

"Harnessing The Potential Of Sugarcane Bagasse In Indian States: A Strategic Pathway For Economic Growth And Energy Independence"

Sarang Madhukar Kapse*

*Deputy Manager (MM), STEEL Authority of India/ MIT world peace university Email ID: sarang.kapse54@gmail.com

Abstract

India, as the second-largest producer of sugarcane, generates an enormous amount of bagasse—a by-product with immense industrial potential. This paper evaluates how major sugarcane-producing states like Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh can leverage bagasse to produce ethanol, electricity, green coal, and animal feed. It further analyses the economic implications, environmental benefits, and necessary policy interventions to transform bagasse from an underutilized residue to a national economic asset.

Keywords: Bagasse, Sugarcane, Ethanol Production, Biofuel, Green Coal, Animal Feed, Cogeneration, Renewable Energy, India, Sugar Industry, Enzymatic Treatment, State-wise Potential, Economic Contribution, Sustainable Development, Energy Independence, Pollution Reduction, Waste Valorization, Ethanol Blending, Agricultural Residue, Rural Employment

1. Introduction

Sugarcane, primarily grown for sugar production, leaves behind bagasse—constituting approximately 25% of the sugarcane weight. Bagasse is rich in cellulose and hemicellulose, making it suitable for energy generation and ethanol production. Despite India's vast sugarcane output, bagasse is underutilized, with much of it burned in inefficient boilers, contributing to air pollution. This research explores how targeted utilization across states can support India's economic and energy goals.

State	Sugarcane Production (MT)	Estimated Bagasse (MT)
Uttar Pradesh	177	44.25
Maharashtra	75	18.75
Karnataka	35	8.75
Tamil Nadu	30	7.50
Andhra Pradesh	25	6.25
Others (Combined)	50	12.50
Total	392	97.00

2. State-wise Sugarcane Production and Bagasse Potential

Note: 1 ton sugarcane \rightarrow 250 kg bagasse

3. Economic Value from Ethanol and By-products

- Using the Micro biogen enzymatic model:
- 1 MT bagasse → 655 litters of ethanol
- 97 MT bagasse \rightarrow 63.6 billion litters ethanol/year

Estimated Annual Value:

Product	Quantity	Approx. Market Price	Total Value (INR)
Ethanol	63.6 billion liters	₹60/liter	₹3.81 lakh crore
Green coal	~1.32 tons/MT bagasse	₹5,000/ton	₹6.40 lakh crore
Animal feed	~1.16 tons/MT bagasse	₹3,000/ton	₹3.38 lakh crore
Total			₹13.59 lakh crore

4. State-wise Economic Contribution

State	Ethanol Output (BL)	Value (₹ Crore)
Uttar Pradesh	28.99	1,739.4
Maharashtra	12.28	736.8
Karnataka	5.74	344.4
Tamil Nadu	4.91	294.6
Andhra Pradesh	4.10	246.0

5. Environmental and Strategic Benefits

- Reduces Crude Oil Imports: Replacing fossil fuels with ethanol reduces India's fuel bill.
- Lower Carbon Emissions: Ethanol blending cuts vehicular emissions significantly.
- Waste-to-Wealth Conversion: Utilizing agricultural waste creates sustainable income streams.
- Job Creation: Processing units for ethanol, feed, and green coal will boost rural employment.

6. Policy Recommendations

- Mandatory Ethanol Blending Targets: Enhance to 20%+ blending by 2030.
- Incentivize Ethanol Units in Top States: With capital subsidies and tax relief.
- Ban Open Bagasse Burning: To curb pollution and encourage conversion.
- PPP Models for Bagasse-to-Biofuel Plants: Encourage private investment in rural bio-refineries.
- R&D Support: Promote enzyme-based bagasse treatment methods.

7. Conclusion

India holds the potential to emerge as a global leader in bio-based energy and products using sugarcane bagasse. By strategically leveraging its top sugarcane-producing states, India can reduce fuel imports, boost the rural economy, generate employment, and meet its environmental targets. The integration of ethanol production into state-level industrial policy will be critical to harnessing this untapped resource.

8. References

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