Trade direction and export competitiveness of rice in India

M Srikalaa[1*], I Bhavani Devi[2], S Rajeswari[1], G Mohan Naidu[1] and SV Prasad[1]

[1]*S. V. Agricultural College, Tirupati, Andhra Pradesh, India*

[2]*Institute of Agribusiness Management, ANGRAU, Tirupati, Andhra Pradesh, India*

*Corresponding author e-mail: srikalamedikondu@gmail.com

ABSTRACT

The changing pattern of rice exports were estimated by obtaining the transitional probability matrices for the annual export data of rice (in terms of quantity) for the period 2000-01 to 2014-15 and competitiveness of Indian rice in the international market during the period 2012-13 to 2014-15. The results of Markov chain analysis showed that Bangladesh is the most stable market of rice as it could retain its share of 38.26 per cent followed by Benin with 29.92 per cent retention and UAE with 14.05 per cent of its original share, while Sri Lanka, Nepal and Saudi Arabia were unstable importers as they could not retain their original share. The analysis of export competitiveness revealed that the Indian rice has moderate degree of competitiveness as Nominal Protection Coefficients during all the years studied ranged between 0.5 to 1.0.

Key words: *Direction of trade, export competitiveness, export destination, markov chain analysis, nominal protection coefficient, rice*

INTRODUCTION

Agricultural exports of India have increased manifolds and sizeable portion of India's export trade is based on the agricultural products, such as jute, tea, tobacco, coffee and spices. However, in current year, rice, marine products and spices etc. are played major role in agriculture export share (Anjum and Khan, 2017).

Rice is one of the most important exportable agricultural commodities from India (Anup et al., 2016). The export of rice is also related with the buffer stock 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 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 (Chandrashekhar, 2013). The future performance of any product in international markets can be judged in the light of its past performance. Therefore, evaluation of past performance of rice is necessary to work out its export potential, challenges and opportunities. Rice export from India is determined by various factors and therefore, reliable estimates of determinants of export are essential for the formulation of appropriate policies. The export promotion policy of a country must be in tune with the fast changing and dynamic international markets for commodities. India's direction of foreign trade has exhibited a structural shift during the last decade. India has comparative advantage in agriculture, so that there is considerable scope for raising farm income and employment by stepping up agro-based exports without jeopardizing and indeed by consolidating the food security already achieved (Naseeruddin and Sundaresan, 1999). Agricultural exports can thus serve as the bigger safety net in the process of structural adjustment in India (Leelavathi et al., 2014). With this background the present study has analysed the export competitiveness and direction of rice export from India.

MATERIAL AND METHODS

The study is based on time series data on exports of rice from India obtained from APEDA (Agricultural & Processed Food Export Development Authority). The temporal analysis was based on data for the 15 years starting from 2000-01 to 2014-15. It is the post-WTO period and the data before 2000-01 was not continuous as per requirements. For the analysis, six major importing countries of rice were considered namely Bangladesh, Sri Lanka, Benin, Nepal, United Arab Emirates and Saudi Arabia. To estimate the export competitiveness of rice, Sona masuri variety was considered because this variety occupied a greater percentage share in the exports from Andhra Pradesh and the data for this variety was available in detail. The data on export pertaining to the period 2012-2013 to 2014-15 were collected and the FOB prices were accessed from www.eximpulse.com. The markets selected for the study were as: Nizamabad as the local market and Boston (USA) as the international market. The information on transportation costs, port clearance charges etc. for the selected crop was obtained from port authority, Mumbai. Export competitiveness of rice was estimated under exportable hypothesis. Under exportable scenario, competition is assumed to take place at foreign port and therefore domestic commodity has to be extra efficient to the tune of international transportation costs at least.

The statistical techniques used were Markov chain analysis to study structural change and direction of change in export value of rice and, Nominal Protection Co-efficients to assess export competitiveness.

Markov chain analysis

Central to the Markov chain analysis is the estimation of transistional probability matrix Pij. The elements Pij of the matrix P indicates the probability that exports will switch from the ith country to the country jth country with passage of time (Dent, 1967; Lee et al., 1970; Gillet, 1976). The diagonal elements of the matrix measure the probability that the export share of a country will be retained. Hence, examination of diagonal element will indicate the preference of an importing country for a particular country's exports. In the context of the present study, structural changes were

treated as a random process with selected importing countries. The average export to a particular country was considered to be a random variable which depended only on the past exports to that country, and can be denoted algebraically by equation (1):

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

where,

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

E_{it-1} = Exports to the ith country during the year t^{-1},

e_{jt} = The error-term which is statistically independent of Eit-1, and

r = Number of importing countries.

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

$$O \le P_{ij} \le 1, \text{ and}$$

$$\sum_{i=1}^{r} P_{ij} = 1$$

Thus, the expected export shares of each country during period t were obtained by multiplying the exports to these countries in the previous period (t-1) with the transition probability matrix. The transition probability matrix was estimated in the Linear Programming (LP) framework by the method referred to as minimization of Mean Absolute Deviation (MAD), the LP formulation is stated as

Min O'P* + Ie
Subject to, XP* + V = Y
GP* = 1
P* ≥ 0

where, P* is a vector of the probabilities P_{ij}, O is a vector of zeros, I is an appropriately dimensional vector of areas, e is the vector of absolute errors (|U|), Y is the vector of exports to each country, X is a block diagonal matrix of lagged values of Y, V is the vector of errors and G is a grouping matrix to add the row elements of P arranged in P*, to unity.

After calculating the transitional probability

matrix, the expected shares of export were calculated by equation (2):

$$Y_{jt} = \sum_{j=t}^{r} Y_{it-1} x P_{ij} 1 \, (j=1, 2, 3, \ldots, r) \ldots (2)$$

where, Y_{jt} is the predicted proportions of the jth country's share at time 't', Y_{it-1} is the observed proportion of the country's share at time 't-1', and P_{ij} is the estimated transitional probability matrix. Thus, the expected export shares of each country during period 't' were obtained by multiplying the export to these countries in the previous period (t-1) with the transitional probability matrix.

The Nominal Protection Coefficient (NPC) was computed as the ratio of domestic price PD and global price PR of rice. The domestic price used in this computation could either be the procurement price or the farm gate price, while the world reference price is the international price adjusted for transportation cost, packing cost, port clearing charge, insurance, etc.

Symbolically,

NPC= P^D/P^R …… (3)

NPC = Nominal Protection Coefficient

PD= Domestic price of the commodity in question

PR= Reference price of the commodity in question

If NPC is greater than one, then the commodity is protected, compared to the situation that what would prevail under free trade, and if NPC is less than one the commodity is not protected. The NPC helps in measuring the divergence of domestic price of international price and thus determines the degree of protection of the commodities in question.

RESULTS AND DISCUSSION

The changing pattern of rice exports were estimated by obtaining the transitional probability matrices for the annual export data of rice (in terms of quantity) for the period 2000-01 to 2014-15 (Table 1). Six major importers of rice were considered for analysis. The rice trade with the remaining countries was pooled under other countries.

As evident from Table 1 that the countries pooled under others category retained 76.91 per cent of its original share, which implied that even though they import in lower quantities, there was high stability. They have retained most of their original share. It gained 100, 65.61, 41.44 and 29.64 per cent of Saudi Arabia, Nepal, Bangladesh and Sri Lanka share's, respectively.

Bangladesh was one of the stable major importers of Indian rice as reflected in probability of retention at 0.3826 *i.e.,* the probability that Bangladesh retained its import share from one period to another about 38.26 per cent. Bangladesh lost its share to others, Saudi Arabia, Sri Lanka and United Arab Emirates to the extent of 41.44, 13.44, 5.32 and 1.53 per cent respectively. It gained from the share of others to the extent of 18.34 per cent. Benin was also another stable importer, because it retained its original share of 29.92 per cent. It lost its major share to Sri Lanka (32.98 %) followed by Nepal (29.73%), some extent to Saudi Arabia and United Arab Emirates. It gained 13.96, 12.67 and 1.47 per cent from Nepal, United Arab Emirates and others respectively. United Arab Emirates could retain its share of 14.05 per cent of its original import share. It lost its major share to Nepal, Sri Lanka, Benin and Saudi Arabia to the extent of 57.08, 13.87, 12.67 and 2.33 per cent respectively, and it gained from the share of Nepal, Benin, others and Bangladesh to the extent of 14.06, 3.10, 1.89 and 1.53 per cent respectively. Sri Lanka lost its share to Nepal and others to an extent of 70.36 and 29.64 per cent respectively. It gained 32.98, 13.87 and 5.32 per cent from Benin, United Arab Emirates and Bangladesh respectively. Nepal could not retain its original share, it lost a major share to others, United Arab Emirates, Benin and Saudi Arabia to the extent of 65.61, 14.06, 13.96 and 6.36 per cent respectively and it gained 70.36, 57.08, 29.73 and 1.39 per cent from Sri Lanka, United Arab Emirates, Benin and others respectively. Saudi Arabia also could not retain its original share. It lost 100 per cent share to others and it gained 13.44, 6.36, 4.27 and 2.33 per cent from Bangladesh, Nepal, Benin and United Arab Emirates respectively. These results are in line with the findings of Sadavati (2006). Thus, it is clear from the analysis that Sri Lanka, Nepal and Saudi Arabia were the most unstable importers as they could not retain their original share. Bangladesh, Benin and United Arab Emirates would be the stable importers of the

Table 1. Transitional probability matrix of Indian rice exports (2000-01 to 2014-15)

Country	Bangladesh	Sri Lanka	Benin	Nepal	United Arab Emirates	Saudi Arabia	Others
Bangladesh	**0.3826**	0.0532	0.0000	0.0000	0.0153	0.1344	0.4144
Sri Lanka	0.0000	**0.0000**	0.0000	0.7036	0.0000	0.0000	0.2964
Benin	0.0000	0.3298	**0.2992**	0.2973	0.0310	0.0427	0.0000
Nepal	0.0000	0.0000	0.1396	**0.0000**	0.1406	0.0636	0.6561
United Arab Emirates	0.0000	0.1387	0.1267	0.5708	**0.1405**	0.0233	0.0000
Saudi Arabia	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**	1.0000
Others	0.1834	0.0000	0.0147	0.0139	0.0189	0.0000	**0.7691**

Indian rice in future.

Actual and predicted shares of Indian rice export to importing countries

The actual and predicted shares of rice exported from India to different countries (in percentage term) are presented in Table 2. The export share of Indian rice to different countries was computed using transitional probability matrix. A comparison of this proportion during the study period revealed that observed proportions of exports shares were inconsistent with the predicted share of exports, which were derived from the Markov chain process.

The actual share of Bangladesh in rice export had shown fluctuations over the study period (2000-01 to 2014-15). Similar picture was in prediction of export share too, where the decrease was from 47.05 per cent to 3.62 per cent. With regard to Sri Lanka the actual and predicted export share showed fluctuations from 0.06 to 12.84 and 0.96 to 10.78 per cent respectively from 2000-01 to 2014-15. The actual proportion of Benin market share of imports from India showed an increasing trend from 0 per cent to 7.02 per cent. The predicted export share also increased from 0.05 per cent to 6.20 per cent during the study period. With respect to Nepal, the actual proportion of exports showed increasing trend that increased 2.95 per cent to 7.60 per cent. The actual export to United Arab Emirates and Saudi Arabia and others had decreased both in absolute as well as in relative percentage to the total exports from India during the same period.

Projection of Indian rice exports to major importing countries

Table 3 shows the export of Indian rice to different countries which was computed using the transitional probability matrix. It was projected that during 2015-16, the major market for Indian rice would be

Bangladesh (17.18%). The projected exports to Bangladesh have exhibited an increasing trend in both absolute value and percentage to total export. In case of Sri Lanka, Benin and Nepal, the projected value has shown a decreasing trend, in both absolute and relative to total export from India. Similarly, the projected value of rice export to UAE has shown decreasing trend. The projected export share is likely to decrease marginally from 3.36 per cent to 2.73 per cent from 2015-16 to 2017-18. In case of Saudi Arabia, the projected export share values have exhibited nearly constant values. The projected exports to others have shown an increase from 63.32 per cent to 64.71 per cent during the foresaid period.

Export Competitiveness

The competitiveness of Indian rice was examined using Nominal Protection Coefficient (NPC). The domestic prices are compared with international prices. The nominal protection coefficients of rice estimated for the years 2012-13, 2013-14 and 2014-15 under exportable hypothesis and the results of the analysis are presented in Table 4. The incentives for the commodity are measured by the ratios between the domestic and international prices. If the ratio is more than one then the commodity is protected, while commodity is dis-protected by the policy regime if ratio is below one.

Nominal Protection Coefficients of Rice under Exportable Hypothesis

The global competitiveness of rice was evaluated using Nominal Protection Coefficient (NPC) which is a measure of actual divergence or distortion domestic price and international (border) price. The underlying rationale is that such divergence represents the presence of market interventions such as taxes, subsidies and other policy instruments (Appleyard,

Table 2. Actual and Predicted shares of rice exports from India (2000-01 to 2014-15) (in thousand metric tonnes).

Year / Country	Bangladesh A	P	Sri Lanka A	P	Benin A	P	Nepal A	P	United Arab Emirates A	P	Saudi Arabia A	P	Others A	P
2000-01	317.90 (46.56)	103.74 (15.19)	0.52 (0.08)	20.62 (3.02)	0 (0.00)	0.32 (0.05)	2.02 (2.95)	3.47 (0.51)	2.66 (3.90)	14.55 (2.13)	153.34 (22.46)	78.30 (11.47)	164.21 (24.05)	461.71 (67.63)
2001-02	102.65 (6.66)	725.20 (47.05)	46.62 (3.02)	14.93 (0.97)	19.42 (1.26)	4.34 (0.28)	7.81 (0.51)	8.62 (0.56)	32.87 (2.13)	59.92 (3.89)	176.79 (11.47)	25.28 (1.64)	1155.34 (74.95)	703.18 (45.62)
2002-03	930.72 (21.46)	2035.40 (46.93)	42.17 (0.97)	81.08 (1.87)	12.00 (0.28)	7.88 (0.18)	24.11 (0.56)	28.92 (0.67)	52.84 (1.22)	180.87 (4.17)	34.82 (0.80)	229.24 (5.29)	3240.41 (74.71)	1773.58 (40.89)
2003-04	1239.26 (46.93)	677.55 (25.66)	2.69 (0.10)	83.66 (3.17)	4.72 (0.18)	2.07 (0.08)	66.11 (2.50)	16.48 (0.62)	110.18 (4.17)	78.54 (2.97)	142.06 (5.38)	305.23 (11.56)	1075.42 (40.73)	1476.78 (55.93)
2004-05	951.96 (26.33)	1270.64 (35.15)	225.71 (6.24)	73.23 (2.03)	0.037 (0.00)	14.61 (0.40)	20.82 (0.58)	20.79 (0.58)	157.32 (4.35)	120.22 (3.33)	237.68 (6.57)	234.47 (6.49)	2021.59 (55.92)	1881.05 (52.03)
2005-06	593.82 (20.33)	913.20 (31.26)	0 (0.00)	74.17 (2.54)	90.50 (3.10)	75.01 (2.57)	223.60 (7.65)	136.64 (4.68)	0 (0.00)	9.20 (0.32)	0 (0.00)	57.80 (1.98)	2013.67 (68.92)	1655.60 (56.67)
2006-07	512.92 (13.85)	1322.20 (35.71)	0 (0.00)	64.06 (1.73)	111.50 (3.01)	84.84 (2.29)	162.24 (4.38)	118.02 (3.19)	0 (0.00)	7.95 (0.21)	0 (0.00)	49.91 (1.35)	2915.54 (78.75)	2055.21 (55.51)
2007-08	1906.86 (36.07)	1330.76 (25.18)	91.41 (1.73)	238.17 (4.51)	121.25 (2.29)	138.94 (2.63)	232.00 (4.39)	438.77 (8.30)	0 (0.00)	120.97 (2.29)	0 (0.00)	185.54 (3.51)	2934.41 (55.51)	2832.78 (53.59)
2008-09	603.42 (64.75)	115.47 (12.39)	17.39 (1.87)	76.09 (8.17)	10.28 (1.10)	27.06 (2.90)	24.14 (2.59)	138.85 (14.90)	21.31 (2.29)	26.74 (2.87)	0.72 (0.08)	80.02 (8.59)	254.62 (27.32)	467.65 (50.18)
2009-10	00.06 (0.05)	317.52 (22.75)	17.92 (12.84)	14.89 (10.67)	4.05 (2.90)	2.44 (1.75)	20.79 (14.90)	00.02 (0.01)	11.82 (8.47)	17.92 (12.84)	14.88 (10.66)	11.82 (8.47)	70.02 (50.18)	60.70 (43.50)
2010-11	5.50 (5.46)	3.65 (3.62)	08.50 (8.44)	4.07 (4.04)	1.96 (1.94)	5.39 (5.35)	27.16 (26.97)	3.55 (3.52)	1.63 (1.61)	5.23 (5.19)	1.22 (1.21)	2.59 (2.57)	54.73 (54.35)	7.62 (75.70)
2011-12	144.70 (3.62)	277.05 (6.93)	15.61 (0.39)	118.94 (2.98)	213.72 (5.35)	344.61 (8.62)	140.86 (3.52)	236.97 (5.93)	207.47 (5.19)	144.76 (3.62)	102.68 (2.57)	85.96 (2.15)	3172.67 (79.36)	2789.44 (69.78)
2012-13	31.33 (0.47)	611.30 (9.14)	4.10 (0.06)	64.37 (0.96)	576.55 (8.62)	558.28 (8.35)	396.59 (5.93)	379.23 (5.67)	262.07 (3.92)	225.02 (3.36)	143.17 (2.14)	130.40 (1.95)	5274.17 (78.86)	4719.40 (70.57)
2013-14	651.64 (9.14)	1025.98 (14.38)	0.05891 (0.08)	550.46 (7.72)	1166.59 (16.35)	5.00862 (7.02)	404.13 (5.67)	542.46 (7.60)	224.92 (3.15)	220.49 (3.09)	139.42 (1.95)	168.31 (2.36)	4540.60 (63.65)	4124.64 (57.82)
2014-15	1380.50 (14.38)	737.49 (7.68)	741.33 (7.72)	1035.27 (10.78)	674.02 (7.02)	595.04 (6.20)	729.91 (7.60)	653.71 (6.81)	296.96 (3.09)	526.17 (5.48)	226.14 (2.36)	264.20 (2.75)	5550.70 (57.82)	5787.68 (60.29)

Note: Figures in parentheses indicate percentages to total exports of rice, A: Actual; P: Predicted.

Table 3. Projected exports of Indian rice to major importing countries (in thousand metric tonnes).

Years/Country	Bangladesh	Sri Lanka	Benin	Nepal	United Arab Emirates	Saudi Arabia	Others
2015-16	1649.02	262.20	383.56	609.21	322.92	294.23	6078.41
	(17.18)	(2.73)	(4.00)	(6.35)	(3.36)	(3.07)	(63.32)
2016-17	1745.68	259.08	330.20	567.28	283.09	284.24	6130.00
	(18.19)	(2.70)	(3.44)	(5.91)	(2.95)	(2.96)	(63.86)
2017-18	1792.12	241.10	304.09	527.20	272.40	291.35	6171.28
	(18.67)	(2.51)	(3.17)	(5.49)	(2.84)	(3.04)	(64.29)
2018-19	1817.47	233.48	289.94	501.27	265.94	293.68	6197.77
	(18.93)	(2.43)	(3.02)	(5.22)	(2.77)	(3.06)	(64.56)
2019-20	1832.02	229.27	281.65	488.38	261.84	294.68	6211.70
	(19.08)	(2.39)	(2.93)	(5.09)	(2.73)	(3.07)	(64.71)

Note: Figures in parentheses indicate percentages to total exports

Table 4. Nominal protection coefficients of rice under exportable hypothesis (2012-13 to 2014-15) (Rs/qtl).

S.No.	Particulars	2012-13	2013-14	2014-15
1)	Wholesale price in Nizamabad (Rs/qtl)	2850	3100	3300
2)	Transportation cost (Rs/qtl)	140	145	150
3)	Marketing margin @ 5% (Rs/qtl)	142.5	155	165
4)	C & F handling charges (Rs/qtl)	48	53.4	55.4
5)	Wharfage charges (Rs/qtl)	4.2	4.6	4.6
6)	Service charges (Rs/qtl)	31	35	38
7)	Service tax (Rs/qtl)	3.8	4.2	4.2
8)	FOB price (Rs/qtl)	3219.5	3497.2	3717.2
9)	Freight from India to Boston (Rs/qtl)	448	470	485
10)	Insurance @1% of FOB price (Rs/qtl)	32.20	34.97	37.17
11)	Landed price	3699.70	4002.17	4239.37
12)	Exchange rate (Rs. vs. $)	54.95	61.85	63.69
13)	Landed price ($/qtl)	67.33	64.71	66.56
14)	FOB price ($/qtl)	110	97	110
15)	NPC	0.61	0.66	0.61

Note: The percentage of marketing margin is fixed (i.e., 5%) in the trade.

1987). As rice being a dominant item of India's export basket, NPC was calculated under exportable hypothesis. Under exportable hypothesis, the domestic good competes at a foreign port. The NPC less than unity would indicate global competitiveness of the commodity under consideration. If NPC is less than 0.5, it is highly competitive and if it ranged between 0.5 and 1.0, it can be judged as moderately competitive (Jayesh, 2001). The commodity is not competitive for export if it exceeds unity.

Rice was found to be moderately competitive as NPCs during all the years studied, were in between 0.5 to 1.0. From these results, it can be inferred that the domestic prices (Nizamabad) of rice have been consistently lower than the international prices (Boston, USA), indicating Indian rice trade is advantageous in this regard. This is reinforced by the Nominal Protection Co-efficients which were less than one *i.e.,* 0.61, 0.66 and 0.61 during 2012-13, 2013-14 and 2014-15,

respectively suggesting that Indian rice is moderately competitive globally under the exportable hypothesis. Gangwar and Ravi (1995), and Yao (1997) also identified rice is an exportable commodity based on NPCs.

CONCLUSION

Rice exports from India have indicated that Bangladesh and UAE are the stable destinations. Bangladesh can be regarded as the country which is associated with regular imports from India also in the list are Benin and UAE but retention was found higher in Bangladesh. Benin and UAE followed as other nations with next levels of retention. Therefore appropriate export promotion strategies have to be put in place for encouraging exports further. The results also indicated that the rice was moderately export competitive hence, the Government should look into tapping opportunities for expanding the exports of rice.

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