

REVIEWER'S REPORT

Manuscript No.: IJAR- 58403

Title: Forecasting Production Pattern of Sugar, Molasses, Bagasse and Pressmud in India using ARIMA Model

Recommendation:

Accept as it is

Accept after minor revision.....

Accept after major revision

Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality		✓		
Clarity			✓	
Significance			✓	

Reviewer Name: **ANAPANA GOPAL**

Reviewer's Comment for Publication.

General Comments

The manuscript applies the Auto Regressive Integrated Moving Average (ARIMA) model to forecast the production of sugar and its major by-products (molasses, bagasse, and pressmud) in India using historical data from 1999–2019. The study is relevant because accurate production forecasting is essential for policy formulation, industrial planning, renewable energy development, and efficient utilization of sugar industry by-products. The manuscript provides forecasts up to 2029–30 and discusses their implications for ethanol production, cogeneration, and sustainable agriculture.

The manuscript is generally well structured and the forecasting approach is appropriate. However, several methodological aspects require clarification, statistical validation needs improvement, and the discussion should be strengthened. Therefore, **minor to moderate revision** is recommended before publication.

Moderate Comments

1. Novelty should be clearly justified

The manuscript states that forecasting of sugar by-products using ARIMA has not been widely reported. However, the authors should clearly explain:

- the specific research gap,
- how this study differs from previous forecasting studies,
- the practical contribution of forecasting all four products simultaneously.

2. Data source and preprocessing require clarification

The manuscript mentions data collected from 1999–2019 but does not sufficiently describe:

- complete data sources,
- data consistency,
- handling of missing values,
- preprocessing procedures,
- stationarity testing before model development.

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These details are essential for reproducibility.

3. ARIMA model selection needs stronger justification

Although ARIMA (2,1,1) was selected as the best model, the manuscript should explain:

- how model orders (p, d, q) were selected,
- ACF and PACF analysis,
- stationarity tests (ADF or KPSS),
- residual diagnostics,
- Ljung–Box test results.

These are standard procedures in time-series forecasting.

4. Model validation should be strengthened

The study compares predicted and observed values, but additional validation metrics are recommended, including:

- Mean Absolute Percentage Error (MAPE) interpretation,
- Root Mean Square Error (RMSE),
- Mean Absolute Error (MAE),
- prediction intervals,
- out-of-sample validation or cross-validation.

A graphical comparison between observed and predicted values would also improve the presentation.

5. Forecast uncertainty is not discussed

The forecasts are presented as single-point estimates.

The manuscript should include:

- 95% confidence intervals,
- uncertainty analysis,
- possible effects of climate change,
- policy changes,
- market fluctuations,
- technological advancements on future forecasts.

6. Discussion requires greater scientific depth

The discussion mainly explains forecasted trends.

The authors should compare their findings with:

- previous ARIMA studies,
- machine learning forecasting models,
- exponential smoothing,
- hybrid ARIMA models,
- LSTM or other AI-based forecasting approaches.

7. Practical implications should be expanded

The manuscript briefly discusses ethanol and renewable energy.

Additional discussion should include:

- implications for sugar mill management,
- supply chain planning,
- export policy,

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- carbon neutrality,
- circular bioeconomy,
- resource optimization.

Minor Comments

Abstract

- Mention the model validation statistics.
- Briefly explain the practical significance of the forecasts.
- Avoid repeating numerical values unnecessarily.

Keywords

Consider adding:

- Time series forecasting
- ARIMA
- Bioeconomy
- Ethanol
- Renewable energy
- Agricultural forecasting

Introduction

The introduction provides useful background but contains several lengthy paragraphs.

Condense the discussion on the sugar industry and emphasize the research objectives more clearly.

Methodology

Please include:

- software used,
- model assumptions,
- residual normality,
- autocorrelation diagnostics,
- forecast evaluation procedure.

Tables

The tables are informative but require improved formatting.

Consider:

- highlighting the selected model,
- improving table readability,
- maintaining consistent decimal places.

Figures

The manuscript would benefit from additional graphical presentation, including:

- time-series plots,
- ACF and PACF graphs,
- residual plots,
- forecast trend graphs with confidence intervals.

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Language

The manuscript requires professional English editing.

Several issues include:

- grammatical errors,
- repetition of sentences,
- inconsistent terminology,
- punctuation,
- formatting inconsistencies.

References

Please verify:

- uniform citation style,
- DOI formatting,
- consistency in journal names,
- completeness of publication details,
- inclusion of more recent forecasting studies.

Strengths

- Relevant topic with significant economic importance.
- Appropriate use of ARIMA forecasting methodology.
- Covers both sugar and major industrial by-products.
- Practical implications for biofuel and renewable energy sectors.
- Comprehensive historical dataset.
- Useful information for policy makers and industry.

Weaknesses

- Limited methodological details.
- Insufficient model validation.
- Forecast uncertainty is not addressed.
- Discussion lacks comparison with recent forecasting techniques.
- No graphical representation of forecasts.
- English language and formatting require improvement.

Recommendation

Minor to Moderate Revision