

Rice production, prices and export dynamics in Maharashtra

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Abstract

Rice is a widely cultivated crop in Maharashtra, and the ideal climate and adequate rainfall of the Konkan region are favourable for rice production. It is observed that nearly 32 districts of Maharashtra cultivate rice. For 2023, Maharashtra recorded rice production of nearly four million metric tons. Despite its significance and substantial area under cultivation, Maharashtra is facing challenges in sustaining rice marketing. The study examines the impact of prices and production on rice export. From the Engle-Granger cointegration analysis, the authors found that price and production significantly influence rice exports in the long term.

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Keywords: Rice export, Agricultural marketing, Rice production, Rice price, Engle-Granger cointegration.

1. Introduction

Agriculture is essential to the nation's quicker and sustainable economic development. In a developing country like India, it's quite obvious that nearly 50% of the workforce is engaged in agriculture, as it works as a predominant occupation for livelihood. Over the past four decades, India has experienced outstanding progress in the field of agriculture; production has increased from 51 million tonnes (mt) in 1950-51 to 332.22 million tonnes in 2023-24. Rice is among the major food crops

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in Maharashtra, especially in the Konkan region, which has a climate considered ideal for paddy cultivation. In Vidarbha and isolated sections of western Maharashtra, irrigation further improves the rice-growing belts. Maharashtra, as compared to giant rice-producing states such as Punjab, West Bengal, and Uttar Pradesh, still adds enough contribution to keeping food security and gross production of rice [1], [2]. The primary income source of thousands of farmers in Maharashtra is Rice, and hence it is the biggest support to rural livelihood. It also provides food safety and quality to millions of consumers and adds a substantial portion to the agricultural GDP of the state. Along with domestic consumption, rice has become an important export earner for the state by increasing foreign exchange [3] and contributing to the economy of Maharashtra. Climate change, changing market prices, global trade dynamics, export-import policies, and decisions have come up as the primary concerns for all policymakers and stakeholders for rice production in Maharashtra. Such interactions are necessarily understood for achieving a belief of balancing food stability, farmers' welfare, and economic development.

2. Literature Review

[4] Highlighted the various innovative agricultural methods, like the usage of bio-fertilisers and integrated pest management for enhanced productivity and environmental health. Considering all other aspects, it is beneficial to understand the problems involved in maintaining the crucial agro ecosystem. [5] Reveal that in dealing with market access and trade barriers, policymakers have to consider some aspects of rice cultivation and production. Similarly, [1] for reducing the exploitation by middlemen, there must be effective agricultural marketing policies. Along with this, irrigation management must be incorporated. On the other hand, [6] expectations and obstacles prevailing in Indian agricultural marketing give a key historical view of how agricultural practices changed in India in the 1930s. [3] Trade liberalisation and private sector imports have upgraded food security in Bangladesh, specifically during the period of low production. In striving for a balance between food availability and supporting local farmers, it highlights the need for a flexible strategy in rice trading. [7] The link between agricultural output and procurement prices gives insight into how policies and measures related to the government can crucially influence agricultural market dynamics. [8] Ensures that investment in the research and development needs to be focused on yield growth, specifically in the eastern and southern regions

of India. [9] Analysed how a change in trade policy influenced agriculture in India as a crucial sector of the Indian economy, along with foreign trade, and gave a perception through India and world prices comparison of agricultural commodities.

3. Methodology and Data

The study evaluates the impact of rice prices and production on Maharashtra's rice export, with the help of regression analysis, correlation, and Engle-Granger co-integration analysis. In this particular study, the researcher has selected rice as a combination of both basmati and non-basmati varieties. Correlation analysis gives a good insight into the type of relationship between rice production, prices, and the export volume of rice. From the regression equation (1) given below, researchers have carried out the results for the factors influencing rice export in Maharashtra state. Current research revolves around the main aim of knowing the impact of price and production on the volume exported of rice since researchers have selected a period of 7 years from 2017-18 to 2023-24. For this period of study and to get accurate results, the Engle-Granger cointegration analysis is a well-grounded method to evaluate the long-term impact or type of association between the study variables. Since the data availability is referred from the various sources, researchers gathered data from these sources, namely, the Directorate General of Commercial Intelligence and Statistics (DGCIS). APEDA export statistics, NIRYAT portal, Government of Maharashtra, and AGMARKNET. The following Regression equation is used to analyse the impact of production and prices of rice on exports.

$$\text{Rice Exports} = \alpha + \beta_1 \text{Production} + \beta_2 \text{Price} + \varepsilon \quad (1)$$

Where, α = Intercept, β_1 = Coefficient of rice production, β_2 = Coefficient of rice prices, ε = Error term

4. Results and Discussion:

Rice export is significantly influenced by rice production and price. The price of rice in the domestic market has a crucial effect on the export determination of the crop. Lower prices, many times helped with subsidies or production surplus, enhance competitiveness and promote exports; on the other hand, higher prices make the crop less tempting in global markets and bring down the number of exported quantities [9]. The international

change in price even affects the probable revenue of exporting nations. Reduced global prices may restrict exportability or force exporters to lower these prices; yet, increasing global prices above domestic prices uplifts exports. Production of rice is another factor that has an impact on the export of rice. Higher productivity is achieved from the use of high-yielding varieties and enhanced irrigation facilities, which in turn enhances a country's potential to export rice [8].

a) *Scatter plot:*

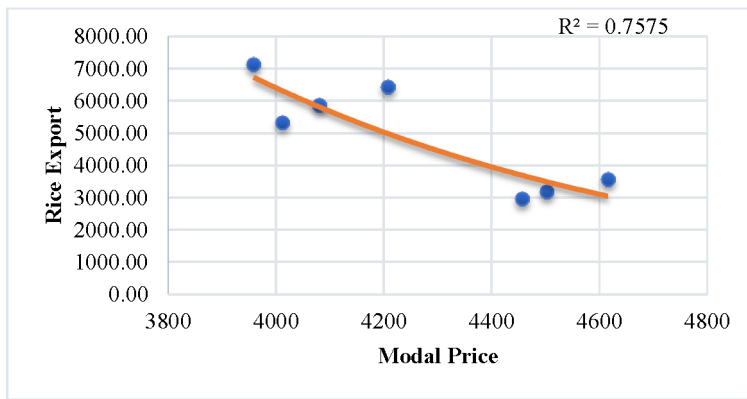


Figure 1
Relationship between Rice prices and Export volume

Figure 1 shows a negative relationship between modal rice prices and the export volume of rice. With rising rice prices, it is observed that there is a falling export volume, which accords with some economic theory in that higher prices reduce demand in international markets. This reveals that fluctuation in the modal prices explains about 77 per cent of the spread in rice export volume. The general outcome of this analysis is the need for mechanisms to balance the local pricing with export performance, as increasing rice prices will lower the capacity for export competitiveness.

Figure 2 demonstrates that there is no association between the volume of rice exported (in crores) and the production of rice (in tonnes), as indicated by the graph. A very low value of (R^2) as 0.005. Changes in production would hardly affect export quantities. The scatterplot shows that export quantities remain relatively stable with changes in levels of output, and the regression line is almost flat. This implies that more factors

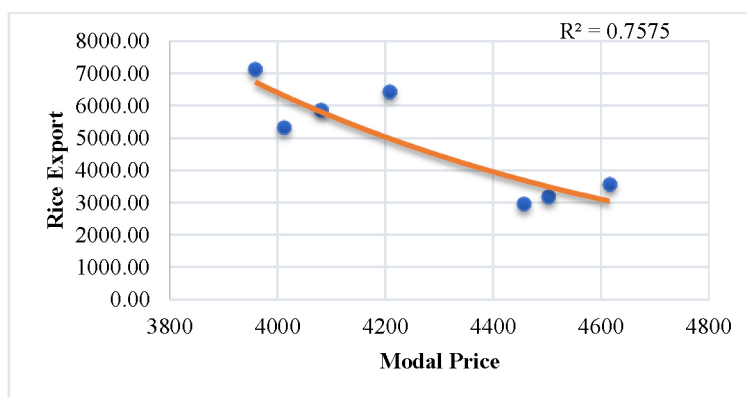


Figure 2

Relationship between Rice prices and Export volume

are at play, such as demand internationally, pricing strategies, trade policies, or market forces, and that these contribute significantly more to rice exports. It is not likely that merely an increase in output would improve export performance; rather, competitive strategies and external market conditions have to take centre stage for export results to be improved [8].

b) Correlation Analysis:

Table 1
Correlation Matrix

	Rice Exports (Cr)	Modal Price	Production (Tonnes)
Rice Exports (Cr)	1	-0.873	0.0657
Modal Price	-0.8735	1	-0.0164
Production (Tonnes)	0.0657	-0.0164	1

The correlation matrix presented in Table 1 depicts the relationship between output in tonnes, the modal price, and rice export in crores. Where the modal price and rice export have a significant negative relation, i.e., -0.8736, means that when the Modal price increases by 1 unit, rice export tends to decrease by 0.87. Here, we can say that the reduced export volume reflects weaker demand for exports because of increased prices. On the other hand, a slightly positive correlation, i.e., 0.0657, between rice exports and production means from the dataset, we can say that changes

in production have the slightest direct effect on rice exports. Modal price and production are also negatively correlated, showing a lesser impact of production on modal price. The above results suggest modal price significantly influences the export of rice, and from the data, it seems production of rice doesn't play any strong role in determining either exports or pricing [7].

c) Regression Analysis:

For equation (1), the regression results are as follows,

Table 2
Multiple Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	27948.63	7761.02	3.6011	0.0227
Production	0.000271	0.0012	0.2124	0.8421
Price	-5.5982	1.5522	-3.6064	0.0228
R-squared	0.7658	Mean dependent var		4926.25
Adjusted R-squared	0.6487	S.D. dependent variable		4926.25

Source: Calculated by the author on EViews

Table 2 presents the result for multiple regression, using both Price and Production as independent variables, this seeks to identify the factors that influence rice exports. Although this is an unlikely situation, in the real world, the answer has come out to be 27,948.63 for the intercept, which is the level of rice exports at a time when production and price are also zero. While production's coefficient indicates a very slight positive association with rice exports, it is statistically insignificant. Price's coefficient, conversely, indicate that there is a very significant negative effect on rice exports (p -value = 0.0226), meaning reduced exports are a consequence of increased prices. The value of R^2 is 0.7658; the model has a strong fit. Durbin-Watson statistic value is 2.146; no evidence of autocorrelation in the dataset. Conclusively, in the model, only price is the significant predictor, as it explains the inconsistency of rice exports. The production variable is not significant in the model of prediction. Still, the model works well on the available data, in addition to increasing the estimation power and general dependability, some other variables might be introduced for the current model.

d) *Engle-Granger cointegration analysis:*

Cointegration is the best tool to check whether there is a long-term impact of one variable on another. Here, we will check the long-term impact of prices and production of rice in Maharashtra on the export of rice in Maharashtra. The results are,

Table 3
Engle–Granger Cointegration Test

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.766956	0.0145
Test Critical Values:	1% Level		-3.007406	
	5% Level		-2.021193	
	10% Level		-1.597291	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Error (-1)	-1.364414	0.493110	-2.766956	0.0395
R-squared	0.584582	Mean dependent var		263.6943
Adjusted R-squared	0.584582	S.D. dependent variable		1272.777
S.E. of regression	820.3414	Akaike info criterion		16.40833

Source: Calculated by the author on EViews

From the Table 3 Engle-Granger Cointegration test, we can see that the given ADF test results confirms that the residuals are likely stationary. Therefore, rice export, production, and prices move together in the long run, despite short-run deviations [5]. However, from ADF test Equation, we can see the result that rice price and production have a significant influence on the rice export of Maharashtra.

5. Conclusion

An analysis of the impact of rice production and pricing on the state's rice exports is expected to throw up new vital information about the dynamics of agricultural marketing in the state. The study underlines how productively linked all three levels are—that is, production level, export volume, and rice prices mean changes in the model prices drastically affect export performance. As demonstrated by the study, the connection between rice production and pricing goes beyond oneness to show a long-term relationship in exhibiting its influence on export results through

thorough analysis that includes correlation and Engle-Granger cointegration techniques. Though more production does not necessarily lead to larger export quantities, according to this particular study, enhancing export competitiveness requires both favourable international market conditions and systematic domestic pricing methods. The study comes to an end by highlighting the need for a united approach to agricultural marketing by considering the dynamics of domestic and international markets [6]. Maharashtra can benefit its economy and the welfare of the farmers by encouraging a sustainable environment for agriculture by utilising the capability of rice production [2]. To strengthen knowledge of this domain, future work should frequently examine how mutually dependent relationships within market forces affect export performance and agricultural policies.

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Conflict of Interest:

The authors confirm that there is no conflict of interest.

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