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Export dynamics and trade direction of non-basmati rice: An Indian perspective

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Abstract

The study examines the positive and significant growth rates in the area, production, productivity, export quantity, and export value of rice in India. Among country-wise exports of non-basmati rice, the highest growth rates were recorded in Guinea and South Africa, while the United Arab Emirates exhibited the lowest annual growth rate. Senegal emerged as a moderately stable market for Indian non-basmati rice, with a retention probability of 0.43. The study concludes that the growth and export performance of non-basmati rice are critical for developing strategic policies to enhance rice exports, given the crop's substantial contribution to the Indian economy and the challenges associated with its international trade.

Keywords: Export, growth rate and Markow chain analysis

Introduction

India is one of the world's leading producers and exporters of rice, with both basmati and non-basmati varieties playing significant roles in its agricultural economy. Non-basmati rice, which includes a wide range of varieties such as Sona Masuri, Parboiled rice, IR-64, and others, constitutes a major share of India's total rice exports. Unlike basmati rice, which is prized for its fragrance and long grains, non-basmati varieties are valued for their versatility, affordability, and adaptability to different cuisines and markets. Over the years, demand for Indian non-basmati rice has grown steadily across Asia, Africa, the Middle East, and parts of Europe, driven by population growth, food security needs, and India's competitive pricing. The Government of India, through policies and export promotion measures, has also played a crucial role in enhancing the global footprint of non-basmati rice. Understanding the dynamics of non-basmati rice exports is vital for analyzing India's agricultural trade patterns, rural income generation, and its role in global food supply chains.

Methodology

The present study relied on secondary data, covering the period from 1991-1992 to 2020-21, sourced from various secondary sources. These include the Agricultural and Processed Food Products Export Development Authority (APEDA), Directorate General of Commercial Intelligence and Statistics (DGCI&S), Department of Commerce, Ministry of Commerce and Industry, Government of India,

Directorate General of Foreign Trade, World Trade Integrated Solutions, DIC, and the Joint Department of Agricultural Office in Thane, among others. For analysis, the collected data were organized and examined using appropriate statistical and economic tools. Additionally, formulas and add-ons in MS Excel, as well as the statistical software Lingo were employed to facilitate further analysis.

Analytical tools

Estimation of Growth Rates

The growth rates in area, production, yield; export of Non Basmati Rice in India was studied by using compound growth rates.

The growth rate was estimated using following model

$$Y = a \cdot b^t \quad (1)$$

Where,

Y = Dependent variable for which growth rate is to be estimated

(Quantity exported/export value/unit value)

a = Intercept

b = Regression Coefficient

t = Time Variable

This equation was estimated after transforming (1) as follows,

$$\text{Log } y = \log a + t \text{ Log } b \tag{2}$$

Then the percent compound growth rate (g) was computed using the relationship.

$$\text{CGR (g)} = (\text{antilog } b - 1) \times 100 \tag{3}$$

The significance of the regression coefficient was tested using the student ‘t’ test.

Markov chain analysis

The trade directions of Non-Basmati rice export were analyzed by using the first order Markov chain approach. Central to Markov chain analysis is the estimation of transitional probability matrix P. The elements P_{ij} of the matrix P indicates the probability that export was switch from country i to country j with the passage of time. The diagonal elements of the matrix measure the probability that the export share of a country was retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country to a particular country’s export.

In the context of the current application major Non Basmati rice importing countries were considered. The average exports to a particular country was considered to be a random variable which depends only on the past export to that country which can be denoted algebraically as

$$E_{jt} = \sum_{i=1}^r (E_{it-1} * P_{ij} + e_{jt})$$

Where,

E_{jt}= Exports from India to jth country during the year t

E_{it-1} = Exports to ith country during the period t-1

P_{ij}= Probability that the exports will shift from ith country to jth country

e_{jt} = The error term which is statistically independent of E_{it-1}

t = Number of years considered for the analysis

r = Number of importing countries

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix have the following properties

$$0 \leq P_{ij} \leq 1$$

$$\sum_{i=1}^n P_{ij} = 1 \text{ for all } j$$

Thus, the expected export shares of each country during period ‘t’ was obtained by multiplying the export to these countries in the previous period (t-1) with transitional probability matrix.

Results and Discussion

Compound growth rate of area, production and productivity of rice in India

The information on performance of rice with respect to production and export for a period from 1999-2000 to 2020-21 is presented in table 1. The study period was divided into three sub periods i.e., Period I (1991-92 to 2004-2005), Period II (2005-2006 to 2020-21) and overall period (1991-92 to 2020-21).

Table 1: Compound annual growth rate of area, production and productivity of rice in India

Sr. No	Period	Area (000 ha)			Production (000 Tons)			Productivity (kg/ha)		
		CAGR	R ²	t-value	CAGR	R ²	t-value	CAGR	R ²	t-value
1	Period I	0.10 ^{NS}	0.023	0.55	1.06**	0.33	2.57	0.96**	0.46	3.35
2	Period II	0.23*	0.19	1.81	2.06***	0.87	9.96	1.83***	0.92	13.35
3	Overall	0.13**	0.18	2.52	1.65***	0.87	14.19	1.52***	0.91	18.10

(***, ** and * denotes significance at 1 percent 5 percent and 10 percent level, respectively)

Period I: 1991-92 to 2004-05

Period II: 2005-06 to 2020-21

Overall Period: 1991-1992 to 2020-21

The area under rice cultivation in India showed an increase of 0.13 percent per annum during the overall study period, with a slightly higher growth rate of 0.23 per annum observed in Period II. Rice production increased at an annual rate of 1.65 percent, primarily driven by yield improvements of 1.52 percent per annum across the study period. Specifically, production growth rates stood at 1.06 percent, 2.06 percent, and 1.65 percent per annum during Period I, Period II, and the overall period, respectively. Similarly, rice yields improved annually by 0.96 percent, 1.83 percent, and 1.52 percent during the same respective periods. Throughout the study period, positive compound

growth rates were recorded for area, production, and productivity. Among these, production exhibited the highest compound growth rate of 1.65 percent per annum, followed by productivity at 1.52 percent and area at 0.13 percent per annum.

Growth rate in production and export of Non-Basmati rice

Table 2 provides insights into the export of non-basmati rice from India. Senegal emerged as the leading export destination, with a notable compound annual growth rate (CAGR) of 51.12 percent in quantity and 48.85 percent in value over the entire study period. Both growth rates were statistically significant at the one percent level, underscoring Senegal's importance as a key market for India's non-basmati rice exports.

Table 2: Country wise Compound Annual Growth Rate of Export value of Non-Basmati Rice from India for overall period (1991-92 to 2020-21)

Sr. No.	Name of Country	Export Quantity		Export Value		Export Value		Quantity (MT)	Cumulative percent share
		CAGR	R ²	CAGR	R ²	CAGR	R ²		
1	Senegal	51.12***	0.28	48.85***	0.34	47.89***	0.90	265078 (13.05)	15.77
2	Benin	51.48***	0.64	53.91***	0.70	48.41***	0.69	251298 (12.37)	15.77
3	Nepal	46.39***	0.44	47.08***	0.54	45.96***	0.56	25149 (1.23)	44.57
4	Bangladesh	26.25**	0.17	28.26***	0.25	21.81***	0.13	587735 (28.94)	52.98
5	Cote d ivory	60.48***	0.50	57.18***	0.58	61.5***	0.61	198488 (9.77)	56.23
6	Guinea	81.66***	0.59	73.32***	0.64	77.39***	0.64	138245 (6.80)	61.53
7	South Africa	24.56***	0.19	26.76***	0.25	25.79***	0.82	224300 (11.04)	75.61
8	UAE	7.59***	0.26	14.66***	0.59	12.91**	0.49	123799 (6.09)	83.88
9	Somalia	30.06 ***	0.27	32.66**	0.38	38.16***	0.44	139690 (6.87)	87
10	Togo	43.46***	0.24	43.18***	0.32	42.08***	0.31	76841 (3.78)	91.82
Total								2030623	

(*** denotes significance at 1 percent, level, respectively &Fig. in parentheses indicate percentage to total)

Benin exhibited remarkable growth in non-basmati rice imports from India, with statistically significant increases of 51.48 percent in quantity and 53.91 percent in value during the study period. Guinea and Cote d'Ivoire also emerged as key destinations for non-basmati rice exports, registering notable compound annual growth rates (CAGR) in both quantity and value, all significant at the one percent level. Collectively, Senegal, Benin, Nepal, Bangladesh, Cote d'Ivoire, Guinea, South Africa, the UAE, and Somalia accounted for 91.82 percent of India's average non-basmati rice exports. These countries demonstrated consistently positive and significantly increasing growth rates, ranging from 7.59 percent per annum (UAE) to an impressive 60.48 percent per annum (Cote d'Ivoire) in both quantity and value. Given their substantial contribution and growth potential, these markets should be prioritized in policy formulation. Strategic efforts to further enhance exports to these countries are essential to sustain and expand India's non-basmati rice export footprint.

Transitional probability matrix of Non-Basmati rice Export from India

Transitional probability matrix of Non-Basmati rice export from India is given in table 3.

Table 3: Transitional probability matrix of Non-Basmati rice Export from India

Country	Senegal	Benin	Nepal	Bangladesh	Cote d ivory	Others
Senegal	0.43	0.56	0	0	0	0
Benin	0.03	0.12	0.26	0	0.04	0.19
Nepal	0	0.01	0.35	0.59	0.021	0.018
Bangladesh	0.06	0	0.57	0.21	0.15	0
Cote d ivory	0	0.18	0	0.53	0.15	0.12
others	0	0.067	0	0	0.41	0.52

The table indicates that Senegal and Nepal were moderately stable markets for Indian non-basmati rice, with transitional probability values of 0.43 and 0.35, respectively. In contrast, other major importers such as Benin, Bangladesh, and Cote d'Ivoire were identified as unstable markets for Indian rice. Additionally, the group of other countries collectively had a transitional probability value of 0.52.

Conclusion

The study highlights key findings related to rice production and non-basmati rice exports from India. Overall, India

recorded positive and statistically significant growth rates in the area, production, and productivity of rice. However, in the Konkan region of Maharashtra, these growth rates were negative and statistically insignificant. In terms of non-basmati rice exports, Guinea and Côte d'Ivoire showed the highest growth rates as import destinations, while the United Arab Emirates recorded the lowest. Senegal emerged as a consistent importer, maintaining 43% of its previous share. The findings emphasize that non-basmati rice holds significant export potential, and focused efforts to enhance production and productivity are essential for strengthening India's position in the global rice market.

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