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Export performance and comparative analysis of onion-with reference to India

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Abstract

Agriculture supports the country's ability to hold a dominant position in the world's trade market, particularly in the trade of onions. In India, exports are only allowed if domestic criteria have been satisfied; fluctuations in domestic conditions are the reason for export changes. This study examines the export competitiveness of Indian onions, analyzing trade direction and future export share from 2006 to 2021 in comparison to competitor countries. Utilizing measures such as Markov chain analysis, revealed comparative advantage, revealed symmetric comparative advantage, and comparative export performance Index. The findings reveal that Indian onion exports were highly competitive until 2018 when a ban was imposed, resulting in increased competition from Pakistan. This has posed a serious threat to India's onion export potential. However, India still maintains a comparative advantage compared to other top onion exporting countries, as indicated by the comparative export performance Index. Nepal has consistently been the top importer due to limited domestic production and the inability. On the other hand, Sri Lanka, Indonesia, and other countries were identified as unstable markets with uncertain destinations for Indian onion exports. However, India needs to implement proactive measures to sustain its position in the global market, such as producing onion varieties that meet foreign requirements and modifying export policies. Challenges from competitors require strategic efforts to maintain and enhance India's export competitiveness in the global onion trade.

Keywords: Onion, export competitiveness, export performance, comparative advantages transactional probability matrix

1. Introduction

Production and trade of agricultural commodities are essential to emerging nations' economic development (Akriti *et al.*, 2017) [3]. During the Liberalization, Privatization, and Globalization (LPG) phase of 1991, India benefited from net agricultural exports as it enjoyed a comparative advantage in agricultural commodities (Ashpreet *et al.*, 2022) [5]. India is the world's second-largest onion producer after China (Abhishek, 2015) [1]. It is the top earner in foreign exchange among fruits and vegetables, and not just for domestic consumption (Vani *et al.*, 2022) [37]. Of the vegetables that India exported in 2021-22, the country exported 1,537,496.89 MT of fresh onions worldwide for a total of Rs. 3,432.14 crores (APEDA, 2022) [4]. This demonstrates how crucial onions are to India's export economy.

Due to their widespread consumption, people from all socioeconomic classes. It is raised both for domestic consumption and for export (Sendhil *et al.*, 2014) [31]. A total of 26.64 million tonnes will be produced in 2021–2022, on a 1.62 Mha area. The three states that produce the most onions are Maharashtra, Madhya Pradesh, and Karnataka (Abhishek, 2017) [2]. India contributes roughly 28.5% of the world's onion production, which places it second only to China (FAO, 2019) [16]. India exports onions to 150 different nations, ranking second after the Netherlands in terms of onion exports. In December 2018, the Indian government unveiled a new agricultural export policy to boost exports yet further. Bangladesh, Malaysia, the United Arab Emirates (UAE), Sri Lanka, Nepal, and Indonesia are the main destinations for Indian onions (Bhagat *et al.*, 2022) [8]. Indian onion exports had many ups and downs, either due to price and production variations, continually increasing cultivation costs, domestic market prices that are higher than international prices, or occasionally as a result of exporting countries' prohibitions (Sonali and Rakesh, 2021) [34].

As a result of our inconsistent policies regarding onion exports, we are losing significant importing nations. After India's ban on export, the price of onions has risen throughout Asia, forcing major importers like Bangladesh and Sri Lanka to import their produce from Pakistan, Myanmar, and China, which are close by and have been exporting to neighboring nations. Due to the problems mentioned above, the major importing countries changed their trade directions (Subramani, 2021) [35]. This indicates that it is necessary to reevaluate India's advantage in export competitiveness and the direction change of Indian onion exports.

For policymakers and other stakeholders to identify measures for improving agricultural exports, it is necessary to examine how various commodities perform in dynamic shifts and movements when a country begins to export a commodity (Misu Kim, 2019) [24]. For that reason, the methods of export potential assessment (competitiveness) help countries evaluate their export prospects and raise their market share, and stability analysis might enable us to measure changes in market shares over time, both within and across markets (Sunil and Singh 2021) [36].

Several studies have examined the competitiveness and trade direction shifting of Indian agricultural commodities (Bhattacharya, P. 2019; Jha *et al.*, 2019; Narayan and Bhattacharya, 2019; Yogesh and Srivastava, 2020; Ayu Sitanini, 2022) [9, 18, 28, 39, 6], but none of them have specifically examined the Indian onion using recent data after the government implemented new agricultural export policies in terms of competitiveness and trade surpluses. In light of this context, we have attempted to study the current and projected export performance of Indian onions with their competitive advantage in international markets, along with comparing against other major exporters of onions and Indian onion export stability and performance.

2. Methods and Materials

Data Collection

The study's goals are achieved by using secondary data. The Agriculture and Processed Food Products Export Development Authority (APEDA) provided data on the top export destinations for Indian onions from 2008 to 2021. Food and Agricultural Organization (FAO) provides export quantity data that is used to assess India's and other major exporting nations' competitiveness.

Export Competitiveness

Competitiveness is the capacity of a country to produce and market items that can compete on the world market while simultaneously improving the real incomes and living standards of the producers (Saxena *et al.*, 2022) [30]. If a nation's domestic market price (DMP) is lower than its international price (IP) for a given commodity, it is said to be export competitive for that product. Examining export competitiveness involves using the metrics RCA (Revealed Comparative Advantage), RSCA (Revealed Symmetric Comparative Advantage), and CEP (comparative export performance) (Balassa, 1965) [7]. When an individual, organization, or country can supply a good or service at a lower opportunity cost than another producer, it is said to have a comparative advantage (Kumar, and Gummagolmath, 2021) [20].

Revealed Comparative Advantage (RCA)

Balassa was the one who first calculated the RCA index (1965). It had undergone various changes (1977, 1979, and 1986). Instead of analyzing the reasons for comparative advantage, the index seeks to determine if a country has

demonstrated an advantage. By dividing a commodity's share of total national exports by its share of total exports worldwide, the formula is calculated.

$$RCA_{ij} = RXA_{ij} = \frac{X_{ij}/X_{it}}{X_{wj}/X_{wt}}$$

Where,

RCA_{ij} = Revealed Comparative Advantage of the i th country for the j th product.

X_{ij} = j th commodity exports by the i th country.

X_{it} = Total commodity exports of the i th country.

X_{wj} = World exports of J th commodity.

X_{wt} = Total commodity world exports.

The index's predicted value ranges from zero to infinity. Based on Balassa's RCA, Hinloopen (2001) [17] suggested the classification shown below:

$0 < \text{but} \leq 1$ then No comparative advantage.

$1 < \text{but} \leq 2$ then Weak comparative advantage.

$2 < \text{but} \leq 4$ then Moderate comparative advantage.

4 or more then Strong comparative advantage.

Revealed Symmetric Comparative Advantage (RSCA)

The term revealed symmetric comparative advantage (RSCA) was developed by Dalum *et al.*, (1998) [11] and Widodo (2009) [38] as a result of the asymmetry problem with the RCA determined by the Balassa index, which is fundamentally not comparable on both sides of unity. RSCA has a value between -1 and +1. A modified formula is as follows:

$$RSCA_{ij} = \frac{RXA_{ij}-1}{RXA_{ij}+1}$$

When the value will be greater than 0 $RSCA_{ij}$ represents the country 'i' enjoy for product 'j' and vice versa if the value will be less than 0 (Shinoj and Mathur, 2008) [32].

Comparative Export Performance Index (CEP)

The comparative export performance (CEP) index is used to evaluate two countries export competitiveness (Donges, 1982; Bobirca and Miclaus, 2011) [14, 10]. The index's basis in export shares makes it possible to compare two indices.

$$CEP = \frac{X_{ij}/X_i}{X_{kj}/X_k}$$

Where,

X_{ij} = j th commodity exports by the i th country.

X_i = Total commodity exports of the i th country.

X_{kj} = j th commodity exports by the k th country.

X_k = Total commodity exports of the k th country.

The RCA and other indices are based on trade patterns that have been observed. An increase in RCA means an increase in the productivity of a country in a product market. Because of the simplicity of the measurements, this competitiveness measure is widely adopted (Darekar *et al.*, 2015) [12].

Markov chain analysis

Analyzing structural change in any system whose progress over time can be measured by a single outcome variable is the goal of Markov chain analysis (Dent, 1967) [13]. Specifically, we explored the gains and losses related to Indian onions' exports to key importing countries using the Markov chain

model. An important part of a Markov chain analysis is developing a transitional probability matrix, P, which represents the probability that exports will switch from one nation 'i' to another nation 'j'. According to Yogesh and Srivastava (2010) [40], the diagonal element measures a country's chances of maintaining its market share. Indian onions were imported into eight major countries in the context of the current application, viz. In addition to Bangladesh, Malaysia, the UAE, Sri Lanka, Nepal, Indonesia, Saudi Arabia, and all the other countries selected for analysis, all the other countries were grouped under the others selected category. We assumed that the average annual export of onions from India to countries that import onions was a function of previous exports and was constant over time (Mahadevaiah *et al.*, 2005) [23]. This was algebraically expressed as

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

Where,

- E_{jt} = Exports from India to the i^{th} country during the year t
- E_{it-1} = Exports to the i^{th} country during the year t - 1
- P_{ij} = Probability that exports will shift from the i^{th} country to j^{th} country
- e_{jt} = Error-term which is statistically independent of e_{jt-1} , and
- r = Number of importing countries.

According to Sathish and Khadar (2017) [29], the properties of the transitional probabilities, which can be arranged in a (c × r) matrix, are as follows:

- 1) $0 \leq P_{ij} \leq 1$
- 2) $\sum_{i=1}^r P_{ij} = 1$ for all i

India's expected export share for the given period t is based on the previous period's exports (t-1) multiplied by the estimated transition probability matrix (P) (Mohandas *et al.*, 2018) [25]. By minimizing mean absolute deviation (MAD), the transition probability matrix was estimated using the linear programming (LP) framework (Joshi *et al.*, 2015) [19]. According to the LP formulation for analysis was stated as

Min $O P^* + I_e$
 Subject to,

$$\begin{aligned} XP^* + V &= Y \\ GP^* &= 1 \\ P^* &\geq 0 \end{aligned}$$

Where,

- P^* is a vector of the probabilities P_{ij}
- O is the vector of zeros.
- i is an appropriately dimensional vectors of areas.
- e is the vector of absolute errors.
- Y is the proportion of exports to each country.
- X is a block diagonal matrix of lagged values of Y.
- V is the vector of errors.
- G is a grouping matrix to add the row elements of P arranged in P^* to unity.

Future projections for exports

Using the transitional probability matrix, the quantity of onion export share was predicted (Siddeshwar *et al.*, 2017) [33].

$$B_t = B_o * T$$

$$B_{t+i} = B_{t+i-1} * T$$

Where,

- B_o = Quantity exported in Base years,
- B_{t+i} = Quantity exported in next year (prediction),
- T = Transitional probability matrix.

3. Results and Discussion

The required data were collected, analyzed, and interpreted in the context of the study's goal. The obtained results are displayed and discussed below.

Indian onion exports share

In terms of exporting onions, India dominates the world market and is the top exporter. India secured second place in terms of exports with a share of 18% after the Netherlands with 20%. The decadal export share comparison plot (Fig. 1) shows that China and the USA have decreased their export share compared to all other top exporting nations and countries. Worldwide, China and India are the top producers and consumers of onions; however, when it comes to exports, Indian onions are preferred more by customers due to their flavor and appearance.

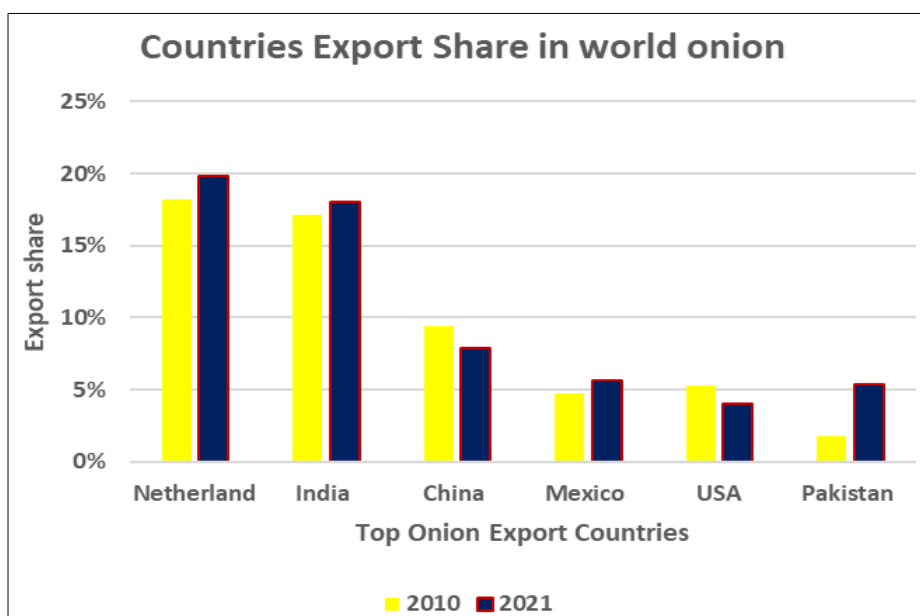


Fig 1: Export share comparison of major onion export countries

Export Competitiveness

The results of a study by the RCA and RSCA indices indicate that onions have a significant comparative advantage over all other top major onion exporter countries (Tables 1 and 2). India has a higher RCA index value than other countries, which indicates that India has an advantage in onion exports and that Indian onions have a unique demand and position on the world market (Nalini and Rai, 2007) [27]. According to Table 2, the values of the RSCA index for the export of

Indian onion quantity are closer to one for India, followed by Pakistan and the Netherlands, indicating that these countries have a better position in onion exports. According to Fig. 2, Indian onion exports had a large increase in comparative advantage between 2006 and 2018, following which the RCA and RSCA indices gradually decreased. Due to rising domestic market prices, India was imposing an export ban in 2019 to maintain domestic market prices and supplies, and India's export policy for onions has been quite volatile.

Table 1: Revealed Comparative Advantage Index onion export quantity for the period 2006-2021

Years	Netherland	India	China	Mexico	USA	Pakistan
2006	1.752	5.588	0.662	0.575	0.966	2.714
2007	1.663	5.298	0.723	0.579	0.928	1.542
2008	1.838	5.632	0.584	0.495	0.864	4.505
2009	1.843	5.584	0.578	0.532	0.834	2.401
2010	1.793	4.572	0.640	0.481	0.962	4.494
2011	1.863	5.454	0.686	0.562	0.926	3.166
2012	1.847	6.099	0.626	0.567	0.879	1.248
2013	1.816	5.334	0.709	0.529	0.879	2.699
2014	1.945	4.905	0.724	0.544	0.860	2.787
2015	1.994	6.985	0.848	0.517	0.832	4.847
2016	1.954	7.708	0.676	0.483	0.820	2.819
2017	2.080	6.012	0.809	0.480	0.882	2.650
2018	2.091	8.212	0.811	0.494	1.006	5.281
2019	1.985	4.472	0.781	0.349	1.054	4.693
2020	2.207	5.769	0.693	0.413	1.007	6.693
2021	2.151	5.710	0.602	0.449	0.945	6.568

Table 2: Revealed Symmetric Comparative Advantage Index onion export quantity for the period 2006-2021

Years	Netherland	India	China	Mexico	USA	Pakistan
2006	0.273	0.696	-0.203	-0.270	-0.017	0.461
2007	0.249	0.682	-0.161	-0.267	-0.037	0.213
2008	0.295	0.698	-0.262	-0.338	-0.073	0.637
2009	0.297	0.696	-0.267	-0.306	-0.091	0.412
2010	0.284	0.641	-0.219	-0.350	-0.019	0.636
2011	0.302	0.690	-0.186	-0.281	-0.038	0.520
2012	0.298	0.718	-0.230	-0.276	-0.064	0.110
2013	0.290	0.684	-0.170	-0.308	-0.064	0.459
2014	0.321	0.661	-0.160	-0.296	-0.075	0.472
2015	0.332	0.750	-0.082	-0.318	-0.091	0.658
2016	0.323	0.770	-0.193	-0.349	-0.099	0.476
2017	0.351	0.715	-0.105	-0.351	-0.062	0.452
2018	0.353	0.783	-0.105	-0.338	0.003	0.682
2019	0.330	0.635	-0.123	-0.483	0.026	0.649
2020	0.376	0.705	-0.182	-0.415	0.003	0.740
2021	0.365	0.702	-0.249	-0.381	-0.028	0.736

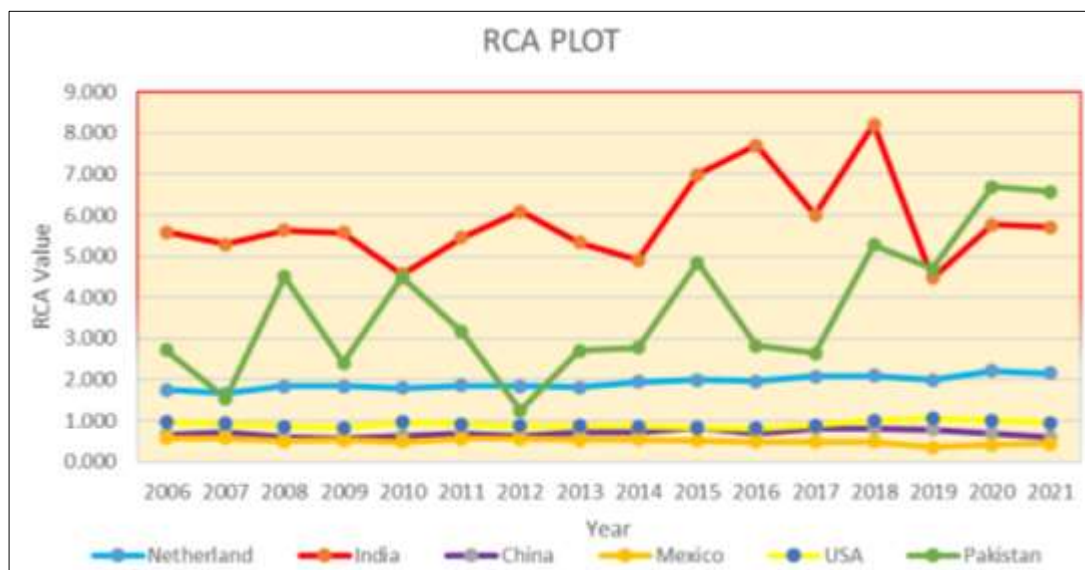


Fig 2: Revealed comparative advantage index of major onion export countries

After the Indian government's September 2019 ban on onion exports, Pakistan onions are supposed to see an increase in demand and export prices on the global market. According to the RCA and RSCA, India is now competing with Pakistan for the export of onions as a result of the export ban on onions. Due to what might be their geographical proximity, Pakistan and India both export to similar countries? Together, Bangladesh, Malaysia, Sri Lanka, the United Arab Emirates,

Sri Lanka, and Qatar contributed 86%. Examining Table 3 reveals the CEP index values of selected countries regarding India. All countries have values greater than one, indicating that Indian onions outperform all other countries (Pitcheswara and Balakrishna, 2018) [15]. However, the calculated values show a decreasing index in all countries over the years, which indicates the rise of Indian onion exports in the world market.

Table 3: Comparative Export Performance Index of onion export quantity for the period 2006-2021 in the context of India

Years	Netherland	China	Mexico	USA	Pakistan
2006	3.190	8.439	9.726	5.785	2.059
2007	3.185	7.326	9.151	5.708	3.436
2008	3.065	9.640	11.377	6.519	1.250
2009	3.030	9.656	10.505	6.699	2.326
2010	2.550	7.140	9.506	4.752	1.017
2011	2.927	7.950	9.712	5.889	1.722
2012	3.302	9.745	10.758	6.936	4.885
2013	2.937	7.525	10.077	6.065	1.976
2014	2.522	6.776	9.022	5.705	1.760
2015	3.503	8.237	13.504	8.391	1.441
2016	3.945	11.404	15.964	9.405	2.734
2017	2.891	7.429	12.521	6.813	2.269
2018	3.928	10.131	16.607	8.162	1.555
2019	2.254	5.727	12.815	4.244	0.953
2020	2.614	8.328	13.958	5.729	0.862
2021	2.655	9.488	12.730	6.039	0.869
Mean	3.031	8.434	11.746	6.428	1.945

Export performance of Indian onion

Researchers examined the dynamics of changes in the export trade of a few selected commodities from India through the estimate of a transitional probability matrix (TPM). Because of their possible changes, it was important to know how trade among countries that import onions was changing direction in order to make the right decision (Kumar *et al.*, 2007) [21]. Table 4 provides an overview of changes in India's exports of onions to major importers over the study period. The Comparative trade loss is measured by TPM row elements. Column elements show the probability that trade volume gained from competing countries, while diagonal elements show the probability that trade volume will be retained from

its previous year's volume by TPM (Kandeeban, and Mahendran, 2019) [22].

Table 4 shows that Nepal was the most constant importer of Indian onions, maintaining 64.20 percent of the market from the previous year while losing 20 percent and gaining 37.50 percent with Saudi Arabia. Another consistent importer of Indian onions was Bangladesh, which maintained 42.70 percent of the market it had the previous year while losing 24 percent to Malaysia and 14.60 percent to Sri Lanka. Malaysia, the United Arab Emirates, and Saudi Arabia retain (33.31, 32.20, and 30.30 percent) of their share from the previous year. Sri Lanka, Indonesia, and other categories of countries had the most unstable markets since they did not of their shares from the previous year.

Table 4: Transitional probability matrix Indian onion export quantity to various countries

Countries	Bangladesh	Malaysia	UAE	Sri Lanka	Nepal	Indonesia	Saudi Arab	Others
Bangladesh	0.427	0.242	0.106	0.146	0.036	0.038	0.000	0.004
Malaysia	0.000	0.331	0.232	0.030	0.000	0.000	0.000	0.407
UAE	0.000	0.000	0.322	0.000	0.000	0.000	0.000	0.678
Sri Lanka	0.993	0.000	0.000	0.000	0.007	0.000	0.000	0.000
Nepal	0.000	0.000	0.158	0.000	0.642	0.000	0.200	0.000
Indonesia	0.000	0.000	0.000	0.872	0.106	0.000	0.000	0.021
Saudi Arab	0.322	0.000	0.000	0.000	0.375	0.000	0.303	0.000
Others	0.356	0.221	0.000	0.168	0.000	0.130	0.040	0.086

TPM was used to project Indian onion export market shares to major importing countries (Yamini *et al.*, 2020) [26]. Based on Figure 3, the actual shares of exports to major importing countries are illustrated, while Figure 4 depicts the predicted shares. Over the study period, Nepal's actual share climbed

dramatically, from 2.43 percent to 10.89 percent, whereas the anticipated share only marginally increased, from 3.55 percent to 9.24 percent (Table 5). For all other major importing nations, there was a small fluctuation in both the actual and expected proportions throughout the period.

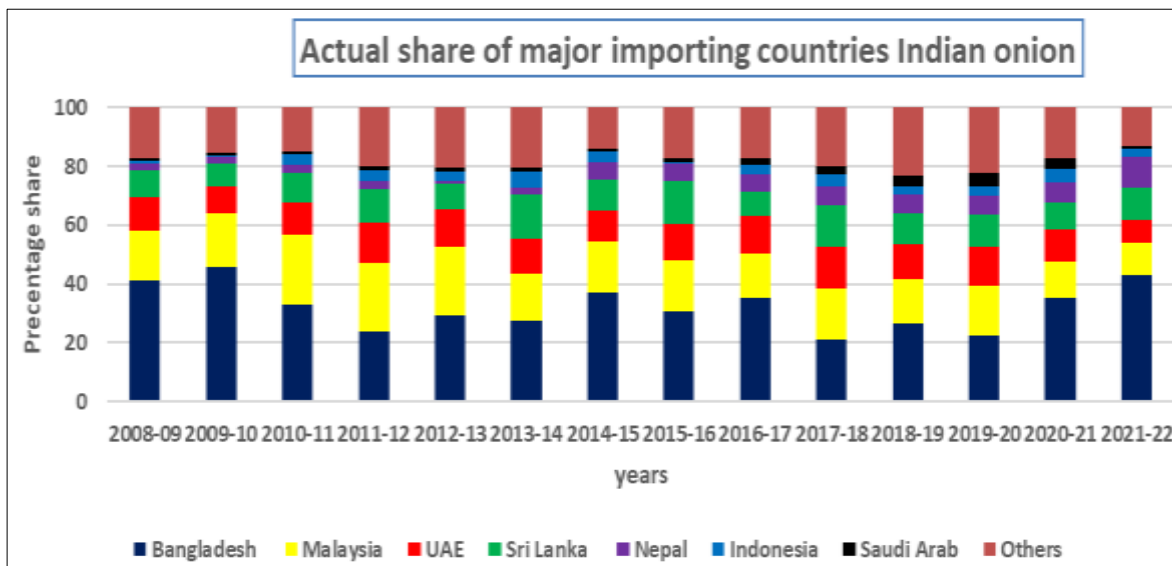


Fig 3: Actual share of onion major importing countries from India

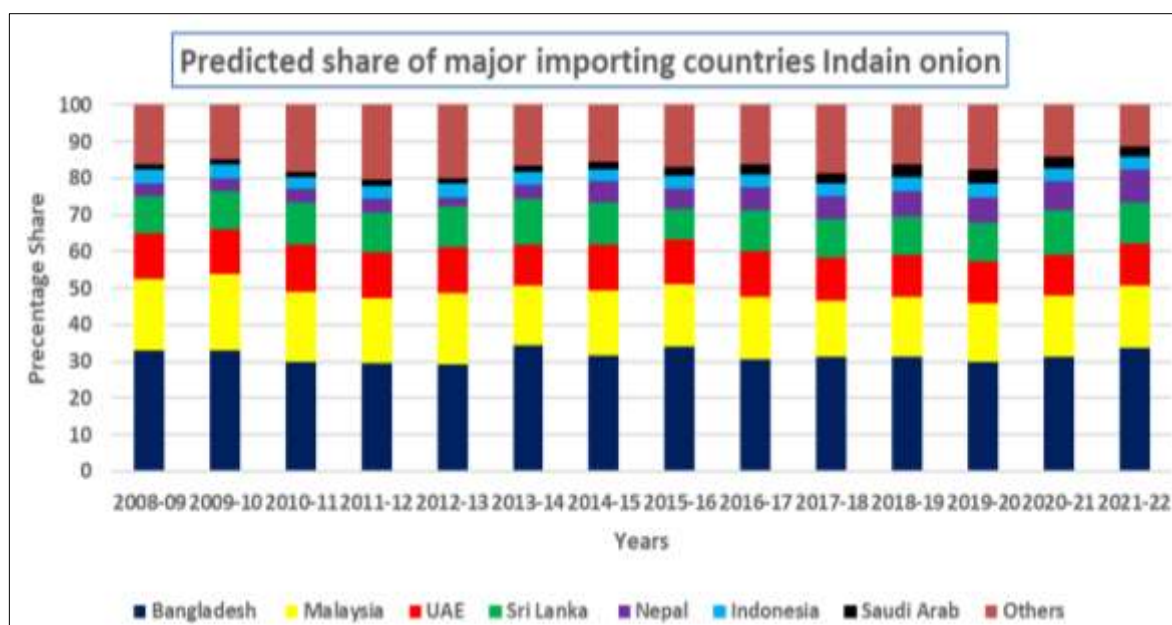


Fig 3: Predicted share of onion major importing countries from India

The actual and expected export percentages for Bangladesh both showed an upward trend, rising from 41.04 percent to 42.84 percent and 33.07 percent to 33.83 percent, respectively. In the instance of Malaysia, the actual and expected export proportions (i.e., 17.00% to 11.04% and 19.41% to 16.97%) both indicated a decreasing trend. The actual and projected market share percentages for the UAE show a decreasing trend, going from 11.36 percent to 7.99

percent and from 12.34 percent to 11.41 percent, respectively. Saudi Arabia, Sri Lanka, and Indonesia all had a slight increase in share. A forecast of the Indian onion export shares from 2022–2023 to 2025–2026 is presented in Table 6. Over 70% of Indian onions are expected to be exported in the upcoming forecasted years to Bangladesh, Sri Lanka, Malaysia, the United Arab Emirates, and Nepal.

Table 6: Forecasted export shares of Indian onion to major importing selected countries

Years	Bangladesh	Malaysia	UAE	Sri Lanka	Nepal	Indonesia	Saudi Arab	Others
2022-23	33.832	16.970	11.410	10.956	9.235	3.336	3.002	11.259
2023-24	30.313	16.313	12.660	10.267	8.701	2.747	3.207	15.793
2024-25	29.804	16.243	12.453	9.980	8.241	3.200	3.342	16.737
2025-26	29.681	16.304	12.244	10.458	8.024	3.303	3.329	16.657

Table 5: Export share of Indian onion to selected countries in (per cent).

Years	Bangladesh		Malaysia		UAE		Sri Lanka		Nepal		Indonesia		Saudi Arab		Others	
	A	P	A	P	A	P	A	P	A	P	A	P	A	P		
2008-09	41.04	33.07	17.00	19.41	11.36	12.34	9.11	10.10	2.43	3.55	0.76	3.81	0.96	1.47	17.33	16.26
2009-10	45.89	33.12	18.21	20.57	8.84	12.31	7.77	10.37	2.34	3.62	0.58	3.75	0.91	1.36	15.46	14.90
2010-11	33.12	29.87	23.80	19.21	10.76	12.90	10.18	11.34	2.54	3.65	3.75	3.19	0.95	1.39	14.90	18.45

2011-12	23.94	29.39	23.00	17.82	13.67	12.70	11.70	10.77	2.66	3.58	3.70	3.49	1.43	1.76	19.89	20.49
2012-13	29.39	29.19	23.11	19.31	12.70	12.74	8.96	11.00	1.05	2.62	2.93	3.77	1.37	1.44	20.49	19.94
2013-14	27.31	34.38	16.22	16.50	11.61	10.81	15.09	12.55	2.62	3.87	5.31	3.68	1.44	1.77	20.40	16.43
2014-15	36.89	31.65	17.38	17.79	10.63	12.27	10.63	11.49	5.70	5.87	3.69	3.21	1.11	2.03	13.98	15.68
2015-16	30.52	33.88	17.66	17.05	12.27	12.22	14.40	8.59	5.87	5.53	0.80	3.39	1.28	2.25	17.20	17.10
2016-17	35.06	30.38	15.40	17.38	12.52	12.20	8.59	11.43	5.53	6.14	3.39	3.55	2.43	2.52	17.10	16.41
2017-18	20.97	31.17	17.38	15.22	14.24	11.84	14.35	10.52	6.30	6.39	4.12	3.37	2.82	2.91	19.82	18.58
2018-19	26.47	31.15	15.22	16.58	11.84	11.16	10.52	10.72	6.39	6.75	2.85	4.01	3.53	3.27	23.18	16.36
2019-20	22.56	29.96	16.58	15.88	13.26	11.55	10.94	10.24	6.54	7.20	3.09	3.74	4.77	3.64	22.25	17.79
2020-21	35.00	31.34	12.55	16.43	10.81	11.25	9.17	12.30	7.20	7.78	4.48	3.55	3.64	3.22	17.14	14.13
2021-22	42.84	33.83	11.09	16.97	7.99	11.41	10.60	10.96	10.89	9.24	2.45	3.34	0.99	3.00	13.16	11.26

A-Actual, P- predict

4. Conclusion

Inconsistent export policies, rising domestic onion prices, and export bans in India necessitate reevaluating export competitiveness and the direction of onion exports. This study evaluates the competitiveness and export performance of the Indian onion crop. The RCA, RSCA, and CEP indices assess competitiveness. From 2006 to 2018, Indian onion exports showed considerable growth in comparative advantage, followed by a gradual fall in the RCA and RSCA indices. After imposing a ban, India is now competing with Pakistan to export onions due to their geographical proximity. According to the CEP index, onions from India outperform those from all other nations. Nepal is the most consistent importer of Indian onions based on the first-order Markov chain method. Because Nepal cannot produce Indian onions in factories and there is little local production. The most unstable markets and uncertain destinations for commodities are found in Sri Lanka, Indonesia, and other nations.

5. Suggestion

To the government and decision-makers, the author suggested, now there is little opportunity for growth in India's onion exports because some nations have already started their own production. India currently exports onions to the Gulf countries, countries in the Far East, and Asian countries. But there is an opportunity to grow the market to include countries like Japan and Europe. These countries favor yellow onions with a mild pungency, a larger bulb size, and thick fleshy layers. The possibility of yellow onion cultivation in Maharashtra, Orissa, Madhya Pradesh, and other regions will help farmers earn more money and raise the GDP of local governments.

6. Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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