

Trade Dynamics of Basmati and Non-Basmati Rice Exports from India

M. Udhayakumar^{1*} and K. R. Karunakaran¹

¹*Department of Agricultural Economics, Centre for Agriculture and Rural Development Studies, Tamil Nadu Agriculture University, Coimbatore – 641 003, India.*

Authors' contributions

This work was carried out in collaboration between both authors. Author MU designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KRK guided of the study. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEMT/2020/v26i1030299

Editor(s):

(1) Dr. Afsin Sahin, Ankara Haci Bayram Veli University, Turkey.

Reviewers:

(1) Diosdado C. Cañete, Isabela State University, Philippines.

(2) Yohana James Mgale, Institute of Rural Development Planning, Tanzania.
Complete Peer review History: <http://www.sdiarticle4.com/review-history/63934>

Original Research Article

**Received 10 October 2020
Accepted 15 December 2020
Published 30 December 2020**

ABSTRACT

India is the world's largest producer and leading exporter of basmati rice. India produces about 70 per cent of the total world basmati rice production and the rest is produced by Pakistan. During 2017-18 the country has exported globally about 40.56 Lakh tonnes of Basmati Rice and 86.48 Lakh tonnes for Non-Basmati rice, the worth of ₹ 268.70 billion and ₹ 229.68 billion respectively. Basmati rice has got good export demand and fetches good export price in international markets due to such uniqueness. The higher price of basmati rice in international market made basmati rice as export competitive product. The present study is to analyze the export performance and its competitiveness of basmati non-basmati rice in India. In this paper rice trade dynamics of changes in terms of value of exports of basmati and non-basmati rice from India to different export markets have been measured by employing the Markov-Chain model. U.A.E. and Saudi Arabia are found to be stable destinations for Indian basmati rice exports from Markov-Chain results. Whereas, Benin, Bangladesh and UAE are found to be major destinations for non-basmati rice exports. The most unstable markets among the non-basmati rice importing countries were Cote D Ivoire and Liberia with the zero per cent retention. In order to sustain in the international market, Indian export price needs to be competitive besides improvement in quality and sanitary standards.

*Corresponding author: E-mail: raanaudhay4@gmail.com;

Keywords: *Basmati rice; export competitiveness; performance; Markov chain analysis.*

1. INTRODUCTION

Rice is one of the most important exportable agricultural commodities from India. The global markets for Indian rice are highly dynamic and the barriers to trade are being lowered gradually all around the world [1]. 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 of rice in 2012. There is a strong demand for Indian rice in the international markets. The Indian rice export growing from ₹ 33.70 billion to ₹ 503.07 billion between 1997-98 to 2017-18 (APEDA 2017-18). India is the world's largest producer and leading exporter of basmati rice. India produces about 70 per cent of the total world basmati rice production and the rest is produced by Pakistan [2]. During 2017-18 the country has exported globally about 40.56 Lakh tonnes of Basmati Rice and 86.48 Lakh tonnes for Non-Basmati rice, the worth of ₹ 268.70 billion and ₹ 229.68 billion respectively. (Agricultural and Processed Food Products Export Development Authority (GOI a 2017).

Basmati rice has got good export demand and fetches good export price in international markets due to such uniqueness. The higher price of basmati rice in international market made basmati rice as export competitive product. The major markets for Indian basmati rice were Iran, Saudi Arabia, United Arab Emirates, Iraq, United Kingdom and Kuwait. Similarly, major destinations for Indian's non-basmati rice exports are Senegal, Benin, United Arab Emirate, Bangladesh, Cote D Ivoire, Guinea and Somalia. Consumer demand is increasing 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 sample scope for rice export. In recent years, the African countries have also shifted to Indian non-basmati rice because of price competitiveness.

The above facts relating to basmati rice exports from India indicate that it has enough potential to grow more of basmati rice and can be a major exporter as well. There exists vast potential to bring more area under basmati rice production and increase in productivity levels. Through scale economy, India's basmati can effectively compete in the global market. In order to assess the future trend in rice export, it is essential to work out its export potential and challenges. Rice

export from India is determined by various factors and therefore, reliable estimates of determinants of export are essential for the formulation of appropriate trade policies which suit to the Indian rice export.

1.1 Objective

1. To analyze the export performance and its competitiveness of basmati rice and non-basmati rice in India.

2. DATA AND METHODOLOGY

The study is based on the time series data on export quantity and value which were compiled from various sources for a period of 23 years (1995-96 to 2017-18). Markov chain analysis will be done for the period of 1995-96 to 2017-18. Further, considering the recent drift in Indian rice export trend performance after 2010-11 the study period was divided into two sub-periods; 1995-96 to 2009-10 (period I) and 2010-11 to 2017-18 (period II) corresponding broadly to pre and post reform periods and shifting period respectively. Data were collected from Agricultural and Processed Food Products Export Development Authority (APEDA).

2.1 Methodology

2.1.1 Markov chain model - direction of trade

Major destinations were identified based on the average quantity exported to each country in respective periods. The proportionate share to these major destinations was checked over the period. The Markov chain approach was employed to estimate transitional probability matrix. A Markov Chain may be simply defined as a sequence of random values whose probability value at time t hinge on the value of the value of number in the time interval $t-1$. Central to this approach is to estimate the transitional probability matrix. A transition probability matrix is defined as a square array of non-negative numbers such that the rows tally to unity. The element P_{ij} of this matrix indicates the probability that exports will switch from country i to country j with the passage of time ([3]; Lee et al., 1970; [4]). The diagonal P_{ij} measures the probability that the export share of a country will be retained. Therefore, diagonal element of the transitional probability matrix points out the retention of an importing country to Indian rice

export in respective period. In Markov Chain analysis average export to a particular country is considered to be a random variable which depended only on its past exports to that country. It could be denoted algebraically as:

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

Where,

E_{jt} = Exports from India during the year 't' to j^{th} country,

E_{it-1} = Exports to i^{th} country during the year 't-1',

P_{ij} = Probability that exports will shift from i^{th} country to j^{th} country,

e_{jt} = Error-term which is statistically independent of E_{it-1} , and

r = Number of importing countries.

The transitional probabilities P_{ij} , which can be arranged in a $(c \times r)$ matrix, have the following properties:

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

$$\sum_{i=1}^n P_{ij} = 1 \text{ for all importing countries.}$$

The transitional probability matrix was estimated in the linear programming (LP) framework by a method referred to as Minimization of Mean Absolute Deviation (MAD). The LP formulation is stated as

$$\text{Minimize } O' P^* + Ie$$

Subject to

$$X P^* + v = y$$

$$G P^* = I$$

$$P^* \geq 0$$

Where,

P^* = Vector in which probabilities P_{ij} are arranged,

O = Vector of zero,

I = Dimensioned vector of country,

G = Grouping matrix to add the row elements of P arranged in P^* to unity

e = Vector of absolute errors ($|U|$),

y = Vector of exports to each country,

x = Block diagonal matrix of lagged values of y ,

v = Vector of errors (Angles et al. [5]).

3. RESULTS AND DISCUSSION

3.1 Major Export Destinations of Indian Basmati Rice

The major export destinations of Indian rice vary according to variety of rice. Basmati rice is mainly exported to Iran, Saudi Arabia, Kuwait, UK, USA, UAE and Iraq. The major destinations of Indian basmati rice and their shares illustrated in Table.1 show that nearly 75 per cent of the total export of basmati rice from India was concentrated in countries like Saudi Arabia, UK, Kuwait, UAE, Iran and Iraq. Among the major importing countries, Iran accounted for the highest share (21.72%) in total export of basmati rice from India, followed by Saudi Arabia (19.91%), UAE (10.51%), Iraq (10.45%), Kuwait (4.27%) and UK (3.83%) in the year 2017-18 as shown in Fig. 1. The actual export value of basmati rice exported from India to different countries shown in Table 1.

Since 2008, when a new rice variety, 'Pusa 1121' was notified as basmati rice, Saudi Arabia and Iran has been a major buyer of this rice variety [2]. The preference of Iran for this variety of basmati rice was due to its lower cost vis-à-vis of other varieties making it affordable for every class of consumer in Iran [6].

3.1.1 Trade directions of basmati rice export from India

The directions of trade of basmati rice export to different destinations was examined by estimating the transitional probability matrix using Markov chain analysis and the values indicating the transitional probability matrix (TPM) is presented in Table 2 and 3. Among the importing countries, six major countries import Indian basmati rice in large quantities and rests of the countries were pooled under 'Others' category. The diagonal elements in the TPM provide information on the probability of retention of trade, while row elements indicate the probability of loss in trade on account of competing countries. The column elements indicate the probability of gain in trade from the competing countries.

The changing pattern of basmati rice exports were estimated by obtaining the transitional

probability matrices for the annual export data of basmati rice (in terms of volume and value) for the period 1995-96 to 2017-18. These analyses were carried out separately for first period (1995-96 to 2009-10) and second period (2010-11 to 2017-18).

It is evident that U.A.E. followed by Saudi Arabia and Iran has been the most stable importers of Indian basmati rice, as reflected by the high probability of retention in first period like 0.937, 0.634 and 0.624 respectively. The same result shows in second period also the high probability of retention was U.A.E. (0.556) followed by Saudi Arabia (0.551) and Iran (0.479) respectively. On the contrary, UK has shown lower probability of retention (0.192) and 'zero' probability of retention in second period, indicating that UK was an unstable importer of Indian Basmati rice.

The major gainer among the importers of Indian basmati rice in the first study period was Saudi Arabia, which had a transfer probability of 0.911 from Kuwait and 0.808 from UAE. In a similar manner, Iran gained 58.70 per cent market share from Iraq. The second study period was Iran which had a transfer probability of 1.00 from UK and 0.183 from UAE. In a similar manner, Saudi Arabia gained 31.90 per cent market share from Iran. On the other hand, Iran was likely to lose 36.60 per cent market share to Kuwait in first period. UK, which is an unstable market both the period.

3.2 Major Export Destinations of Indian Non-Basmati Rice

The export markets of non-basmati rice are highly unstable. There is year to year variation in the total value realization with India's trading partners. The percentage share of different countries to India export of non-basmati rice during 2010 -11 and 2017-18 are shown in Table 4. The non-basmati rice is mainly exported other (45.00%), Bangladesh (21.43%), Benin (8.81%), Senegal (7.39%), UAE (4.19%), and Cote D Ivoire (4.17%) during the year 2017-18 as shown in Fig. 2. The actual export value of basmati rice exported from India to different countries shown in Table 4. Since, Benin, Cote D Ivoire, Senegal Bangladesh and UAE provide better price for non-basmati rice, therefore, there is need to direct more export to these countries to get higher price of non-basmati rice as well as to retain future shares in these countries.

3.2.1 Trade direction of non-basmati rice export

Similar way, as shown in basmati rice, Markov chain analysis was carried out for non-basmati for the period 1995-96 to 2017-18. These analyses were carried out separately for first period (1995-96 to 2009-10) and second period (2010-11 to 2017-18) to analyze the shift in market share to different countries. The transitional probability matrix (TPM) is presented in Table 5. and 6. There are seven major

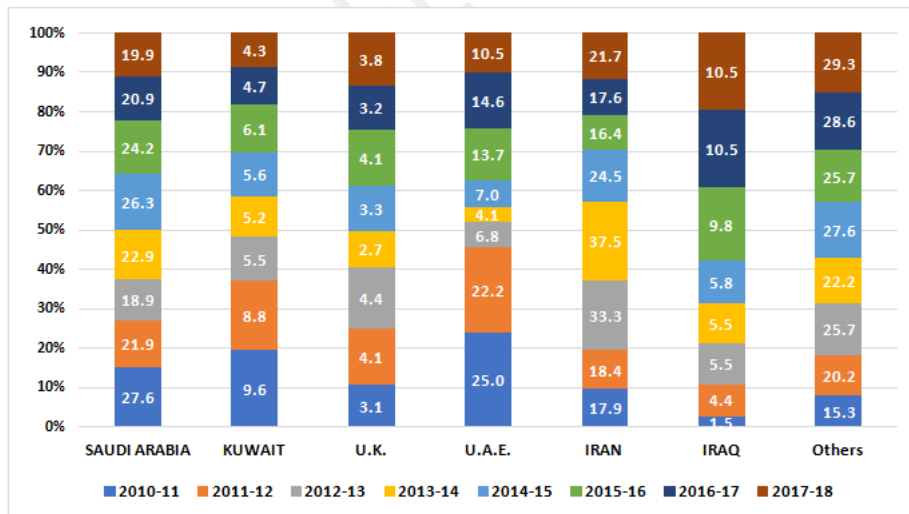


Fig. 1 Share of basmati rice exported from India to major importing countries

countries importing the Indian non-basmati rice in large quantity, namely Bangladesh, Senegal, Benin, Cote D Ivoire, Guinea, Somalia, UAE and rest of countries are pooled under others category. The diagonal elements in the TPM provide the information on the probability of retention of the trade, while row elements indicate the probability of loss in trade on account of competing countries. The column elements indicate the probability of gain in trade from the competing countries.

It can be inferred from Table 4 that during the period from 1995-96 to 2009-10, Somalia, Senegal and Benin has been the most stable importers of Indian basmati rice, as reflected by the high probability of retention in first period like

0.605, 0.380 and 0.357. Cote D Ivoire and Guinea had probability of retention as zero, which could not retain its original export share. Bangladesh gained 81.10 per cent from Cote D Ivoire, and 51 per cent from others. UAE could retain 23.20 per cent of previous year's share, and lost 56.80 per cent to others. Instead, Bangladesh lost 92.40 per cent to others category. In similar way, guinea lost its complete share to others. UAE had probability of retention 0.0914, which retains its original export share of 9.14 per cent. The most stable and major gainer among importer of Indian non-basmati rice the first study period is Somalia, which is having probability of retention 0.605, indicating others retains 60.502 per cent of its original export share.

Table 1. Basmati rice export value from India to major countries: 2010-11 to 2017-18 (Value in Crores)

Year	Saudi Arabia	Kuwait	U.K.	U.A.E.	Iran	Iraq	Others	Total
2017-18	5343.17	1146.27	1028.36	2820.53	5829.78	2805.83	7867.18	26841.1
2016-17	4494.53	1002.42	680.81	3141.72	3778.42	2263.96	6151.05	21512.9
2015-16	5493.85	1376.7	932.84	3110.7	3723.93	2231.15	5849.43	22718.6
2014-15	7260.78	1533.23	899.81	1929.97	6758.97	1587.39	7628.56	27598.7
2013-14	6717.06	1513.06	785.85	1189.22	10975.7	1599.72	6511.2	29291.8
2012-13	3659.08	1059.68	849.98	1311.2	6463.5	1076.67	4989.27	19409.4
2011-12	3380.88	1362.92	629.46	3432.79	2843.21	672.87	3127.48	15449.6
2010-11	3132.94	1091.64	351.77	2839.76	2033.96	165.31	1739.25	11354.6

Source: [7]

Table 2. Transitional probability matrix of Indian basmati rice export, 1995-96 to 2009-10

Country	Saudi Arabia	Kuwait	U.K.	U.A.E.	Iran	Iraq	Others
Saudi Arabia	0.634	0.066	0.099	0.027	0.000	0.000	0.174
Kuwait	0.911	0.087	0.000	0.000	0.000	0.002	0.000
U.K.	0.808	0.000	0.192	0.000	0.000	0.000	0.000
U.A.E.	0.000	0.000	0.000	0.937	0.061	0.002	0.000
Iran	0.000	0.366	0.000	0.000	0.624	0.010	0.000
Iraq	0.000	0.000	0.000	0.000	0.587	0.413	0.000
Others	0.183	0.191	0.085	0.000	0.000	0.000	0.541

Table 3. Transitional probability matrix of Indian basmati rice export, 2010-11 to 2017-18

Country	Saudi Arabia	Kuwait	U.K.	U.A.E.	Iran	Iraq	Others
Saudi Arabia	0.551	0.076	0.083	0.283	0.000	0.000	0.006
Kuwait	0.000	0.399	0.000	0.000	0.000	0.000	0.601
U.K.	0.000	0.000	0.000	0.000	1.000	0.000	0.000
U.A.E.	0.000	0.000	0.038	0.566	0.183	0.000	0.214
Iran	0.319	0.047	0.000	0.000	0.479	0.000	0.156
Iraq	0.097	0.000	0.000	0.000	0.000	0.297	0.607
Others	0.054	0.000	0.054	0.000	0.141	0.256	0.495

Table 4. Non- basmati rice export value from India to major countries: 2010-11 to 2017-18 (Value in Crores)

Year	Bangladesh	Benin	Cote D Ivoire	Guinea	Senegal	Somalia	U.A.E.	Others	Total
2017-18	4921.68	2022.33	958.63	1120.25	1697.81	808.32	961.52	10477.3	22967.8
2016-17	199.01	1687.61	832.05	1222.33	1268.1	817.06	897	10006.7	16929.9
2015-16	865.7	1411.12	984.77	866.95	1603.97	605.27	747.78	8397.83	15483.4
2014-15	2763.41	1506.86	601.09	935.83	1380.52	494.44	767.03	11886.8	20336
2013-14	1518.94	2945.56	598.89	535.84	1185.92	295.76	705.81	10008.3	17795
2012-13	83.36	1302.45	1175.89	576.57	1463.43	137.22	760.15	8949.8	14448.9
2011-12	271.98	452.75	556.36	28.81	589.34	165.95	499.03	6094.88	8659.1
2010-11	10.84	3.13	3.31	3.2	8.9	2.3	5.11	194.48	231.27

Source: [7]

Table 5. Transitional probability matrix of Indian non- basmati rice export, 1995-96 to 2009-10

	Bangladesh	Benin	Cote D Ivoire	Guinea	Senegal	Somalia	U.A.E.	Others
Bangladesh	0.073	0.004	0.000	0.000	0.000	0.000	0.000	0.924
Benin	0.000	0.357	0.093	0.550	0.000	0.000	0.000	0.000
Cote D Ivoire	0.811	0.000	0.000	0.000	0.000	0.000	0.189	0.000
Guinea	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Senegal	0.000	0.000	0.000	0.000	0.380	0.119	0.000	0.501
Somalia	0.030	0.152	0.132	0.081	0.000	0.605	0.000	0.000
U.A.E.	0.000	0.000	0.197	0.000	0.000	0.004	0.232	0.568
Others	0.510	0.002	0.008	0.007	0.028	0.008	0.072	0.365

Table 6. Transitional probability matrix of Indian non- basmati rice export, 2010-11 to 2017-18

	Bangladesh	Benin	Cote D Ivoire	Guinea	Senegal	Somalia	U.A.E.	Others
Bangladesh	0.416	0.033	0.000	0.095	0.309	0.000	0.000	0.147
Benin	0.000	0.386	0.000	0.107	0.460	0.000	0.047	0.000
Cote D Ivoire	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Guinea	0.000	0.000	0.000	0.236	0.000	0.000	0.764	0.000
Senegal	0.000	0.000	0.000	0.000	0.132	0.814	0.000	0.054
Somalia	0.000	0.000	0.000	0.545	0.000	0.177	0.278	0.000
U.A.E.	0.437	0.101	0.000	0.013	0.000	0.000	0.351	0.098
Others	0.002	0.226	0.065	0.000	0.042	0.001	0.063	0.601

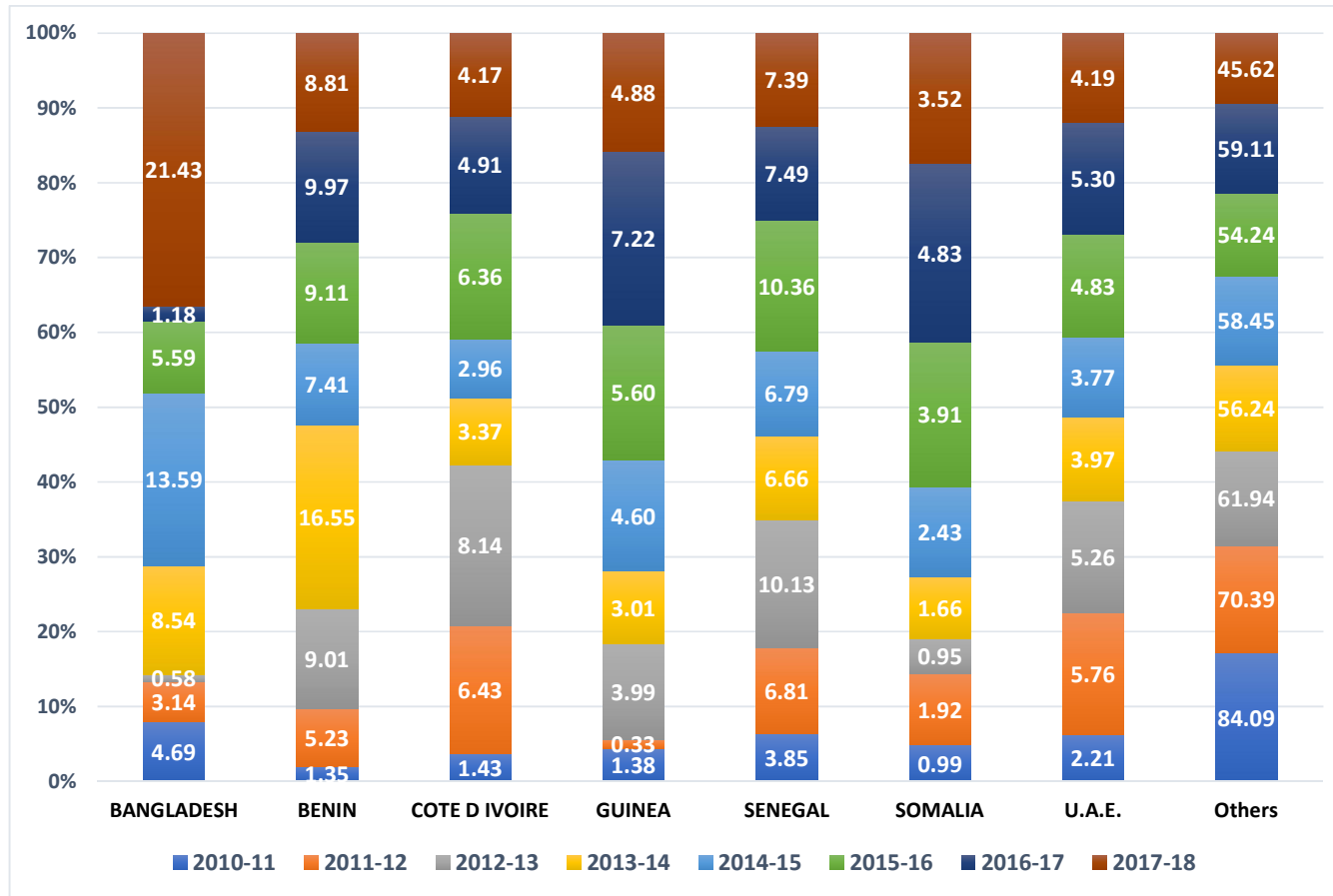


Fig. 2 Share of non-basmati rice exported from India to major importing countries

During the second period from (2010-11 to 2017-18) entirely change in compare to first period, Bangladesh, Benin and UAE has been the most stable importers of Indian basmati rice, as reflected by the high probability of retention in second period like 0.416, 0.386 and 0.351. The most stable and major gainer among importer of Indian non-basmati rice the second period is others category, which is having probability of retention 0.601, indicating others retains 60.10 per cent of its original export share. These results are in line with the findings of Sadavati (2006). Cote D Ivoire had probability of retention as zero, which could not retain its original export share in both the period. In this period Guinea, Somalia and Senegal has been some stable importers of Indian basmati rice, as reflected by the low probability of retention in second period like 0.236, 0.177 and 0.132 respectively. Bangladesh gained 43.70 per cent from UAE. Senegal gained 46 per cent from Benin and 30.90 percent from Bangladesh. In similar way, Cote D Ivoire lost its complete share to Somalia. Instead, Benin lost 46 per cent to Senegal. We compare to both the period Bangladesh, Benin and other category probability of retention is slightly increasing which means the actual export value share increasing the those the countries.

4. CONCLUSIONS

Rice contributes substantially to the national income through exports of its basmati rice varieties. The study has revealed that Indian rice exports had a fabulous performance during the study period 1995-96 to 2017-18. India faces competition in export of non-basmati rice from Thailand and Vietnam in international market due to better quality of rice from these countries, and from Pakistan for basmati rice. While comparing the probability of retention of countries in both time periods, it was low in the second time period of the study. U.A.E. and Saudi Arabia has been the most stable importers of Indian basmati rice. Probability retention of UK is zero which implies that they are unstable in import of basmati rice from India. When compared to first period, in second period the import stability of Bangladesh, Benin and Other category is increased for non-basmati rice import. In both the study period, Cote D Ivoire and Guinea is less stable in import of non – basmati rice. The study result clearly indicates that stability of import of basmati rice is decreased while the stability of the import of non- basmati rice is increased over the study period. There is a need of separate long-term

export policies for basmati and non-basmati rice. In order to sustain in the international market, Indian export price needs to be competitive besides meeting quality and sanitary and Phyto-sanitary standards. Quality is an important factor for export competitiveness. So, quality maintenance is prime importance. Most of the pesticides commonly used on paddy in India are not registered in importing countries. Therefore, quality should be maintained keeping in view of requirement of importing countries. It is necessary to develop and produce exportable quality of rice. Mixing of superior varieties with inferior ones of basmati rice to make a quick buck by some exporters/millers is another problem, which affect our reputation in the international markets. So, there should be a close watch on private exporter in order to maintain quality of basmati rice.

ACKNOWLEDGEMENT

Authors express their gratitude to Indian Council of Social Science Research (ICSSR), New Delhi, India for providing Doctoral fellowship to carry out research to the first author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Singh KM. Performance and prospects of agricultural exports of India. PhD dissertation, Punjab Agricultural University, Ludhiana, Punjab; 2001.
2. Sidhu JS, Singh J, Kumar R. Role of market intelligence in agriculture: A success story of basmati cultivation in Punjab. *Indian J Econ.* 2014;10:26-31.
3. Dent WT. Application of Markov analysis to international wool flows. *Review of Economics and Statistics.* 1967;49(2):613-616.
4. Gillet BE. Introduction of operation research – A computer oriented algorithmic approach. McGraw Hill Inc., New York, USA; 1976.
5. Angles S, Sundar A, Chinnadurai M. Impact of globalization on production and export of turmeric in India. *Agricultural Economics Research Review.* 2011; 24(2):301–308.
6. Anup Adhikari A, Sekhon MK, Kaur M. Export of rice from India: Performance and

- determinants. Agricultural Economics Research Review. 2016;29(1):135-150.
7. GOI a (Government of India). Agricultural and processed food products export development authority (APEDA), Ministry of Commerce and Industry, New Delhi. 2017. Available:<http://agriexchange.apeda.gov.in>

© 2020 Udhayakumar and Karunakaran; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/63934>