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Research Article

TRADE DIRECTION OF PADDY EXPORT FROM INDIA

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Abstract: The present study was conducted to analysed the trade direction of paddy export from India to major importing countries by studying the structural changes in paddy export from India was examined. The trade direction has been explored by Markov chain analysis using export quantity and value during the period 2007-08 to 2016-17. The major importer countries from India *viz.*, Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada, and Belgium were considered for analysis. It was observed that UAE was the most stable market among the major importers of Indian paddy as reflected by the probability of retention at 0.6793, which means that UAE had retained its original export quantity share of 67.93 per cent during the period 2007-08 to 2016-17. The U.S.A. was the most stable market in terms of value among the major importers of Indian paddy, as exhibited by highest probability of retention at 0.7634, which means that U.S.A. had retained its original export value share of 76.34 per cent during the period 2007-08 to 2016-17.

Keywords: *Export, Import, Trade Direction, Markov chain, Retention and Stable market*

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Introduction

World trade figures are very different to those for production, as only about 5-6 per cent of paddy produced is traded internationally. In economic terms, the global paddy trade was a small fraction of 1 per cent of world mercantile trade. Many countries consider paddy as a strategic food staple, and various governments subject its trade to a wide range of controls and interventions. The majority of the global paddy trade-83 percent of exports and 85 percent of imports-comes from developing nations. Although there are many people that import paddy, there aren't many who export it. Only five nations-China, Thailand, Vietnam, India, and the United States-in decreasing order of exported quantities, accounted for about three quarters of world paddy exports in the year 2002. In the year 2010, the three largest exporters of paddy, in decreasing order of quantity exported were Thailand, Vietnam and India. Together, they accounted for nearly 70 per cent of the world paddy exports. An essential factor in a nation's economic development is its international trade. India's involvement in global commerce is primarily limited to primary goods, particularly those originating from the agricultural sector. 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 paddy is necessary to work out its export potential, challenges and opportunities. The present study has analysed major markets for Indian paddy, in terms of its future share. Paddy export from India is determined by various factors and therefore, reliable analysed structural changes of export are essential for the formulation of appropriate policies. The present study *viz*., Trade direction of paddy export from India has examined the direction of trade for export in future export of paddy in India. The major objectives of the present study are as followed

1. To estimate share per cent of paddy in each importing country.
2. To analyze the direction of trade of paddy export from India.

Hypothesis

The dynamics in the direction of paddy export is changing.

Material and Methods

This chapter explains the characteristics of the study area, sampling procedure, nature and sources of data, the statistical tools and techniques employed for analysing the data are presented under the following.

Description of the study area

In India the area is suitable for cultivation of paddy and scattered in all over India. West Bengal state ranks first in area and production, and it contributes about 14 per cent of the total production of the country. The total area of paddy in India was about 42949.8 '000 ha and the production were 111007' thousand tonnes during the year 2017-18 and this production depends on the climate, soil condition and management aspects in different states. Hence the export performance and competitiveness of paddy was examined at National level.

Nature and sources of data

The study is completely based on secondary data, therefore required data for the present study was collected from various reports *viz*., APEDA, Agricultural statistics at a glance 2015, Commission for Agricultural Costs and Prices (CACP), International Food and Policy Research Institute (IFPRI), International Rice Research Institute (IRRI), Rice Board of India, and studies on different government sector reports etc. was used for the study.

The study period

The duration of study period was considered as ten year data for markov chain analysis *i.e*., 2007-08 to 2016

Analytical Techniques

Keeping in view the objectives of the study, data collected were subjected to analysis through the following statistical techniques.

Markov Chain Analysis

The dynamic nature of trade pattern was analyzed by applying First Order Markov process and examining the gains and losses in export share of paddy in major importing countries.

Table-1 India's total paddy export to major importing countries (Qty: MT)

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	U.S.A.	Canada	Belgium	Total
2007-08	382642.50(44.29)	74026.9(8.57)	44459.87(5.15)	252641.99 (29.24)	51997.24(6.01)	41965.16(4.86)	8899.45(1.03)	7344.335(0.85)	863977.43(100.00)
2008-09	262562.61(41.18)	55867.05(8.76)	31928.45(5.00)	238729.17(37.44)	15923.84(2.50)	20022.05(3.14)	8899.45(1.40)	7344.34(1.15)	637649.3(100.00)
2009-10	327640.85(41.74)	70025.92(8.92)	18963.55(2.42)	313970.28(39.10)	32000.81(4.08)	15439.69(1.97)	5402.63(0.69)	1495.05(0.19)	784938.8(100.00)
2010-11	311962.36(36.94)	98876.17(11.78)	38809.34(4.60)	318196.95(37.68)	35146.76(4.16)	24019.21(2.84)	8321.04(0.99)	9207.06(1.09)	844538.9(100.00)
2011-12	411962.83(33.20)	109385.2(8.81)	80573.44(6.51)	468147.03(37.73)	82219.44(6.63)	55891.63(4.50)	16056.48(1.30)	16430.22(1.32)	1240666.28(100.00)
2012-13	412204.69(37.40)	101732.05(9.23)	107939.20(9.80)	248375.66(22.54)	113903.70(10.34)	56371.15(5.12)	15052.42(1.37)	46303.31(4.20)	1101882.18(100.00)
2013-14	482852.43(45.51)	101354.37(9.55)	71377.88(6.73)	186979.14(17.62)	105752.98(9.97)	64404.42(6.07)	15955.99(1.50)	32198.23(3.03)	1060875.43(100.00)
2014-15	574498.42(46.73)	99875.99(8.12)	75941.77(6.18)	259876.56(21.14)	126585.49(10.30)	58464.10(4.76)	14779.48(1.20)	19479.96(1.58)	1229502.66(100.00)
2015-16	550356.92(38.73)	106611.91(7.50)	101907.46(7.17)	423212.95(29.78)	113420.71(7.98)	81081.95(5.71)	20406.1(1.44)	23895.66(1.68)	1420893.66(100.00)
2016-17	467503.11(37.05)	97224.45(7.70)	81208.435(6.44)	437437.87(34.67)	84119.91(6.67)	72125.53(5.72)	16060.44(1.27)	6021.105(0.48)	1261700.84(100.00)

Table-2 India's paddy export to major countries during 2007-08 to 2016-17 (Value ₹. Lakh)

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	U.S.A.	Canada	Belgium	Total
2007-08	122567.89(45.99)	23646.92(8.87)	16191.23(6.07)	75897.35(28.48)	11607.63(4.35)	10744.88(4.03)	3226.70(1.21)	2600.94(0.97)	266483.52(100.00)
2008-09	155277.97(39.86)	36737.47(9.43)	21782.69(5.59)	145144.98(37.26)	8795.24(2.25)	13728.42(3.52)	6048.67(1.55)	1991.01(0.51)	389506.43(100.00)
2009-10	167329.08(40.46)	51607.38(12.47)	10050.92(2.43)	156833.07(37.92)	15115.72(3.65)	8593.58(2.07)	3222.29(0.77)	783.63(0.17)	413535.66(100.00)
2010-11	156906.23(38.42)	54593.07(13.36)	17626.70(4.31)	142243.24(34.83)	14860.00(3.63)	12628.38(3.09)	5044.42(1.23)	4,489.55(1.09)	408391.57(100.00)
2011-12	183037.19(32.74)	71136.71(12.72)	34693.54(6.21)	196591.37(35.16)	28927.38(5.17)	28805.09(5.15)	9332.66(1.67)	6593.74(1.18)	559117.67(100.00)
2012-13	204701.51(39.22)	59174.47(11.34)	45360.50(8.69)	103567.20(19.84)	51505.94(9.87)	32352.29(6.20)	8858.75(1.70)	16429.85(3.15)	521950.49(100.00)
2013-14	362077.60(49.84)	81037.38(11.16)	43588.52(6.00)	94751.59(13.04)	67281.15(9.26)	50287.71(6.92)	12304.69(1.69)	15107.59(2.08)	726436.21(100.00)
2014-15	395508.67(48.99)	82850.62(10.26)	48129.46(5.96)	134849.68(16.70)	74600.67(9.24)	47072.79(5.83)	12401.72(1.54)	11914.19(1.48)	807327.80(100.00)
2015-16	300026.68(40.41)	74768.86(10.09)	50108.45(6.70)	192924.28(25.79)	50741.22(6.78)	53969.45(7.21)	13568.08(1.81)	12095.81(1.62)	748202.82(100.00)
2016-17	246134.94(37.74)	56522.05(8.67)	36683.62(5.62)	201935.95(30.96)	40993.55(6.29)	46889.82(7.19)	11617.87(1.78)	11436.46(1.75)	652214.23(100.00)

Table-3 Transitional probability matrix for total paddy export in quantity from India during 2007-08 to 2016-17

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.5734	0.1220	0.0000	0.3046	0.0000	0.0000	0.0000	0.0000
Kuwait	0.2779	0.1355	0.1482	0.0000	0.3067	0.0000	0.0463	0.0855
UK	0.4745	0.0000	0.0865	0.0000	0.0000	0.3552	0.0837	0.0000
UAE	0.1672	0.0724	0.0414	0.6793	0.0000	0.0308	0.0089	0.0000
Yamen AR	0.0000	0.0000	0.3464	0.0000	0.3939	0.1832	0.0000	0.0766
USA	0.9897	0.0000	0.0000	0.0000	0.0000	0.0000	0.0103	0.0000
Canada	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Belgium	0.2699	0.0000	0.0000	0.0000	0.7301	0.0000	0.0000	0.0000

Table-4 Transitional probability matrix for paddy export in value from India during 2007-08 to 2016-17

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.4389	0.1202	0.0864	0.3340	0.0000	0.0000	0.0206	0.0000
Kuwait	0.5021	0.2010	0.0000	0.0000	0.1463	0.0835	0.0117	0.0553
UK	0.8309	0.0000	0.1587	0.0000	0.0000	0.0000	0.0105	0.0000
UAE	0.2794	0.1555	0.0000	0.5647	0.0000	0.0000	0.0005	0.0000
Yamen AR	0.4183	0.0000	0.0726	0.0000	0.2899	0.1256	0.0000	0.0935
USA	0.0113	0.0000	0.0833	0.0000	0.0051	0.7634	0.1047	0.0323
Canada	0.2923	0.0000	0.0000	0.0000	0.7077	0.000	0.0000	0.0000
Belgium	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000

In the context of current application, the major paddy importing countries were considered since the export of paddy from India was highly inconsistent and unstable. The average export of paddy to particular country was considered to be a random variable following the First Order Markov process.

The basic assumption of first order Markov process is that the average export of a commodity (paddy) from a country to its importing countries in any period depends only on export in the previous period and this dependence is the same among all periods.

This is algebraically expressed

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

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} - The probability that exports will shift from i^{th} country to j^{th} country

E_{jt} - The error term which is statistically independent of E_{ij-1} and

R - Number of importing countries

The transitional probability matrix, which can be arranged in a (c × r) matrix, has the following properties.

The diagonal elements of matrix P indicate the probability that the export share of a particular country will remain the same from one period to another. The off-diagonal or transfer probabilities indicate the probability that the export share of a particular country will shift to another country over time. Thus, the export share of a country during the period 't' was obtained by multiplying the actual exports in the previous period (t-1) with transition probability matrix. The transitional probability matrix is estimated in the linear programming (LP) framework by a method referred to as minimization of mean absolute deviation (MAD).

The LP formula is stated as,

*Min (OP)^ * + I_e*

Subject to- XP +V=Y*

GP=1*

P>=0*

Where,

P* - a vector in which probability P are arranged,

0 - a vector of zeros,

I - an appropriately dimensioned vector of area,

e - the vector of absolute errors (IUI)

Y - the vector of export to each country

X - a block diagonal matrix of lagged values of Y and

V - a vector of errors.

G - a grouping matrix to add the row-elements of P arranged in P* to unity.

Results and Discussion

Structural Changes in Paddy Export from India

Major export destinations of Indian paddy

Indian paddy mainly exported to Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium. The major destinations of Indian paddy in terms of both quantity and value and their shares illustrated in [Table-1 and 2], respectively.

It was revealed from the [Table-1] that the Saudi Arabia accounted for the highest share (37.05 %) in paddy export from India in terms of quantity followed by UAE (34.67 %), Kuwait (7.70 %), Yamen Arab Republic (6.67 %), UK (6.44 %), USA (5.72 %), Canada (1.27 %) and Belgium (0.48 %) in the year 2016-17. Whereas [Table-2] depicted in terms of export value. Saudi Arabia accounted the highest share (37.74%) followed by UAE (30.96 %), Kuwait (8.67 %), USA (7.19 %), Yamen AR (6.29 %), UK (5.62 %), Canada (1.78 %) and Belgium (1.75 %) in the year 2016-17. Paddy is not produced in Saudi Arabia and the country imports substantial quantity of paddy from India to meet its more consumer demand and the UAE imports paddy due to extreme heat and limited fresh water supplies that limit crop output. There has been a major destinations of export of Indian paddy over a period of ten years (2007-08 to 2016-17).

Trade directions of paddy exports from India

The changing pattern of Indian paddy export were estimated by computing the transitional probability matrices for the annual export data in terms of quantity and value presented in [Table-3 and 4], respectively. The transitional probability matrix's row elements give information on the degree of the loss in the quantity and value of imports to rival nations. The columns element indicates the probability of gains in quantity and value of trade from other competing countries and the diagonal element indicates probability of retention of the previous year's trade quantity and value by the respective country.

The major importer countries from India *viz*., Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium were considered for analysis. It is evident from the [Table-3] that, UAE was the most stable market among the major importers of Indian paddy as reflected by the probability of retention at 0.6793, which means that UAE had retained its original export quantity share of 67.93 per cent during the period 2007-08 to 2016-17. Saudi Arabia had probability of retention 0.5734, and it retained its original export quantity share of 57.34 per cent. Similarly, Yamen Arab Republic retained its original export quantity share of 39.39 per cent. This implies that Saudi Arabia and Yamen AR were also the stable importer of Indian paddy. Kuwait and UK have shown lower probability of retention *viz*., 0.1355 and 0.0865 respectively, on the contrary, USA, Canada and Belgium have shown 'zero' probability of retention which means that they were unstable importer of Indian paddy.

The major gainer among the importers of Indian total paddy in quantity over the study period was Saudi Arabia which had a transfer probability of 1.0000 from Canada, 0.2779 from Kuwait, 0.4745 from UK, 0.1672 from UAE, 0.9897 from USA and 0.2699 from Belgium.

The Transitional Probability Matrix presented in [Table-4] provides a broad indication of changes in the direction of export value of paddy from India. The major Indian paddy importing countries were Saudi Arabia, Kuwait, UK, Yamen Arab Republic, U.S.A, Canada and Belgium in terms of value.

[Table-4] indicated that U.S.A. was the most stable market in terms of value among the major importers of Indian paddy, as exhibited by highest probability of retention at 0.7634, which means that U.S.A. had retained its original export value share of 76.34 per cent during the period 2007-08 to 2016-17. UAE had the probability of retention 0.5647, and it retained its original export value share of 56.47 per cent. Similarly, Saudi Arabia retained its original export value share of 43.88 per cent. This implies that UAE and Saudi Arabia was the stable importer Indian paddy in value term.

Kuwait, UK, Yamen Republic, and other countries have shown lower probability of retention, *viz*. 0.2010, 0.1586 and 0.2899, respectively, on the contrary, Canada, and Belgium have shown 'zero' probability of retention, indicating that Canada and Belgium were an unstable importer of Indian paddy.

The major gainer among the importers of Indian paddy over the study period was Yamen Republic which had a transfer probability of 1.0000 from Belgium, 0.0051 from U.S.A. 0.1463 from Kuwait and 0.7077 from Canada.

Thus, the trade direction of Indian paddy export in terms of quantity and value are changing over a period of time. These results are in line with findings of Adhikari et al. (2016) and Yamini (2019). The hypothesis *viz*; the dynamics in the direction of paddy export is changing has been proved.

Conclusion

The UAE was the most stable market among the major importers of Indian paddy as it retained its original export quantity share of 67.93 per cent during the period 2007-08 to 2016-17. Similarly, Saudi Arabia and Yamen Arab Republic have retained their original export quantity share of 57.34 and 39.39 per cent, respectively. This implies that Saudi Arabia and Yamen AR were also the stable importer of Indian paddy.

The USA was the most stable market among the major importers of Indian paddy, it retained its original export value share of 76.34 per cent during the period 2007-08 to 2016-17. Similarly, UAE and Saudi Arabia have retained its original export value share of 56 .47 and 43.88 per cent, respectively.

Application of research: Study of trade directions of paddy exports from India

Research Category: Agricultural economics

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Study area / Sample Collection: Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, 413722, Maharashtra, India

Cultivar / Variety / Breed name: Paddy

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