

Research Paper

# Growth Instability and Comparative Advantage in Export of Indian Rice

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## ABSTRACT

India is the second largest producer and leading exporter of rice in the international market. More than 60 per cent of the world's population depends on rice as one of their main sources of food, and it contributes significantly to agriculture. Factors like introduction of high yielding and quality varieties along with suitable rice production technologies during the Green Revolution period has enhanced the Indian rice production and also trade liberalization is positively influenced the Indian rice export. So, present study explored the growth rate, instability and comparative advantage in export of basmati and non-basmati rice. The study used secondary data of rice export for the period 2001-02 to 2019-20. Result of the study revealed that export of basmati rice was registered higher growth at rate of 19.96 per cent as compare to non-basmati of 12.63 per cent per annum. Both basmati and non-basmati rice shows high degree of instability in export but basmati rice was found more stable (43.98 per cent) than non-basmati with 63.46 per cent instability during the study period. The result also indicated that except USA all countries had greater than one value of revealed comparative advantage and positive value of revealed symmetric comparative advantage during the study periods. The estimated value of RCA for India had increased from 8.14 in 2001-02 to 13.14 in the year 2019-20 indicated India had comparative advantage during whole study period.

## HIGHLIGHTS

- Both basmati and non-basmati rice shows high degree of instability in export but basmati rice was found more stable than non-basmati.
- India had comparative advantage during whole study period.

**Keywords:** Basmati, Growth rate, Instability, RCA and RSCA

Rice plays an important part in people's diet, especially in India. The most important reason for its popularity is that it is rich and offers ample energy to the body. There is an extensive range of rice available and each of them has a unique aroma, taste, and properties. India having the largest area under rice in the world and in case of production it is next to China. Rice contributes 42 per cent of total food grains production and 45 per cent of cereal production in the country. The major rice

cultivating states in India are Uttar Pradesh, West Bengal, Punjab, Bihar, Assam, Haryana, Tamil Nadu, Odisha and Chhattisgarh, together constitute over 80 percent of the rice production in India. The production of rice was

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increased from 74.3 million tons in 1990-91 to 120 million tons in 2020-21. Most of this increase was the result of an increase in area as well as yields. India is the world's largest rice exporting country in the world. Other rice exporters include Thailand, Vietnam, Pakistan, USA, China, Italy and Burma. These 8 countries accounted more than 85 percent of the total value of annual global rice exports. On the global market, Indian rice is in high demand. The increased demand for rice on the global market is creating a favourable atmosphere for Indian rice exports. Indian agriculture made a significant contribution to world food production, with rice having the biggest percentage of export value among agricultural products (Karunakaran N, 2013).

India has been a significant exporter of rice since the early 80's, but the country has observed a remarkable increase only after the implementation of new economic policy (Kumar M, 2019). India largely exports two types of rice – Basmati and Non-Basmati Rice. While both are quite common, there are several varieties of rice that are largely exported globally. The production during 2021-22 was higher by 25.33 MMTs over the previous 5 years. Indian rice exports reached 9.66 Billion USD in 2021-22 as compared to 8.82 Billion USD during previous year. The global markets for Indian rice are highly dynamic and the barriers to trade are being lowered gradually all around the world (Singh, 2001). The export of rice is also related with the buffer stock of rice held by the government. Because of comfortable buffer stock, India became a major exporter. There is a strong demand for Indian rice in the international markets. The increasing consumer demand for rice and India's strength for production of basmati as well as non-basmati rice, coupled with liberal export policy, and large public stock have created ample scope for rice export. In recent years, the African countries have also shifted to Indian non-basmati rice because of price competitiveness (Adhikari *et al.* 2013). India accounted for 70 per cent of the international trade in basmati rice, while Pakistan accounted for the remaining 30 per cent. Extra-long slender grains, distinct flavor, and superior aromatic quality make India's basmati rice unique and highly competitive in the global market (Sadavatti, 2006).

As per the latest data, India exported rice to 150 countries globally from 2021-22. Having the largest share of the global rice trade, India is expanding its rice export footprint in Asia, Africa, and the European Union. India exports majorly to Iran, Iraq, UAE, Saudi Arabia, and the USA along with other countries.

## MATERIAL AND METHODS

The study was based on secondary time series data of export of rice in value term from 2001-02 to 2019-20. The data was collected from various sources and official website of Agricultural and Processed Food Product Export Development Authority (APEDA), Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce and Industry, India Agristate etc.

### 1. Growth rates analysis

The annual compound growth rate in exports of basmati and non-basmati were worked out by using the exponential function of the form (Adhikari *et al.* 2016):

$$Y_t = ab_t U_t$$

By taking logarithms on both sides, the equation takes the form.

$$\text{Log } Y = \text{Log } a + t \text{Log } b + \text{Log } U_t$$

Where,

$Y_t$  = Dependent variable (export value)

$t$  = Time (Independent variable  $t = 1, 2, \dots, n$ )

$a$  = Intercept and

$b$  = Regression coefficient

$U_t$  = Error terms with usual assumptions

Compound growth rate was worked out as follows:

$$\text{C.G.R. } (r) = [(\text{antilog of log } b) - 1] \times 100$$

Students' test was used for testing the significance of growth rates.

## 2. Instability analysis

Cuddy-Della index is a commonly employed for estimating the magnitude of instability in exports. The index was originally developed by John Cuddy and Della Valle for measuring the instability in time series data (Cuddy and Della Valle, 1978). This index is a better measure compared to coefficient of variation, as it is inherently adjusted for trend, often observed in time series data. It is also superior over other scale dependent measures of deriving the standard deviation or root mean square of the residuals obtained from the fitted trend lines of the raw data, and hence it was suitable for cross comparisons.

The magnitude of instability in export of rice was worked out by using the following methods:

The Instability Index ( $I_x$ ) was measured as follows:

$$\text{Instability Index } (I_x) = CV\sqrt{1 - \bar{R}^2}$$

Coefficient of variation (C. V) was calculated as follows:

$$\text{Coefficient of Variation (C.V)} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (\bar{X})} \times 100$$

$$CV = \frac{\sqrt{\frac{\sum (X - \bar{X})^2}{N}}}{\bar{X}} \times 100$$

Where,

Adjusted  $R^2$  = Coefficient of determination

$N$  = No. of observations

The magnitude of the instability index was explained under the following range accordingly Cuddy Della Valle Instability Index:

Low Instability = between 0 to 15 per cent

Medium Instability = greater than 15 and lower than 30 per cent

High Instability = greater than 30 per cent

## 3. Comparative advantages in rice export

To analyze the Comparative advantages, Balassa's index of Revealed Comparative Advantage was used. The Revealed Comparative Advantage technique is a measure for identify the international trade specialization in extent to which a country has a comparative advantage in a commodity with respect to another country or group of countries. A country's comparative advantage is "revealed" by the value of RCA, if RCA is more than unity, then the country has a comparative advantage and there is scope of agricultural trade between India and other countries of the world.

The original index of RCA was first formulated by Balassa, 1965 and it was computed as:

$$B = \frac{(X_{ij} / X_{ik})}{(X_{nj} / X_{nk})}$$

Where,

$$B = RCA$$

$X_{ij}$  = Exports of country 'i' of commodity 'j'

$X_{ik}$  = Exports of country 'i' of a set of commodities 'k'

$X_{nj}$  = Exports of a set of countries 'n' of commodity 'j'

$X_{nk}$  = Exports of a set of countries 'n' of a set of commodities 'k'

Hence, country 'i' refers to India, commodity 'j' refers to any of the selected commodities, set of commodities 'k' refers to total exported commodities and set of countries 'n' refers to world.

Further, revealed symmetric comparative advantage suggested by Dalum *et al.* (1998) was also calculated, because of RCA suffers from the problem of asymmetry as 'pure' RCA is basically not comparable on both sides of unity, as the index ranges from zero to one, if a country is said not to be specialized in a given sector, while the value of the index ranges from one to infinity, if a country is said to be specialized.

Revealed symmetric comparative advantage (RSCA) was used in following formula:

$$RSCA = (RCA - 1) / (RCA + 1)$$

Since, this method measures the ranges between -1 and +1 and indicates the free from the skewness problem.

## RESULTS AND DISCUSSION

India was the leading exporter of basmati as well as non-basmati rice to the global markets. It can be seen from Fig. 1, there are several changes in export of Indian rice in the last two decades, which are caused by a combination of national and international factors. Basmati rice constitutes a significant part of the total rice and food grain exported from India. The value share of exports of basmati rice is more than non-basmati rice in total. After 2008 crisis the GoI placed some restrictions on the export of non-basmati rice for four years. In September 2011, the Government allowed export of non-basmati rice out of privately held accounts. Later on, the Government also started allowing the Public Sector Units (PSUs) to export the non-basmati rice to some countries. In the period after 2007–2008, the share of basmati export revenue was higher than that of non-basmati rice in total rice export revenue, due mainly to the higher market price of basmati rice (Kumar, 2019).

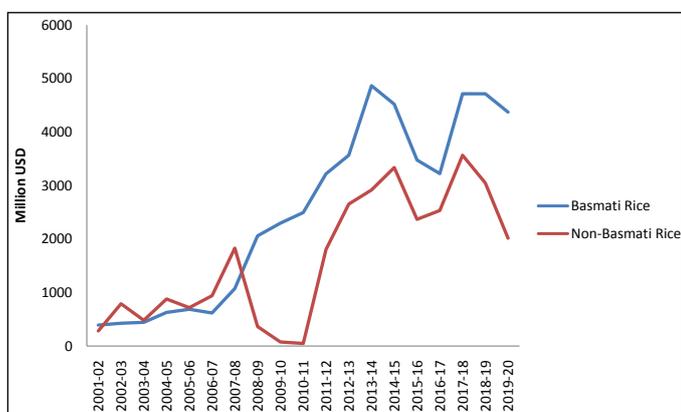


Fig. 1: Rice export from India during 2001-02 to 2019-20

### Growth rate and Instability Export of Basmati Rice

The major importers of basmati rice from India were the Middle Eastern countries. The major destinations to which India exports basmati rice were Iran, Saudi Arab, UAE, Iraq, Kuwait, Yemen, USA, UK, Oman and Jordan. Growth rates and instability in export of basmati rice from India to major destinations during the period 2001-

02 to 2019-20 is presented in Table 1. This table shows that all major destinations of basmati rice exports had recorded as highly significant growth in export value of basmati rice at 1 per cent level of significance during the study period.

Table 1: Growth rate and instability in exports of basmati rice from India (2001-02 to 2019-20) (Value terms)

Sl. No.	Destination	CAGR (In per cent)	Instability (In per cent)
1	Iran	84.86**	59.09
2	Saudi Arab	9.12**	62.78
3	UAE	20.01**	82.27
4	Iraq	68.59**	40.00
5	Kuwait	11.26**	68.03
6	Yemen Republic	21.56**	38.47
7	USA	15.52**	35.20
8	UK	7.50**	71.00
9	Oman	29.25**	41.80
10	Jordan	39.15**	50.07
11	World	19.96**	43.98

\*\* Significant at 1 per cent level of significance.

Among the major destination, Iran had registered highest growth of 84.86 per cent per annum, because of after 2008, Iran shift their import of rice from Thailand and Pakistan to India and became major rice importing partner of India. Another destinations like Iraq was the second destinations that registered highest growth rate of (68.59 per cent), followed by Jordan (39.15 per cent), Oman (29.25 per cent), Yemen Republic (21.56 per cent), UAE (20.01 per cent), USA (15.52 per cent), Kuwait (11.26 per cent) and Saudi Arab (9.12 per cent). While, UK registered lowest growth rate in export value among all major basmati importing countries at the rate of 7.50 per cent per annum. A greater instability was noticed in basmati exported to all the destinations. The UAE, UK, Kuwait, Saudi Arab, Iran and Jordan had very high instability of 82.27, 71, 68.03, 62.78, 59.09 and 50.07 per cent, respectively. Only USA recorded lowest instability that was 35.20 percent among all destinations. Basmati rice export from India to the world increased at an impressive rate of over 19.96 per cent per annum with high instability index of 43.98 per cent per annum during study period. The higher positive growth rates

were mainly due to increased exports driven by higher global demand for basmati rice during the study period. Indian basmati rice is increasingly the choice preference across world consumer group mainly because of its superior taste and aroma that is highly pleasant to the senses. There was a continuous increase in the demand of basmati rice and at the same time new international markets were emerged. In order to maintain prime position in world basmati rice trade, India would have to take effective steps to enhance domestic production through expansion of area as well as improving productivity. This gives huge potential of basmati to India for exporting around the world. The high instability in exports may be due to increasing domestic demand as well as international demand, volatility of world prices, change in export policy and situation in international markets. Besides, variability in quantity imported by different countries during different years may be another caused. A particular nation may import one year to a particular quality of basmati rice and same country may import another grade during next year so this different quality and quantity of rice exported to different countries at different price may be the reason for instability of basmati rice. Similar results were found by Satishkumar *et al.* (2016), Manohar *et al.* (2017) and Udhayakumar and Karunakaran (2020).

### Growth and Instability Export of Non-Basmati Rice

It is revealed from the Table 2, that Benin had the largest importer of non-basmati rice which was exhibited by highly significant growth rate at 1 per cent level of significance. It was registered at the rate of 46.68 percent followed by Guinea (32.96 per cent), Nepal (30.03 per cent), and Togo (18.54 per cent) during study period. The compound growth in exports of non-basmati to Somalia, Cote D Ivory, and UAE were also registered significant at the rate of 21.41, 18.96 and 14.09 per cent per annum, respectively during the period 2001-02 to 2019-20. The estimated of growth in non-basmati rice exports to the world was significant at 5 per cent level and grew at the rate of 12.74 per cent per annum during study periods. India's rice export was unstable during the period. The instability in non-basmati rice exports was as high as 83.61, 82.92, 78.62, 77.80, 70.79, 62.88 and 53.41 per cent

for Guinea, Somalia, Benin, Togo, Cote d'Ivoire, UAE and Nepal respectively. Overall non-basmati exports to world were also recorded highly unstable and it was evident from the estimated index of instability of 63.46 per cent. High instability in exports as a result of higher inter-year fluctuation in demand for rice, price competitiveness in the international markets, whereas rice production and consumption remained more or less stable in India during the study period (Velmurugan, 2016). Weather conditions are also responsible for rice production and exports. Non-basmati rice exports have also suffered much due to the competition from countries like Thailand, Vietnam, China, Japan and Pakistan of their low cost of production (Udhayakumar and Karunakaran 2020).

**Table 2:** Growth rate and instability in exports of non basmati rice from India (2001-02 to 2019-20) (Value terms)

Sl. No.	Destination	CAGR (In per cent)	Instability (In per cent)
1	Nepal	30.03**	53.41
2	Benin	47.68**	78.62
3	UAE	14.09*	62.88
4	Somalia	21.41*	82.92
5	Guinea	32.96**	83.61
6	Togo	18.54**	77.80
7	Cote d'Ivoire	18.96*	70.79
8	World Total	12.74*	63.46

\*\* Significant at 1 per cent level of significance; \* Significant at 5 per cent level of significance.

### Comparative advantage in exports of rice

Nearly 75 per cent of rice exports to the world which was contributed by six countries namely India (28%), Thailand (17%), Vietnam (10%), USA (8%), Pakistan (9%) and Myanmar (3%) during 2019-20. The estimated values of RCA and RSCA are presented in Table 3.

Table 3 shows that, except USA all countries had greater than one value of revealed comparative advantage (RCA) and positive value of revealed symmetric comparative advantage (RSCA) during the study periods. Indian rice exports exhibited various value of comparative advantage in different years of the study period. In period 2001-02, the estimated value of RCA

was 8.14 which had improved to 12.17 in the year 2007-08 then, slightly dropped to 11.82 in the period 2013-14. It was also observed that, among sub periods, the value of RCA was 13.41 highest in the period 2019-20 as similar result was found by Shinoj and Mathur (2008) and Rao and Ankalam (2018). It was concluded that all major rice exporters except USA were enjoyed various level of comparative advantage in export of rice.

**Table 3:** Value of RCA and RSCA for exported rice from India and other major countries

Country	Year			
	2001-02	2007-08	2013-14	2019-20
<b>Balassa RCA</b>				
India	8.14	12.17	11.82	13.41
Thailand	11.61	13.03	9.06	8.14
Vietnam	12.76	13.83	8.33	7.55
Pakistan	7.40	10.65	13.86	11.46
USA	0.81	0.95	0.92	0.84
Myanmar	18.20	8.26	15.94	13.47
<b>RSCA</b>				
India	0.78	0.85	0.84	0.86
Thailand	0.84	0.86	0.80	0.78
Vietnam	0.86	0.87	0.73	0.77
Pakistan	0.76	0.83	0.87	0.84
USA	-0.11	-0.03	-0.04	-0.09
Myanmar	0.90	0.78	0.88	0.86

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