**Export Direction of major cereals in India**

**ABSTRACT**

Indian economy is dependent on agriculture. Agriculture serves as a significant income generator for the society, providing numerous employment opportunities for both educated and uneducated individuals. India’s capacity to meet domestic cereal demand while engaging in international trade highlights the importance of identifying stable and strategic export markets. In terms of value the trade of cereals was accounted to Rs. 744.91 billion during the year 2020-21, which increased to Rs. 1110.62 billion during year 2022-23. The present study aimed to examine the competitiveness of major cereals *viz*. basmati rice, non-basmati rice, wheat, maize and other cereals. export from India. For the study secondary data for last twenty years (2002-2022) obtained from official sources, including the Agricultural Processed Product Export Development Authority (APEDA), the Food and Agricultural Organization (FAO), the Agricultural Marketing Information Network (AGMARKNET) and India stat. Markov Chain analysis is used to identify the direction of exports. The results of Markov Chain analysis showed that UAE, Saudi Arabia, Iran and Iraq for basmati rice; South Africa, Nepal, UAE and Senegal for non-basmati rice; Nepal, Bangladesh, UAE and Sri Lanka for wheat and Nepal, Indonesia, Bangladesh, Vietnam and Malaysia for maize were the most stable market for these commodities. These findings are crucial for shaping targeted export strategies, optimizing resource allocation, and strengthening India's trade relationships.

***Keywords:*** *Economy,**Direction, Cereals, Markov Chain, Employment*

1. **INTRODUCTION**

“Export plays a crucial role in the economy of the country. Export allows us to expand our markets at global level. It allows countries to use their resources - whether labour, technology or capital - more efficiently. It makes possible to access global technology for up-gradation of indigenous production technology, better education, better health and better transport services. International trade not only results in increased efficiency but also allows countries to participate in a global economy which raise employment levels and increases the income of individuals and nation as a whole. This leads to stimulating economic growth” (Gondalia *et al.,* 2017). The major exportable agro-based products include different cereals and pulses, oil meals, guar gum meals, cotton, spices and various other products that consistently find markets in other countries. “The export of agricultural products from India holds vast potential and demand in the international market” (Bhatia *et al.,* 2021). Among the different cereals non-basmati rice occupies the major share (58%) in India's total cereals export whereas, other cereals including wheat and Basmati rice, each represents 15 per cent share of total cereals exported from India during 2022-23. “The huge demand for cereals in the global market is creating an excellent environment for the export of Indian cereals” (Soumya and Yeledhalli, 2020). The major destination for the Indian cereals export were the Bangladesh, South Africa, Nepal, UAE, Saudi Arabia, Sri Lanka, Kuwait, Oman, Malaysia, Vietnam, Indonesia and Philippians. South-East Asia was considered as the largest market for Indian maize and it was also exported to Indonesia, Malaysia and Vietnam (Upreti *et al.,* 2020). During 2020-21, the quantity and value of Basmati rice export was 46.30 lakh MT and Rs. 298.50 billion. The quantity of Basmati rice exported declined from 46.30 lakh MT during 2020-21 to 45.59 lakh MT during 2022-23, but the value of export increased from Rs. 298.50 billion to Rs. 385.24 billion (APEDA, 2024).

1. **METHODOLOGY**

The study was based on secondary data pertaining to the export quantity and prices of selected cereals from India and the world, which was collected from the website of Agricultural and Processed Food Products Export Development Authority (APEDA). As per the availability, the data was collected for the period of last twenty years *i.e*. from year 2002 to 2022. To study the decadal performance the entire study period was divided into two sub-period and overall period *viz.,* Period I: 2002-2011 Period II: 2012-2022 Overall Period: 2002-2022.

**Markov Chain Analysis**

“The changes in the exports of sel ected commodities to different countries was analyzed by employing a first order finite Markov chain model which captured the net effect in changes in their exports over a period of time. The estimation of the Transitional Probability Matrix (TPM, (P)) was central to this analysis. The element Pij of the matrix indicates the probability that the export was switch from the ith country to jth country over a period of time. The diagonal elements Pij indicates the probability that the export share of a country retained in the successive time periods, which in other words, measured the loyalty of an importing country to a particular exporting country. In this context seven major importing countries was considered for each of the selected commodities. The average export to a particular country was considered to be a random variable which depended only on its past exports to that country and which is denoted algebraically by the following equation”: (Madhu *et al.*, 2024)

|  |  |  |
| --- | --- | --- |
|  | **Ejt = Eit-1Pij + ejt** |  |

where, Ejt = Exports from India to the jth country during the year ‘t’

Eit-1 = Exports to the ith country during the year ‘t – 1’

Pij = Probability that exports will shift from the ith country to jth country

ejt = Error-term which is statistically independent of ejt-1, and

r = Number of importing countries

The transitional probabilities Pij, which can be arranged in a (c × r) matrix, had the following properties: 0 ≤ Pij ≤ 1.

1. **RESULTS AND DISCUSSION**
2. **Export Direction in Export of Major Cereals**

The directions of trade of major cereals export from India to different destinations was examined using first order Markov chain analysis and the values of transitional probability matrix (TPM) from Markov Chain analysis were estimated. The major importing countries for a particular crop were identified and rest of the countries were pooled under ‘others’ category. This study examines the annual export data of cereal crops from 2002-2022, employing transitional probability matrix. The analysis is divided into two sub-periods: period I (2002-2011) and period II (2012-2022). 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.

1. **Trade Directions of Basmati Rice Export from India (Period I: 2002-2011)**

The values of TPM showing the directions of trade of basmati rice export from India to different destinations during Period I are presented in Table 1. There are seven major countries that imported Indian basmati rice in large quantities were identified and rest of the countries were pooled under ‘others’ category. The major countries importing Basmati rice from India during Period-I were Saudi Arabia, UAE, Kuwait, US, Yemen, UK and Canada.

**Table 1: Transitional probability matrix of basmati rice export from India (Period I: 2002-2011)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Saudi Arabia** | **UAE** | **Kuwait** | **US** | **Yemen** | **UK** | **Canada** | **Others** |
| **Saudi Arabia** | **0.7537** | 0.0000 | 0.0799 | 0.0166 | 0.0247 | 0.1165 | 0.0086 | 0.0000 |
| **UAE** | 0.0000 | **0.7182** | 0.0000 | 0.0000 | 0.0060 | 0.0000 | 0.0000 | 0.2758 |
| **Kuwait** | 0.0000 | 0.3607 | **0.0752** | 0.2027 | 0.2849 | 0.0000 | 0.0766 | 0.0000 |
| **US** | 0.8593 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.1407 | 0.0000 | 0.0000 |
| **Yemen** | 0.0000 | 0.7398 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0052 | 0.2550 |
| **UK** | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 |
| **Canada** | 0.1283 | 0.1714 | 0.7003 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 |
| **Others** | 0.0000 | 0.0000 | 0.1435 | 0.0071 | 0.0004 | 0.0000 | 0.0000 | **0.8489** |

The major gainer among the importers of Indian basmati rice over the study period was Saudi Arabia which had a transfer probability of 1.000 from UK, 0.8593 from US and 0.1283 from Canada. In a similar manner UAE gained 73.98 per cent market share from Yemen and 36.07 per cent from Kuwait and 17.14 per cent market share from Canada. On the other hand, UAE was likely to lose 0.60 per cent market share to Yemen and 27.58 per cent to others. The above findings of direction were in agreement with Adhikari *et al.* (2016) who concluded that Saudi Arabia, UAE and Kuwait were most stable market for export of basmati rice.

1. **Trade Directions of Basmati Rice Export from India (Period II: 2012-2022)**

The transitional probability matrix for Indian basmati rice importing countries for period II (2012- 2022) is presented in Table 2. The table clearly depicts that, Saudi Arabia, UAE, Iran and Iraq were the loyal markets of Indian basmati rice. UAE was the most stable and loyal market as resembled by the highest probability retention of 0.4715 implied that UAE retained its import share over the study period by 47.15 per cent followed by Saudi Arabia, Iran and Iraq which retained 42.31 per cent, 32.62 per cent and 32.59 per cent their shares over the study period.

The above findings of direction were in agreement with Chavan *et al*. (2023) who in their study concluded that Saudi Arabia, UAE, Iran and Iraq were most stable market for Indian basmati rice export. The results also match with Shailza et al. (2021) who also concluded that Saudi Arabia, UAE and Iran were stable importing countries for basmati rice.

**Table 2: Transitional probability matrix of basmati rice export from India (Period II: 2012-2022)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Saudi Arabia** | **UAE** | **Kuwait** | **US** | **Yemen** | **Iran** | **Iraq** | **Others** |
| **Saudi Arabia** | **0.4231** | 0.1871 | 0.0766 | 0.0000 | 0.0000 | 0.0000 | 0.2913 | 0.0219 |
| **UAE** | 0.2064 | **0.4715** | 0.0800 | 0.0000 | 0.0150 | 0.0000 | 0.0491 | 0.1781 |
| **Kuwait** | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 |
| **US** | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 1.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Yemen** | 0.0000 | 0.0000 | 0.1032 | 0.1496 | **0.0000** | 0.6815 | 0.0657 | 0.0000 |
| **Iran** | 0.3868 | 0.0000 | 0.0546 | 0.0000 | 0.0334 | **0.3262** | 0.0000 | 0.1991 |
| **Iraq** | 0.0000 | 0.0000 | 0.0000 | 0.0431 | 0.0500 | 0.0000 | **0.3259** | 0.5811 |
| **Others** | 0.0323 | 0.0000 | 0.0000 | 0.0866 | 0.0000 | 0.5453 | 0.0000 | **0.3358** |

1. **Trade Directions of Non-Basmati Rice Export from India (Period I: 2002-2011)**

The values of TPM showing the directions of trade of non-basmati rice export from India to different destinations during Period I are presented in Table 3. The major countries importing non-basmati rice from India during Period I were Bangladesh, South Africa, Nigeria, Nepal, UAE, Saudi Arabia and Sri Lanka.

**Table 3: Transitional probability matrix of non-basmati rice export from India (Period I: 2002-2011)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-**  **desh** | **South Africa** | **Nigeria** | **Nepal** | **UAE** | **Saudi Arabia** | **Sri Lanka** | **Others** |
| **Bangladesh** | **0.0254** | 0.0000 | 0.0532 | 0.0823 | 0.1228 | 0.1514 | 0.1330 | 0.4320 |
| **South Africa** | 0.0000 | **0.0000** | 0.5580 | 0.0000 | 0.0218 | 0.0000 | 0.0000 | 0.4202 |
| **Nigeria** | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 1.0000 |
| **Nepal** | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 | 1.0000 |
| **UAE** | 0.0000 | 1.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 |
| **Saudi Arabia** | 0.0000 | 0.3798 | 0.0874 | 0.5328 | 0.0000 | **0.0000** | 0.0000 | 0.0000 |
| **Sri Lanka** | 0.0000 | 0.0846 | 0.5975 | 0.3179 | 0.0000 | 0.0000 | **0.0000** | 0.0000 |
| **Others** | 0.7245 | 0.0803 | 0.0000 | 0.0000 | 0.0214 | 0.0364 | 0.0000 | **0.1373** |

As evident from Table 3 that Bangladesh retained only 2.54 per cent of its original share and they lost it to UAE (12.28%), Saudi Arabia (15.14%), Sri Lanka (13.30%), Nepal (8.23%) and Nigeria (5.32%). South Africa, Nigeria, Nepal, UAE, Saudi Arabia and Sri Lanka were the most unstable importers as they could not retain their original share.

The above results were in agreement with Satishkumar *et al.* (2016) who concluded that Bangladesh was stable market and South Africa was unstable market for Indian non-basmati rice.

1. **Trade Directions of Non-Basmati Rice Export from India (Period II: 2012-2022)**

The transitional probability matrix for non- basmati rice importing countries for the period II (2012- 2022) is presented in Table 4. The Table 4 clearly depicts that, South Africa, Nepal, UAE and Sengal were the loyal markets of Indian rice. Among the countries, South Africa was the most stable and loyal market as resembled by the highest probability retention of 0.6653, implied that South Africa retained its import share over the study period by 66.53 per cent followed by Nepal, UAE and Sengal which retained 44.07 per cent, 25.82 per cent and 25.38 per cent of their shares over the study period. Bangladesh, Saudi Arabia and Benin were the most unstable importer of non-basmati rice as they could not retain their original share. Saudi Arabia lost their 100 per cent share to Nepal.

**Table 4: Transitional probability matrix of non-basmati rice export from India (Period II: 2012-2022)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-desh** | **South Africa** | **Nepal** | **UAE** | **Saudi Arabia** | **Sengal** | **Benin** | **Others** |
| **Bangladesh** | **0.0000** | 0.0000 | 0.0658 | 0.0106 | 0.0221 | 0.0100 | 0.0000 | 0.8915 |
| **South Africa** | 0.2754 | **0.6653** | 0.0000 | 0.0000 | 0.0592 | 0.0000 | 0.0000 | 0.0000 |
| **Nepal** | 0.0000 | 0.0000 | **0.4407** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.5593 |
| **UAE** | 0.0000 | 0.0000 | 0.0168 | **0.2582** | 0.1252 | 0.1469 | 0.4529 | 0.0000 |
| **Saudi Arabia** | 0.0000 | 0.0000 | 1.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 |
| **Sengal** | 0.0000 | 0.0460 | 0.0869 | 0.1966 | 0.0496 | **0.2538** | 0.3672 | 0.0000 |
| **Benin** | 0.5762 | 0.0000 | 0.1048 | 0.0075 | 0.0503 | 0.2611 | **0.0000** | 0.0000 |
| **Others** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0513 | 0.0911 | **0.8575** |

1. **Trade Directions of Wheat Export from India (Period I: 2002-2011)**

The trade direction of wheat exports to different destinations has been analysed by constructing transition probability matrix for period I (2002-2011) presented in Table 5. The Table 5 clearly depicts that, Bangladesh, Sri Lanka, USA were the loyal markets of Indian wheat. Bangladesh retained its import share over the study period by 8.37 per cent, followed by Sri Lanka and USA with 4.99 and 2.89 per cent, respectively. Bangladesh lost its share of import of Indian wheat to Nepal (39.09%), UAE (27.74%), Shri Lanka (13.61%) and other countries (11.20%). It gained 29.16 per cent share from Nepal and 100 per cent share from Oman.

**Table 5: Transitional probability matrix of wheat export from India (Period I: 2002- 2011)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-desh** | **Nepal** | **UAE** | **Sri Lanka** | **Malaysia** | **Oman** | **USA** | **Others** |
| **Bangladesh** | **0.0837** | 0.3909 | 0.2774 | 0.1361 | 0.0000 | 0.0000 | 0.0000 | 0.1120 |
| **Nepal** | 0.2916 | **0.0000** | 0.0564 | 0.0000 | 0.0000 | 0.0000 | 0.0076 | 0.6445 |
| **U.A.E.** | 0.0000 | 0.9232 | **0.0000** | 0.0000 | 0.0000 | 0.0000 | 0.0768 | 0.0000 |
| **Sri Lanka** | 0.0000 | 0.0000 | 0.2880 | **0.0499** | 0.0000 | 0.0000 | 0.0000 | 0.6621 |
| **Malaysia** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 1.0000 |
| **Oman** | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 |
| **U.S.A.** | 0.0000 | 0.7974 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0289** | 0.1737 |
| **Others** | 0.6299 | 0.0000 | 0.0000 | 0.0000 | 0.0669 | 0.0497 | 0.0000 | **0.2535** |

The above results were in agreement with Agam (2022) who concluded that Bangladesh and Sri Lanka were stable importer of Indian wheat.

1. **Trade Directions of Wheat Export from India (Period II: 2012-2022)**

The TPM for wheat importing countries during period II (2012- 2022) is presented in Table 6. Nepal retained its import share over the study period by 89.87 per cent followed by Bangladesh Sri Lanka and UAE which retained 69.49 per cent, 21.59 per cent and 20.51 per cent of their shares over the study period. Malaysia, Oman and Indonesia were the unstable importer of Indian wheat export.

**Table 6: Transitional probability matrix of Wheat export from India (Period II: 2012-2022)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-desh** | **Nepal** | **UAE** | **Sri Lanka** | **Malaysia** | **Oman** | **Indonesia** | **Others** |
| **Bangladesh** | **0.6949** | 0.0000 | 0.0657 | 0.0105 | 0.0140 | 0.0130 | 0.0794 | 0.1224 |
| **Nepal** | 0.0752 | **0.8987** | 0.0172 | 0.0070 | 0.0019 | 0.0000 | 0.0000 | 0.0000 |
| **U.A.E.** | 0.5800 | 0.2150 | **0.2051** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Sri Lanka** | 0.0000 | 0.0000 | 0.0000 | **0.2159** | 0.0009 | 0.0000 | 0.0000 | 0.7832 |
| **Malaysia** | 0.0000 | 0.0000 | 1.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.0000 |
| **Oman** | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 | 0.0000 |
| **Indonesia** | 0.6352 | 0.0000 | 0.3648 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 |
| **Others** | 0.1002 | 0.0000 | 0.0983 | 0.0138 | 0.0222 | 0.0524 | 0.0674 | **0.6456** |

The above results were in agreement with Udhayan *et al.* (2023) who concluded that Bangladesh, Nepal and UAE were stable market and Malaysia and Indonesia were unstable market for Indian wheat export. The results also in line with Srivastava et al. (2023) who also concluded that Nepal, Bangladesh, Sri Lanka and UAE were stable importing countries of Indian wheat.

1. **Trade Directions of Maize Export from India (Period I: 2002-2011)**

The transitional probability matrix for Indian maize importing countries during the period I (2002- 2011) is presented in Table 7. Vietnam, Bangladesh, Nepal, Malaysia, Sri Lanka, Indonesia, and UAE identified as major importer of maize from India during period I. Vietnam remained as the most stable market among the major importers of Indian maize as it retained its export share to 58.87 per cent.

**Table 7: Transitional probability matrix of maize export from India (Period I: 2002-2011)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-desh** | **Nepal** | **Malaysia** | **Sri Lanka** | **Indonesia** | **Vietnam** | **UAE** | **Others** |
| **Bangladesh** | **0.5317** | 0.0261 | 0.1080 | 0.0643 | 0.0444 | 0.0000 | 0.0390 | 0.1865 |
| **Nepal** | 0.0000 | **0.0000** | 0.0000 | 0.0000 | 0.8424 | 0.0000 | 0.1576 | 0.0000 |
| **Malaysia** | 0.0000 | 0.0244 | **0.4222** | 0.0000 | 0.0000 | 0.0122 | 0.0597 | 0.4815 |
| **Sri Lanka** | 0.4311 | 0.0160 | 0.0000 | **0.3916** | 0.1240 | 0.0000 | 0.0373 | 0.0000 |
| **Indonesia** | 0.0000 | 0.0152 | 0.7015 | 0.0000 | **0.0000** | 0.2822 | 0.0011 | 0.0000 |
| **Vietnam** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.3926 | **0.5887** | 0.0187 | 0.0000 |
| **UAE** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 1.0000 |
| **Others** | 0.5089 | 0.0398 | 0.2224 | 0.0012 | 0.0000 | 0.2278 | 0.0000 | **0.0000** |

Bangladesh had retained 53.17 per cent share of imports of maize and lost share to Malaysia, Sri Lanka, Indonesia, UAE, Nepal and Other countries to the extent of 10.80, 6.43, 4.44, 3.90 and 18.65 per cent, respectively. Nepal, Indonesia, UAE and Other countries were unstable market of maize export from India.

The above results were in agreement with Agam (2022) who concluded that Bangladesh, Vietnam and Malaysia were stable market and Indonesia and UAE were unstable market for Indian wheat export.

1. **Trade Directions of Maize Export from India (Period II: 2012-2022)**

The TPM for Indian maize importing countries during the period II (2012-2022) is presented in Table 8. Nepal retained its import share over the study period by 55.45 per cent followed by Indonesia, Bangladesh, Malaysia and Vietnam which retained 48.75 per cent, 42.26 per cent, 24.19 per cent and 23.53 per cent, respectively of their shares over the study period. Sri Lanka and Philippines were unstable market for Indian maize export.

**Table 8: Transitional probability matrix of maize export from India (Period II: 2012-2022)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bangla-desh** | **Nepal** | **Malaysia** | **Vietnam** | **Indonesia** | **Sri Lanka** | **Philip-**  **pines** | **Others** |
| **Bangladesh** | **0.4226** | 0.0583 | 0.0000 | 0.4050 | 0.0000 | 0.0892 | 0.0000 | 0.0250 |
| **Nepal** | 0.3417 | **0.5545** | 0.0280 | 0.0337 | 0.0000 | 0.0000 | 0.0131 | 0.0290 |
| **Malaysia** | 0.0000 | 0.0000 | **0.2419** | 0.1354 | 0.4654 | 0.0000 | 0.0000 | 0.1573 |
| **Vietnam** | 0.6684 | 0.0000 | 0.0963 | **0.2353** | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **Indonesia** | 0.0000 | 0.0000 | 0.3433 | 0.0000 | **0.4875** | 0.0675 | 0.0302 | 0.0715 |
| **Sri Lanka** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.7527 | 0.2473 |
| **Philippines** | 0.0000 | 1.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | **0.0000** | 0.0000 |
| **Others** | 0.0000 | 0.4585 | 0.0000 | 0.0000 | 0.0000 | 0.0835 | 0.0000 | **0.4580** |

The above results were in agreement with Agam (2022) who concluded that Nepal and Vietnam were stable importer of Indian maize.

1. **CONCLUSION**

The major destinations for Indian cereal exports varied by commodity. For basmati rice, the key importing countries were Saudi Arabia, Kuwait, the United Arab Emirates (UAE), the United States, and Yemen. In the case of non-basmati rice, the primary markets included Bangladesh, South Africa, Nepal, the UAE, and Saudi Arabia. Wheat exports from India were mainly directed to Bangladesh, Nepal, the UAE, and Sri Lanka. For maize, the significant destinations were Bangladesh, Nepal, Malaysia, Sri Lanka, Vietnam, and Indonesia.The results of Markov Chain analysis showed that UAE, Saudi Arabia, Iran and Iraq for basmati rice; South Africa, Nepal, UAE and Sengal for non-basmati rice; Nepal, Bangladesh, UAE and Sri Lanka for wheat and Nepal, Indonesia, Bangladesh, Vietnam and Malaysia for maize were the most stable market for these commodities therefore these commodities needed to be focused for export of these cereals from India.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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