulses, and others. However, during recent years, the area under sugarcane cultivation has been witnessing a continuous decline. In this backdrop, the present study examines the constraints encountered by farmers that have contributed to the reduction in cultivable area and the declining profitability of sugarcane cultivation. The major constraints identified include labour scarcity, low yields, non-remunerative cane prices, delayed payments, escalating cost of cultivation, and incidence of pests and diseases. The Garrett Ranking Technique was employed to ascertain the relative importance of these constraints based on farmers' preferences. The findings revealed that labour shortage emerged as the most critical challenge owing to the acute scarcity of agricultural labourers in villages and increasing migration towards towns and urban centres. This was followed by non-remunerative sugarcane prices, irregular and delayed payments by sugar industries, high cultivation costs, low productivity, and pest and disease incidence. The study suggests that farmers should increasingly adopt mechanization to mitigate the adverse effects of labour scarcity. Furthermore, the government should take proactive measures to enhance the price margin in favour of farmers and ensure timely payments from sugar industries. In addition, sugar industries and agricultural department officials should provide appropriate technical guidance to farmers for effective management of pests and diseases and for reducing cultivation costs, thereby enabling farmers to achieve sustainable and profitable yields.

Keywords: Sugarcane, sugar industries, labour scarcity, mechanization, cost of cultivation

1. Introduction

Sugarcane is a multipurpose commercial crop cultivated in India, and the country is the second-largest producer of sugarcane in the world after Brazil. Sugarcane is used in the production of sugar, jaggery, khandsari, and several by-products such as molasses and ethanol-blended petrol.

Among the sugarcane-producing states in India, Uttar Pradesh is the largest producer of sugarcane, with a production of 2,12,920 thousand tonnes, followed by Maharashtra with 1,09,990 thousand tonnes during 2024–25 (Cooperative Sugar, January 2026) ^[4]. The climatic conditions of the country are suitable for sugarcane cultivation throughout the year; however, the area under sugarcane cultivation and its production have been fluctuating since 2000–01 (Cooperative Sugar, January 2026) ^[4]. Consequently, industries dependent on sugarcane as a primary raw material for processing have been adversely affected.

The Indian sugar industry plays a crucial role in the overall economic growth of the country through its diversified products and its contribution to rural livelihoods by providing remunerative prices to sugarcane farmers and

generating employment opportunities. In 2014–15, there were 538 sugar factories in the country (Cooperative Sugar, August 2022) ^[3]. This number declined to 506 in 2020–21 and subsequently increased to 534 in 2024–25 (Cooperative Sugar, January 2026) ^[4]. Maharashtra and Uttar Pradesh contribute the major share of total sugar production in India, while the remaining share comes from states such as Tamil Nadu, Karnataka, Gujarat, and Andhra Pradesh. Sugar production and exports in India have been cyclical in nature however, the country continues to maintain surplus production.

Surplus sugar production exceeding domestic consumption, coupled with low exports due to subdued international sugar prices, has resulted in the accumulation of sugar stocks within the industries and reduced profit realization from sugar sales. This situation has adversely affected the financial health of sugar industries and led to the accumulation of pending cane price payments to farmers. Simultaneously, the sugar industry has been facing challenges such as stagnant sugarcane productivity and low sugar recovery at the national level (Solomon, 2016) ^[8]. Moreover, farmers continue to rely predominantly on

traditional methods and equipment for sugarcane cultivation. The inadequate level of mechanization in India is primarily attributed to small landholdings and financial constraints among farmers. Although several modern machines are highly efficient and beneficial, many farmers are unable to afford them individually. In this context, the introduction of costly agricultural machinery through Custom Hiring Centres can significantly support farmers in accessing mechanized services and deriving the benefits of modern farm machinery (Bee and Rahman, 2020) [2].

In Andhra Pradesh, sugarcane growers are also facing considerable uncertainty in receiving their arrear payments from sugar industries. Increasing cost of cultivation, coupled with delays in farm operations due to labour scarcity, has emerged as a major constraint for farmers. At the same time, sugar industries have limited control over the quantity and quality of sugarcane supplied by growers and are confronted with problems such as low cane yields, short crushing seasons, and poor sugar recovery. Another significant challenge faced by the sugar industry is the underutilization of by-products from sugar mills, as many industries lack additional processing units for the production of value-added products such as ethanol-blended petrol and related by-products. Owing to these constraints, industries are unable to generate sufficient returns to meet their operational expenses. Consequently, farmers are gradually reducing the area under sugarcane cultivation, while several sugar industries are simultaneously ceasing their operations. In this context, the present study assumes considerable importance in identifying the major constraints affecting both farmers and industries and in suggesting suitable policy measures for the sustainable development of the sugarcane sector with following objectives

1. To assess the area, production and yield changes.
2. To observe the socio-economic profile of sample farmers
3. To compare the cost return structure of sugarcane in plant and ratoon crops
4. To identify major constraints faced by farmers.

2. Methodology

A multistage sampling technique was adopted for the selection of primary sampling units. The districts of Srikakulam, Anakapalle, Eluru, Krishna, and Chittoor from Andhra Pradesh state were purposively selected as they had sugar factories. From each district, the mandal supplying the highest quantity of sugarcane to the respective sugar factories was selected. Subsequently, farmers from each mandal were selected randomly, constituting a total sample size of 70 farmers for the study.

Both primary and secondary data were collected to fulfil the objectives of the study. Primary data were gathered through field surveys using the interview method with the help of a well-structured and pre-tested schedule. Secondary data relating to area, production, and productivity were obtained from the Department of Agriculture and Farmers Welfare.

Tabular analysis was employed to compute percentages and

facilitate meaningful comparisons for deriving valid results. Further, the Garrett Ranking Technique was used to prioritize the constraints faced by sugarcane cultivators in Andhra Pradesh. The major constraints identified during the preliminary survey were arranged in ascending order and converted into ranks using Garrett's formula. These ranks were subsequently transformed into scores with reference to Garrett's ranking table.

Garrett's formula for converting ranks into percent is given by:

$$\text{Percent position} = \frac{100 * (R_{ij} - 0.50)}{N_j}$$

where

R_{ij} = Rank given for i^{th} item by j^{th} farmer

N_j = Number of items ranked by j^{th} farmer

0.5 subtracted from R_{ij} as rank is an interval on a scale and its mid-point best represents an interval.

The constraint with highest score value was considered the most important problem faced by sample farmers.

3. Results and Discussion

3.1 Area, production and productivity of sugarcane

The status of sugarcane cultivation in Andhra Pradesh was analyzed in terms of area, production, and yield (Table 1) for short period from 2022-23 to 2024-25 as districts reorganization was done in 2022, which unable to get data for previous period. The area under sugarcane cultivation in the state declined significantly by 45.63 per cent, decreasing from 40,430 ha in 2022-23 to 21,980 ha in 2024-25. A similar declining trend was observed across all the selected districts. Among the five districts, Eluru recorded the highest reduction in area (64.58%), followed by Anakapalle (62.98%), Krishna (40.18%), Srikakulam (25.26%), and Chittoor (24.42%).

A corresponding decline was also observed in sugarcane production due to the area decline, which decreased by 32.83 per cent in Andhra Pradesh during the same period. Among the selected districts, Eluru registered the highest decline in production (62.39%), followed by Anakapalle (55.11%), Krishna (33.47%), Srikakulam (28.11%), and Chittoor (20.81%).

In contrast, sugarcane yield in the state increased by 22.13 per cent from 2022-23 to 2024-25. However, Srikakulam district recorded a decline in productivity of 4.54 per cent, which may be attributed to poor soil conditions, inadequate crop management practices, and climatic fluctuations. Among the remaining districts, Anakapalle registered the highest improvement in productivity (21.29%), followed by Krishna (10.80%), Eluru (6.69%), and Chittoor (4.80%).

The findings indicate that sugarcane productivity can be enhanced through the efficient utilization of human labour, machinery, fertilizers, and insecticides, along with an increase in farm size (Upreti and Singh, 2017) [10].

Table 1: Area, production and yield particulars in sample districts

District	Area ('000 Ha.)			Production ('000 Tonnes)			Yield (Kg/Ha.)			% Area	% Production	% Yield
	2022-23	2023-24	2024-25	2022-23	2023-24	2024-25	2022-23	2023-24	2024-25			
Anakapalle	15.91	8.45	5.89	936.03	546.88	420.19	58822	64705	71346	62.98	55.11	21.29
Chittoor	7.82	6.12	5.91	734.22	582.48	581.43	93866	95244	98372	24.42	20.81	4.80
Eluru	1.44	1.34	0.51	138.07	127.47	51.93	96018	94972	102446	64.58	62.39	6.69
Krishna	3.26	2.18	1.95	353.33	239.27	235.08	108551	109797	120279	40.18	33.47	10.80
Srikakulam	0.95	0.69	0.71	85.26	52.27	61.29	90222	75965	86123	25.26	28.11	4.54*
Andhra Pradesh	40.43	27.50	21.98	2955.72	2213.85	1985.32	73893	80533	90242	45.63	32.83	22.13

Note: * indicating decreased percentage of yield from 2022-23 to 2024-25

Source: Department of Agriculture and farmers welfare ^[5]

3.2 Socio economic characteristics of farmers

Table 2: Socio economic characteristics of sample farmers (n = 70)

Particulars	Frequency	Percentage (%)
Age group (years)		
Young aged (<35)	11	15.71
Middle aged (36 – 50)	30	42.86
Old aged (>50)	29	41.43
Total	70	100.00
Education level		
Illiterate	11	15.71
Primary Education (up to 5 th class)	13	18.57
Secondary Education (6 th to 10 th class)	39	55.72
Intermediate and above	7	10.00
Total	70	100.00
Total landholding (ha)		
<1	21	30.00
1-2	32	45.71
>2	17	24.29
Total	70	100.00
Land holding (ha) under sugarcane		
<1	35	50.00
1-2	21	30.00
>2	14	20.00
Total	70	100.00
Farming experience in sugarcane		
<10 years	13	18.57
10-20 years	29	41.43
>20 years	28	40.00
Total	70	100.00
Annual income		
Up to 50000/-	24	34.29
50001-100000/-	26	37.14
>100000/-	20	28.57
Total	70	100.00
Major sources of income		
Agriculture	49	70.00
Others (non-agriculture)	21	30.00
Total	70	100.00

As presented in Table 2, the majority of the sample farmers belonged to the middle-aged category (42.86%), followed closely by the old-aged group (41.43%), while only 15.71 per cent of the respondents were young farmers. The relatively lower representation of young farmers indicates their declining interest in agriculture, as many prefer to pursue alternative occupations perceived to offer greater economic opportunities. Consequently, sugarcane cultivation is predominantly undertaken by middle-aged and elderly farmers.

With respect to educational attainment, more than half of

the respondents (55.72%) had completed secondary education, followed by primary education (18.57%), illiteracy (15.71%), and intermediate education and above (10.00%). This distribution suggests that even individuals with formal education are increasingly reluctant to engage in farming as a primary livelihood activity.

The analysis of landholding patterns revealed that 45.71 per cent of the farmers possessed total landholdings ranging from 1 to 2 hectares, followed by those owning less than 1 hectare (30.00%) and more than 2 hectares (24.29%). Regarding the area allocated to sugarcane cultivation, half of the respondents (50.00%) cultivated sugarcane on less than 1 hectare, while 30.00 per cent and 20.00 per cent cultivated the crop on 1–2 hectares and more than 2 hectares, respectively. Although approximately 70 per cent of the farmers owned more than 1 hectare of land, only 50 per cent devoted more than 1 hectare to sugarcane cultivation. This trend reflects the waning preference for sugarcane cultivation among farmers.

The findings further indicated that 41.43 per cent of the respondents possessed 10–20 years of experience in sugarcane cultivation, followed by those with more than 20 years of experience (40.00%) and less than 10 years of experience (18.57%). The predominance of middle-aged and elderly farmers in the sample is reflected in the substantial proportion of respondents having over a decade of experience in sugarcane farming.

Regarding annual income, 37.14 per cent of the respondents earned between ₹50,001 and ₹1,00,000 per annum, followed by those earning up to ₹50,000 (34.29%) and those earning more than ₹1,00,000 (28.57%). Agriculture constituted the major source of income for 70.00 per cent of the farmers, whereas the remaining 30.00 per cent derived a larger share of their income from non-farm sources such as poultry enterprises, salaried employment, and business activities.

3.3 Cost of Cultivation of farmers

The cost of cultivation of sugarcane was estimated separately for plant and ratoon crops and the results are presented in Table 3. The analysis revealed that human labour constituted the largest component of the total cultivation cost, accounting for 55.20 per cent and 64.39 per cent of the total cost in plant and ratoon crops, respectively. This highlights the labour-intensive nature of sugarcane cultivation, particularly in ratoon management.

In the case of the plant crop, input costs represented the second-largest cost component, accounting for 22.97 per cent of the total cultivation cost, followed closely by machine labour at 21.70 per cent. In contrast, machine labour constituted the second-largest expenditure in ratoon

crops, accounting for 22.56 per cent, while input costs contributed only 13.05 per cent. The relatively lower share of input costs in ratoon cultivation can be attributed primarily to the lesser seed material expenses, which form a significant proportion of input costs in plant crops. The negligible contribution of seed cost (2.09%) in the ratoon crop was mainly due to the limited use of seed material for gap filling of plant gaps caused by mortality of sugarcane stools.

Table 3: Costs and returns particulars of farmers

Particulars	Planted	Percentage	Ratoon	Percentage
A. Operational Cost				
i) Human labour	128807	55.20	126564	64.39
ii) Animal labour	307	0.13	0	0.00
iii) Machine labour	50625	21.70	44346	22.56
Total	179739	77.03	170910	86.95
B. Input cost				
Seed	29224	12.52	4104	2.09
Fertilizer	21655	9.28	20077	10.21
Pesticide/Insecticide	2712	1.17	1463	0.75
Total	53591	22.97	25644	13.05
Total A+B	233330	100.00	196555	100.00
Yield (tonnes/Ha.)	87.78		83.70	
Gross income (Rs./ Ha.)	284319		270351	
Net income (Rs./Ha.)	50990		73797	
Return on Investment	1.22		1.38	

The productivity analysis indicated that the plant crop recorded a higher yield of 87.78 tonnes per hectare compared to 83.70 tonnes per hectare in the ratoon crop. Consequently, the gross returns realized from the plant crop (₹2,84,319 per hectare) were higher than those obtained from the ratoon crop (₹2,70,351 per hectare). However, the total cost of cultivation was also substantially higher in the plant crop (₹2,33,330 per hectare) compared to the ratoon crop (₹1,96,555 per hectare). Despite generating lower yields and gross returns, the ratoon crop produced higher net returns of ₹73,797 per hectare, whereas the plant crop yielded net returns of ₹50,990 per hectare. The superior profitability of the ratoon crop was primarily due to its considerably lower cultivation cost. This advantage was further reflected in the return on investment (ROI), which was higher for the ratoon crop (1.38) than for the plant crop, indicating greater economic efficiency and profitability of ratoon cultivation under the prevailing conditions. Apart from constraints like late payments, escalating cost of cultivation etc. were forced them into shifting of sugarcane cane crop to another crop.

3.4 Constraints of farmers

Production and marketing constraints were identified during the study and the sample farmers were subsequently asked to rank these constraints according to their perceived severity and importance during primary data collection. The findings presented in Table 4 revealed that labour shortage emerged as the most critical constraint faced by sugarcane farmers. However, majority of the operations were done by manually (Kishore *et al.*, 2017) ^[6]. This issue was primarily attributed to the declining availability of agricultural labour in rural areas and the increasing migration of workers to towns and cities in search of better employment opportunities and higher wages.

Table 4: Constraints faced by Sugarcane farmers

Constraints	Sum score	Average	Rank
Labour shortage	4404	62.91	1
Lower yields	2938	41.97	5
Non remunerative price	3381	48.30	2
Delay in payments	2978	42.54	3
Higher cost of cultivation	2964	42.34	4
Pest and Diseases	2517	35.96	6

Rapid urbanization has further intensified this problem, as employment in sectors such as construction provides more stable, year-round income compared to the seasonal nature of agricultural work. Consequently, a substantial proportion of the rural workforce has shifted away from agriculture, leading to an acute shortage of labour in villages and posing significant challenges to complete timely farm operations in sugarcane cultivation.

The second most important constraint identified by the farmers was the non-remunerative price of sugarcane. Although the Government announces the Fair and Remunerative Price (FRP) for sugarcane, farmers perceived that the prevailing price was insufficient to offset the continuously rising cost of cultivation (Arun and Premkumar, 2022) ^[1]. The cost of production has increased substantially over the years, primarily due to acute labour scarcity and limited mechanization of key farm operations such as propping, earthing-up, and harvesting. While mechanized harvesting is available, the high rental charges associated with harvesting machinery reduce its economic advantage, as it mainly saves time rather than significantly lowering production costs.

Labour scarcity, coupled with inadequate mechanization, has resulted in increased demand for agricultural labour, compelling farmers to offer higher wages to ensure the timely completion of intercultural and harvesting operations (Rana *et al.*, 2021) ^[7]. Consequently, escalating labour expenses have become a major contributor to the rising cost of sugarcane cultivation. Furthermore, fluctuations in input prices and the increasing cost of production inputs adversely affect the profitability of sugarcane farming (Thibane *et al.*, 2023) ^[9].

Delayed payment by sugar factories emerged as the third most significant constraint. Farmers often experience considerable delays in receiving payment after supplying cane to sugar mills, creating liquidity problems and limiting their ability to finance subsequent crop operations. As a result, many farmers are compelled to sell their produce to local jaggery manufacturing units, where the prices offered are generally lower than those provided by sugar factories. Higher cultivation costs and lower crop yields were also reported as major constraints affecting sugarcane production. In Andhra Pradesh, a substantial proportion of the sugarcane area is cultivated under rainfed conditions, making crop performance highly dependent on rainfall variability. Consequently, yields are often lower than those achieved in major sugarcane-producing states. However, labour wages and input costs remain comparable across regions, resulting in higher production costs relative to output and thereby reducing profitability.

In addition, pest and disease incidence was identified as an important factor contributing to yield reduction. Farmers reported that inadequate adoption of recommended crop

management practices, including crop rotation, efficient irrigation management, and timely intercultural operations, adversely affected crop performance. These challenges, together with unfavourable climatic conditions such as excessive rainfall, negatively impacted plant growth and development, ultimately leading to lower productivity and economic returns from sugarcane cultivation.

4. Conclusion

The analysis revealed a substantial decline in sugarcane cultivation in Andhra Pradesh during 2022–23 to 2024–25, as reflected by the significant reduction in both area and production across all selected districts. Despite the contraction in cultivated area, sugarcane productivity improved at the state level, indicating better resource utilization and adoption of improved production practices. The increase in yield partially compensated for the decline in area, although district-level variations in productivity were evident. These findings suggest that enhancing input use efficiency, mechanization, and crop management practices can further improve sugarcane productivity and sustainability in the state.

The socio-economic profile of sugarcane growers indicates that cultivation is predominantly carried out by middle-aged and elderly farmers with considerable farming experience, while the participation of younger farmers remains limited. Although most respondents possessed moderate educational attainment and landholdings, only a smaller proportion of their land was allocated to sugarcane, reflecting a declining preference for the crop. Agriculture continues to be the primary source of income for the majority of farmers, despite the growing importance of non-farm income sources.

The study revealed that sugarcane cultivation is highly labour-intensive, with human labour constituting the largest share of cultivation costs in both plant and ratoon crops. Although the plant crop recorded higher yields and gross returns, its substantially higher cultivation cost reduced overall profitability. In contrast, the ratoon crop generated higher net returns and return on investment due to its lower production cost, demonstrating its superior economic efficiency. Therefore, ratoon cultivation emerged as a more profitable and cost-effective option for sugarcane farmers under the prevailing conditions.

The study identified labour shortage as the most severe constraint affecting sugarcane cultivation, driven by rural labour migration and inadequate mechanization of farm operations. Non-remunerative cane prices and delayed payments from sugar factories further reduced farmers' profitability and created financial constraints. High cultivation costs, low yields under rainfed conditions, and pest and disease incidence also emerged as major challenges to limiting productivity and economic returns. Addressing these constraints through improved mechanization, timely payments, remunerative pricing, and better crop management practices is essential for the sustainability of sugarcane cultivation.

5. Suggestions

5.1 Promote Mechanization in Sugarcane Cultivation

Subsidies and custom hiring centres should be strengthened to facilitate access to machinery for operations such as

planting, earthing-up, propping, and harvesting. Farmer groups and cooperatives may be encouraged to collectively utilize farm machinery to reduce labour dependence and cultivation costs.

5.2 Ensure Remunerative Pricing for Sugarcane

The Fair and Remunerative Price (FRP) should be periodically revised in line with the increasing cost of cultivation. State governments may consider providing additional incentives or bonuses to farmers during periods of high input costs.

5.3 Facilitate Timely Payments by Sugar Factories

Strict enforcement of payment schedules should be ensured to avoid delays in cane bill settlements. Mechanisms for direct and transparent transfer of payments to farmers' accounts may be strengthened.

5.4 Enhance Productivity through Improved Crop Management

Extension agencies should intensify farmer training on recommended production practices, including integrated nutrient management, efficient irrigation methods, crop rotation, and ratoon management. Adoption of high-yielding, pest- and disease-resistant sugarcane varieties should be promoted.

5.5 Strengthen Pest and Disease Management

Regular monitoring and timely advisory services should be provided to farmers for effective pest and disease control. Integrated Pest Management (IPM) practices should be widely disseminated and adopted.

5.6 Improve Water Management

Expansion of micro-irrigation systems such as drip irrigation should be encouraged through financial assistance and awareness programmes. Rainwater harvesting and water conservation measures should be promoted, particularly in rainfed sugarcane-growing areas.

5.7 Support Youth Participation in Agriculture

Entrepreneurship opportunities in sugarcane-based enterprises, mechanization services, and value-added products should be promoted to attract younger generations to agriculture. Skill development programmes focusing on modern farming technologies may increase youth involvement in the sector.

5.8 Encourage Profitable Ratoon Management

Since ratoon crops were found to be more profitable than plant crops, farmers should be educated on scientific ratoon management practices to maximize yields and returns. Incentives may be provided for maintaining healthy ratoon crops and adopting recommended ratoon management technologies.

6. Policy Implication

A coordinated approach involving government agencies, sugar factories, research institutions, and extension organizations is essential to address labour scarcity, rising cultivation costs, low profitability, and productivity constraints. Such interventions can enhance the economic

viability and long-term sustainability of sugarcane cultivation in Andhra Pradesh.

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