Basmati rice exports from India: Towards global food security

Abstract

Around 80 percent of the basmati rice produced in India is exported, accomplishing the position of largest exporter. Under this perspective, the study aimed at the estimation of crucial turning points in the export volume of Basmati rice and evaluating the growth and instability in its export during the period of 1980-81 to 2021-22 in the global market. Structural breaks during the study period were computed endogenously using Bai-perrons test to reveal the impact of any policy or economic intervention. The growth and instability have been evaluated for different periods attained from the structural break analysis during the study period. Bai perrons test revealed three significant structural breaks for volume of basmati rice exports dividing the time period into four periods viz I (1980-81 to 2004-05), II (2005-06 to 2010-11), III (2011-12 to 2016-17) and IV (2017-18 to 2021-22). The compound annual growth rate calculated for volume of basmati rice exports varied from -0.06 percent to 17.98 per cent per annum for different periods. This could be seen as the consequence of the liberalization policies adopted in early 1990s. Instability computed employing Cuddy De Valle index was also reported higher with a value of 38.97. This instability could be the result from the volatile changes in exchange rate. Instability was revealed to suffer a downfall during the subsequent subperiods from 35.97 to 3.4 in the third subperiod. The growth rate and instability were reported statistically non-significant during the last subperiod. Since, Basmati rice is strategic export commodity from India, policy interventions for reducing the variability in its exports is recommended to ensure regular supply in the global market.

Keywords: Basmati rice exports, structural breaks, growth, instability

Introduction

Global food security is the major goal of various organizations across the world for development and poverty alleviation. The World Food Summit of 1996 defined food security as existing ‘‘when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life’’. Rice plays a major role in global food security, as it is the staple food for over the half of the world’s population. Asia is the centre of the global food security with more than half of the world’s population and one-thirds of global hungry and poor **(Monika, 2013).** Rice and food are highly correlated in terms of cultivation and consumption in almost every Asian country, implying it as a staple crop of the continent. The demand for specialty rice has been gaining traction globally, bolstered by consumers’ growing concerns about health and wellness. Compared with regular milled white rice, specialty rice varieties are rich in vitamins and minerals, aid good health, and are good sources of fibre.

Need of the study

Basmati rice relish an exceptional position among all the other rice varieties in the global market, owing to its unique aroma and distinctive flavour. The global basmati rice market size grew from $10.26 billion in 2022 to $11.65 billion in 2023 at a compound annual growth rate (CAGR) of 13.5% and is expected to grow by $18.32 billion in 2027 at a CAGR of 12.0%. Exports of this premium variety from India have an 85% share in the global market. According to the Agricultural and Processed Food Products Export Development Authority **(APEDA)**, the country exported 3,948,161.03 metric ton of basmati rice to the world for the worth of INR 26,416.49 Crores during the year 2021-22. The hike in population and income of people is providing the upsurge to the demand for premium food and meeting the food requirements of the growing population for global food security poses a huge challenge. This reality, combined with growing populations, may raise the global demand for food crops two- to four-folds within two generations as reported **(Godfray and Garnett, 2014).** Food insecurity is revealed to face the pressures from both supply side and demand-side. As demand from consumers is increasing in response of growing population and per capita income while limited natural resources in term of land and water in the producing pockets posing supply side pressure **(Bandumula, 2017)**.

Objective of the study

Hence the present study was undertaken to study the growth rate and instability in basmati rice exports from India. Since, India is the supreme exporter of basmati rice, the policy adopted by the economy should keep in mind the idea about filling the basmati bowl of importing nations without any breaks.

Materials and methods

The study is conducted to explore the performance of basmati rice exports by estimating the growth and instability in volume of basmati rice exports from India. For this the annual time series data on volume of basmati rice exports compiled from various publication of Government of India viz. Agricultural Statistics at a Glance by Ministry of Agriculture and website of Directorate General of Commercial Intelligence and Statistics by Ministry of Commerce. In order to determine the performance of basmati rice exports, initially structural breaks were identified in the data, on the basis of which the time period was further classified into subperiods, which were later analysed for growth and instability along with that of complete period.

Structural break

A structural break is an unexpected change in the value of the regression parameters of a model, which appears on account of unexpected shift in time series data. This may be caused due to external forces or major policy changes or many other causes **(Gujarati, 2004)**. In order to determine the changes in the exports of Basmati rice over the study period, **Bai and Perron (1998)** test was applied to find multiple breakpoints.

First a multiple linear regression with *m* breaks is considered following **Bai and Perron (1998):**

$$y_t = x_t'\beta + z_t'\delta_j + u_t \qquad t = T_{j-1} + 1, \cdots, T_j$$

where, y_t is the observed dependent variable,

x_t is a (p×1) vector with the coefficient β and

z_t is a (q×1) vector with the coefficient δ_j and

u_t the error term at time t, for *j =1,.., m+1*

T_1,……, T_m are the unknown breakpoints, where $T_0 = 0$ and $T_{m+1} = T$

The goal is to find the unknown coefficients for T observations on y_t, x_t and z_t.

Through a dynamic programming algorithm, the test determines the number of break points. The test starts considering the SSR for zero breaks and then for one break. According to this result, series are treated as function of previous values of the other series for the optimum lags and are then estimated by ordinary least squares and tested for breaks.

Compound annual growth rate

For computing compound annual growth rate, the exponential functional form is preferred over linear, log-linear and power form. As it was found to perform better over others and is intermittently employed in studies **(Chand and Tiwari, 1991; Adhikari et al., 2016; Ashok et al., 2021)**. The following form is used to compute the growth rate in the present study:

$$Y = ab^t$$

where, *Y* is the dependent variable i.e., Volume of basmati rice export

a is Intercept

b is Regression coefficient

t is Time variable

The compound growth rate in percentage is computed by using the relationship:

$$CAGR = \{Antilog(b) - 1\} \times 100$$

The significance of the regression coefficient will be tested using the t-statistic for "b".

Instability

Instability in the exports is the year-to-year fluctuation in the variable. Mathematically, it can be defined as the difference between the actual and estimated value of the variable, i.e., volume of basmati rice exports, expressed as the percentage of average value of the respective variable in the account. The fluctuations can be originated from variations in supply and demand and economic and non-economic factors. There are a number of techniques available to measure the index of instability. Any measure of instability needs to exclude the deviations in the data series that may arise due to secular trend or growth. CDVI was originally developed by John Cuddy and Della Valle for measuring the instability in timeseries data that is characterized by trend **(Cuddy and DellaValle 1978)**.

The index will be calculated using the following equation:

$$I = CV^{*}(1 - R^2)^{0.5}$$

where, *CV* is coefficient of variation;

R^2, coefficient of determination from time trend regression adjusted by number of degrees of freedom

The significance of index will be tested using F-statistic. The value calculated by instability index has been classified into different categories, on the basis of the value it ranges in:

0 -15	Low instability
15-30	Medium instability
> 30	High instability

Results

The structural break outcome has revealed two breaks in the series of value of basmati rice exports, as depicted in Fig. 1, dividing the period for growth and stability analysis of value of exports into three subperiods viz. I (1980-81 to 2005-06), II (2006-07 to 2012-13) and III (2013-14 to 2021-22).

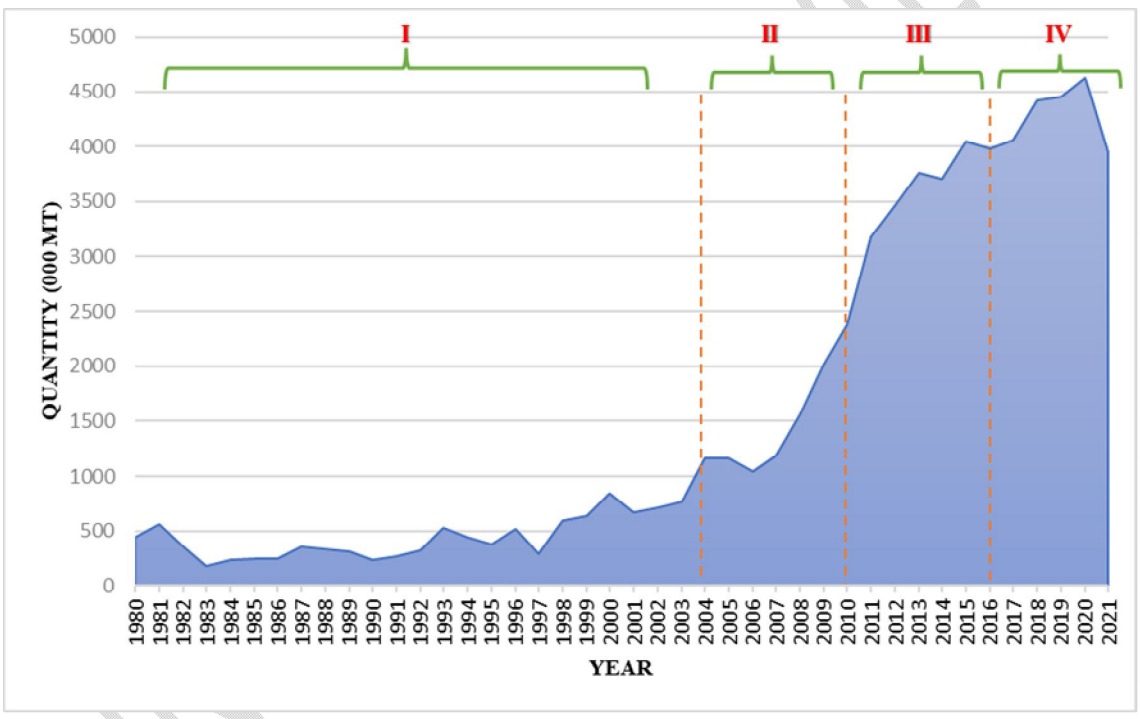

Fig.1 Volume of Basmati rice exports with identified structural breaks and subperiods
Source: Author's own calculation

The growth rates for volume of basmati rice exports over different subperiods and for overall period have been computed by exponentially fitting the time series data of respective variables against time variable and are presented in table 1. All the computed growth rates and instability index are significant at 1 percent level of significance, except the mentioned.

Table 1 Growth and instability in case of volume of Basmati rice exports

Sub period	CAGR (%)	Instability
I (1980-81 to 2004-05)	4.71	35.97
II (2005-06 to 2010-11)	17.99	13.98
III (2011-12 to 2016-17)	4.63	3.4
IV (2017-18 to 2021-22)	-0.06*	7.7*
Overall period	8.49	47.35

*non-significant values
Source: Author's own calculations

Findings and discussion

The volume of Basmati rice exports has remained more or less stable with a little fluctuation during the I (1980-81 to 2004-05) subperiod. This calls for the sky rocketed instability during the first subperiod. Many studies reported the similar results with regard to this stable growth period i.e., quantum reported was not so high during this decade due to low production of basmati distributed over few pockets of the country, obliviousness with the differences between different aromatic varieties, restriction of Minimum Export Price till 1991 and preference to trade with fraternal Islamic country, Pakistan by middle eastern importers. **(Ramakrishna and Degaonkar, 2016; Bhattacharya 2011; Krishniah and Rani 2014).**

The II (2005-06 to 2010-11) subperiod reported a higher growth with moderate instability index, which might be the consequence of removal of minimum export price (MEP) during the financial year 2008-09.

The growth rate of volume of basmati rice exports achieved the lowest after II (2005-06 to 2010-11) subperiod. The decline in growth rate, is reported due to stagnation in exports over the years and decline in imports by some major trading partners like Saudi Arabia, UK and USA, hoarding by them and change in taste preference which shifted to their own non-aromatic long grain variety are evidently the major whys **(Bhattacharya, 2011)**, which is implied by the low value of instability index revealed during the III (2011-12 to 2016-17) subperiod.

Conclusion

Rice production in Asia determines the future trend of the global rice production, which is responsible for meeting the issue of global food security. Therefore, a sustainable supply is the pressing priority. Being the supreme exporter of Basmati rice, India needs to recall its role as the figurehead. The basmati is expected to grow in the near future, supposedly the demand for it in the global market. Since, the overall period of the study reported an outrageous instability index of 47.35 in the volume of basmati exports which required a stable export policy for its promotion and growth. There is scope for India to take the advantage of the trade opportunities due to the distinctive and unique characteristics of Indian Basmati rice.

This can be achieved if the production is made as per the requirements of the global market by increase in research and development and adopting a stable export policy to support producers in order to encourage them for production of Basmati rice.

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