



Analyzing the Export Performance and Competitiveness of Vegetables from Pakistan in Global Markets

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ABSTRACT:

The present research aims at analyzing export performance and competitiveness of Pakistan's vegetable sector by employing a number of indices pertaining to Revealed Comparative Advantage. Data of the vegetable exports from 2003 through 2021 were sourced from the International Trade Center (ITC). The RCA index indicates that Pakistan maintained a comparative advantage in vegetable exports throughout the selected timeframe except 2006 and 2008. The Revealed Symmetric Comparative Advantage (RSCA) results reveal that Pakistan experienced a comparative disadvantage in vegetable exports during 2006 and 2008, while enjoying a comparative advantage (CA) in the other years under consideration. Vollrath index and LnRCA also indicate that Pakistan had a CA in the selected time period in this sector except the years 2006 and 2008. Moreover, the Revealed Import Advantage (RMA) index indicates that Pakistan faced a competitive disadvantage in the import of these products during 2003-2021. The Relative Trade Advantage (RTA) index illustrates that Pakistan enjoyed a net-competitive advantage in 2003, whereas it faced a net-competitive disadvantage from 2004-2021. The positive Revealed Competitiveness (RC) index shows that Pakistan had a revealed competitiveness in the vegetable sector in 2003, while it faced no revealed competitiveness in the remaining years. The negative values of the Net Export Index show that, for the specified time period, Pakistan was not a net exporter of vegetables. To upsurge export competitiveness of vegetables, the current study encourages the government to enhance infrastructure, invest in R&D, improve in supply chain management, strengthen contract farming, quality and management of post-harvest losses and improve the quality of seeds and inputs.

Key Words: Export performance, Competitiveness, Vegetable Exports, RCA, RTA

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1. Introduction

Agricultural exports are essential for the economic development, employment generation, food security, and overall sustainability of many countries. A strong agricultural export sector can contribute to poverty alleviation, economic diversification, and improved living standards for the population (Sofia, A 2004). Export competitiveness has emerged as a critical factor in determining the success and growth of economies in today's increasingly interconnected global market. For developing countries like Pakistan, enhancing export competitiveness is essential for economic development, job creation, and poverty reduction (Irshad and Anwar, 2019). The agricultural sector, particularly vegetable exports, plays a vital role in Pakistan's economy, providing livelihoods for millions of people and contributing significantly to the country's export earnings. In recent years, the global trade landscape has become increasingly competitive, with nations vying for a larger share of the international market. The agricultural sector, in particular, plays a crucial role in the economic development of countries, especially for those with an agrarian-based economy. Pakistan, with its fertile land and favorable agro-climatic conditions, has enormous potential to become a significant player in the international vegetable market.

Pakistan is blessed with diverse agro-climatic conditions, fertile soil, and an abundance of water resources, which make it well-suited for vegetable production. Despite these natural advantages, the country's vegetable exports face numerous challenges in the highly competitive international market. Factors such as product quality, consistency, innovation, value addition, and adherence to international standards are crucial in determining Pakistan's export competitiveness in the vegetable sector. The quality of vegetables is a critical factor in determining export competitiveness. Pakistan's vegetable production has been characterized by inconsistent quality due to various reasons, including traditional farming practices, inadequate post-harvest management, and limited access to quality seeds and inputs. In order to improve the quality of its vegetable exports, it is essential for Pakistan to invest in research and development, adopt modern agricultural practices, and ensure the availability of quality inputs to its farmers.

Another key challenge faced by the vegetable sector in Pakistan is the inadequacy of its infrastructure. Poor transportation systems, insufficient cold storage facilities, and unreliable energy supply have resulted in high post-harvest losses and increased production costs. These factors not only undermine the quality and competitiveness of Pakistan's vegetable exports but also discourage investment in the sector. Addressing these infrastructure gaps would require concerted efforts from public and private sectors, as well as the development of public-private partnerships. Innovation and technology adoption are essential to enhancing the competitiveness of any sector, and the vegetable industry is no exception. Pakistan lags in the adoption of modern agricultural technologies and innovations, which has led to lower productivity and higher production costs compared to other competing nations. It is imperative for the country to invest in agricultural research and development, promote the use of advanced farming techniques, and facilitate the transfer of technology to farmers. Government policies play a vital role in shaping the export competitiveness of a country. In Pakistan, the vegetable sector has been plagued by inconsistent policies, high taxes, and excessive regulations, which have stifled growth and discouraged investment. There is a need for the government to implement pro-export policies that promote the vegetable sector, reduce bureaucratic hurdles, and create a favorable business environment for



investors. Exchange rates also affect export competitiveness, as fluctuations in currency values can impact the prices of a country's goods and services in the global market. Pakistan has experienced significant currency devaluation in recent years, which has increased the cost of imported inputs, such as fertilizers and machinery, thereby increasing the cost of production. It is essential for the government to adopt sound macroeconomic policies that stabilize the exchange rate and enhance the competitiveness of the country's exports.

The assessment of Pakistan's vegetable exports' competitiveness in the international market is the main objective of the current study. By delving into the determinants of competitiveness, the research seeks to spotlight the key driving forces and pinpoint areas ripe for enhancement. Our intention is to contribute valuable insights that can be instrumental in elevating the global standing of Pakistan's vegetable export industry. By understanding these dynamics, policymakers and industry stakeholders can develop strategies to enhance Pakistan's position in the global vegetable trade, ultimately contributing to the country's economic growth and prosperity. The goal of the current study is to quantify the CA and competitiveness in Pakistan's vegetable exports from 2003 to 2021 utilizing a variety of RCA indices. The stakeholders that are concerned with the vegetable export industry of Pakistan will find the study useful for building better policies for the environment that is favorable for exporting goods, and so will benefit from the study overall. Also, it will be useful as a location component for commercial transactions that are investment-friendly for both the general public and the government.

2. Review of the Literature

In economics, the notion of comparative advantage is often used to analyze how countries trade and concentrate on creating goods in which they have a competitive advantage (Prasad, 2004). David Ricardo introduced the concept of comparative advantage in 1817, making it one of the earliest trade theories in the global marketplace. Riaz et al. (2010) used different RCA indices to figure out how competitive Pakistan's agricultural exports were. This study revealed that Pakistan demonstrated competitiveness in the sectors of cereals and horticulture, while its performance in the livestock domain was less impressive. Tahir et al., (2012) used the RCA index to measure the competitiveness and comparative advantage of the Tomato. The study found that Pakistan's exports of tomato were not competitive from 1998 to 2008. Using Revealed Comparative Advantage (RCA) indicators, Riaz and Jansen (2012) examined Pakistan's agricultural products' export competitiveness in the international market. According to their findings, Pakistan was at a comparative advantage in a number of countries but was at a disadvantage globally. Using the RCA index, Hassan (2013) assessed the competitiveness of a few agricultural commodities from 2001 to 2010. According to the conclusions of their study, rice had a considerable comparative advantage over other goods that lacked a discernible advantage. In a separate study, Akhtar et al. (2013) evaluated the CA of Pakistan's horticultural industry from 1990 to 2009 using a range of RCA indices. Their findings showed that Pakistan experienced a CA for the selected products during the study period. Offei and Oduro (2014) determined the competitiveness of Ghana's agro-processed goods using four RCA indices from 2004 to 2011. The study's findings indicate that within the aforementioned time frame, Ghana's share of these particular products with a CA declined. Sachithra et al., (2014) employed various indices of RCA to assess the competitiveness of Sri Lankan exports in the global market. Their findings suggest that Sri Lanka held a comparative advantage in its primary exports. In a similar way, Ignjatijevic



et al., (2014) used several indices of RCA to measure the competitiveness of the food sector of economies in the Danube region from 2005 to 2011. They found that Serbia, the Czech Republic, Germany, Hungary, and Ukraine had all improved their comparative advantages.

Several RCA metrics were employed by Erkan and Saricoban (2014) to evaluate the competitiveness of science-based products in Turkey and the economies of the developed countries. The findings of the study suggested that the chosen products had little effect on raising the export proportions of particular nations in the international market. Rehman et al. (2015) examined the link between Pakistan's agricultural GDP and the output of major crops between 1950 and 2015 using OLS and Johansen's co-integration test. According to the data, sugarcane showed a modest negative association with Pakistan's GDP, whereas cotton, wheat, and rice showed a strong positive correlation. The analysis conducted by Irshad and Xin (2017) utilizing the RCA method revealed that Pakistan's exports were competitive in the international market for vegetables, skins and hides, and textiles between 2003 and 2015. Pakistan was able to compete in the markets for vegetables, skins and hides, and textiles during the time frame mentioned above. Ali et al. (2020) examined Pakistani agriculture's competitiveness in producing a few items using the RCA and RSCA indices of CA. The findings of their study from 1980 to 2013 indicated that Pakistan had a CA in dates, guava, mango, rice, onion, and mangoesteen. The competitiveness of the ICT industry in Punjab (Pakistan) was assessed by Qadir et al. (2019) using data from 360 farmers. Maqbool et al. (2019) used the RCA indices to measure how competitive Pakistan's cotton sector is. Using a variety of RCA measures, Maqbool et al. (2020) examined Pakistan's competitiveness and comparative advantage in the mineral sector between 2003 and 2018. According to the report, Pakistan did not have a comparative advantage in the industry in 2003, but from 2004 to 2018, it progressively gained one. Matkovski et al., (2021) inspected the export performance and competitiveness of Agri-food sector during the process of EU integration. Ahmad et al. (2021) utilized various RCA indices to evaluate the export performance and CA of Pakistan's fruit and vegetable sector exports from 2001 to 2018. Their results revealed that Pakistan encountered both comparative advantage and disadvantage in this export sector during the selected time period. In a separate study, Wang et al. (2022) employed RCA indices to assess the competitiveness of Chinese vegetables and fruits in the Pakistani market. The competitiveness of ornamental fish examined by Tarihoran et al., (2023) by utilizing CMSA, RCA index from 2012-2021. The vegetable export sector is a significant contributor to Pakistan's economy and plays an important role in promoting food security, competitiveness, and poverty reduction in the country. The main goal of this study is to find out what Pakistan's comparative advantage and competitiveness are in the vegetable sector from 2003 to 2021.

The current study examined Pakistan's vegetable sector's level of competitiveness on the international market using a series of RCA indices, including RCA, RSCA, RCA#, InRCA, RMA, RTA, NEI, and RC. There is a dire need for further research to better understand the competitiveness of Pakistan's vegetable exports and identify ways to enhance it.

3. Methods and Material

The International Trade Center provided data on Pakistan's vegetable exports from 2003 to 2021. Liesner's seminal work in 1958 laid the foundation for the concept of the Revealed Comparative Advantage (RCA) index, a pivotal tool in international trade analysis. Subsequently,



in 1965, Balassa (1965) built upon Liesner's (1958) pioneering contributions by operationalizing the RCA index, thus enabling the empirical examination of the comparative advantage for specific products. Balassa's adaptation has since become widely-adopted and remains a cornerstone methodology in assessing trade patterns and competitiveness across various industries and regions. According to Balassa and Marcus (1989), the RCA index of exports is the proportion of an economy's total merchandise export share divided by the exports of a certain product category.

$$RCA = \frac{V_i^t / \sum V_i^t}{V_i^w / \sum V_i^w} \dots \dots \dots (1) \quad (\text{Source: Maqbool et al., 2018})$$

V_i^t = Pakistan's vegetable exports
 $\sum V_i^t$ = Entire exports of Pakistan economy
 V_i^w = Global vegetable exports
 $\sum V_i^w$ = Entire exports of the world

The value of the Balassa Index ranges from zero to infinity, where "0" represents no exports in the selected industry and infinity represents the industry's prominence as a significant exporter relative to other industries in the nation. There is a comparative advantage when the Revealed Comparative Advantage (RCA) value is greater than 1. According to Rivlin (2000), Balassa coined the term "revealed comparative advantage".

In the Balassa index, logarithms are applied; $\ln RCA > 0$ designates CA, whereas $\ln RCA < 0$ postulates comparative disadvantage (Maqbool et al., 2020 and Faustino, 2008).

The RSCA index is a modified version of the RCA index used to address skewness issues. This is the formula used to get the RSCA index:

$$RSCA = \frac{RCA - 1}{RCA + 1} \dots \dots \dots (2) \quad (\text{Source: Maqbool et al., 2020})$$

According to Erkan and Sarcoban (2014), the present index values avoid the issue with zero values that occurs during logarithm transformation by falling between +1 and -1. In order to calculate the CA of the economy's imports, this study used the revealed import advantage (RMA) index. RMA is expressed as:

$$RMA = \frac{M_i^t / \sum M_i^t}{M_i^w / \sum M_i^w} \dots \dots \dots (3) \quad (\text{Source: Maqbool et al., 2020, Usman et al., 2021})$$

M_i^t = Pakistan's Vegetable imports
 $\sum M_i^t$ = Entire imports of Pakistan
 M_i^w = Global Vegetable imports
 $\sum M_i^w$ = World's total imports

The trade advantage index (RTA), defined as the difference between RCA and RMA, was found in the current study that was evaluated.

$$RTA = \frac{V_i^t / \sum V_i^t}{V_i^w / \sum V_i^w} - \frac{M_i^t / \sum M_i^t}{M_i^w / \sum M_i^w} \dots \dots \dots (4) \quad (\text{Source: Maqbool et al., 2020})$$





The CA index was developed by Vollrath (1991), and it is considered to be a more accurate indicator of competitiveness since it removes the problem of duplicate counting in international trade (Topcu and Sarigul, 2015 and Gnidchenko and Salnikov, 2015).

$$RCA\# = \frac{\left\{ \frac{v_{ij}}{(\sum_i v_{ij}) - v_{ij}} \right\}}{\left\{ \frac{(\sum_j v_{ij}) - v_{ij}}{[(\sum_j \sum_i v_{ij}) - (\sum_j v_{ij})] - [(\sum_i v_{ij}) - v_{ij}]} \right\}} \dots\dots\dots (5) \text{ (Source: Topcu and Sarigul, 2015)}$$

Where

v_{ij} = Pakistan's vegetable exports

$\sum_i v_{ij}$ = Pakistan's entire exports

$\sum_j v_{ij}$ = World's vegetable exports

$\sum_j \sum_i v_{ij}$ = World's entire exports

The Net Export Index, which is derived from Pakistan's net exports divided by the total of its vegetable imports and exports, has been used to analyze competitiveness (Balassa and Noland, 1989). This index also shows the specialization of economy as a net importer or exporter. The worldwide economy's ratio of textile inter-industry trade is evaluated by the present index's absolute values. On the other hand, intra-industry trade is clarified using the expression $(1-|NEI|)$ (Vixathep, 2011).

The NEI is described as follows;

$$NEI = (V_{ij} - M_{ij}) / (V_{ij} + M_{ij}) \dots\dots\dots (6)$$

Where M refers to imports

Vollrath (1991) introduced the Revealed Competitiveness Index, which is an augmentation of the conventional Revealed Comparative Advantage. His approach considers both the relative export and import dimensions to offer a more comprehensive measure of a country's trade performance. Specifically, the Revealed Competitiveness Index is calculated as the logarithm of the product of the Relative Export Advantage index (LnRCA) and the Relative Import Advantage index (LnRMA).

$$RC = \text{LnRCA} - \text{LnRMA} \dots\dots\dots (7)$$

4. Results and Discussions

This research aims to evaluate Pakistan's vegetable export performance and competitiveness in the international market from 2003 to 2021. Several Revealed Comparative Advantage (RCA) indices are used to complete this evaluation.

Table 1 Several Revealed Comparative Advantage Indicators for Vegetable Exports of Pakistan during 2003-2021

Years	RCA	RSCA	LNRC	RCA#	RMA	RTA	NEI	NEI	1- NEI	RC
2003	1.799	0.286	0.587	1.807	1.719	0.0798	-0.024	0.024	0.976	0.0454



2004	1.363	0.154	0.31	1.365	1.587	-0.224	-0.185	0.185	0.815	-0.152
2005	2.129	0.361	0.756	2.141	2.437	-0.308	-0.297	0.297	0.703	-0.135
2006	0.808	-0.11	-0.21	0.807	2.994	-2.186	-0.737	0.737	0.263	-1.31
2007	1.256	0.114	0.228	1.258	2.654	-1.398	-0.597	0.597	0.403	-0.748
2008	0.719	-0.16	-0.33	0.718	2.258	-1.539	-0.74	0.74	0.26	-1.145
2009	1.227	0.102	0.204	1.228	3.446	-2.219	-0.666	0.666	0.334	-1.033
2010	1.495	0.198	0.402	1.498	3.616	-2.122	-0.618	0.618	0.382	-0.884
2011	2.95	0.494	1.082	2.978	3.796	-0.846	-0.369	0.369	0.631	-0.252
2012	2.362	0.405	0.86	2.377	4.049	-1.687	-0.519	0.519	0.481	-0.539
2013	2.82	0.477	1.037	2.846	3.121	-0.301	-0.335	0.335	0.665	-0.101
2014	1.932	0.318	0.659	1.941	3.85	-1.918	-0.593	0.593	0.407	-0.69
2015	2.652	0.452	0.975	2.676	3.766	-1.114	-0.485	0.485	0.515	-0.351
2016	1.96	0.324	0.673	1.97	4.519	-2.56	-0.683	0.683	0.317	-0.836
2017	1.923	0.316	0.654	1.932	4.11	-2.187	-0.7	0.7	0.3	-0.76
2018	2.804	0.474	1.031	2.83	2.955	-0.15	-0.452	0.452	0.548	-0.052
2019	2.678	0.456	0.985	2.702	3.172	-0.494	-0.42	0.42	0.58	-0.169
2020	2.665	0.454	0.98	2.69	4.488	-1.823	-0.55	0.55	0.45	-0.521
2021	2.885	0.485	1.06	2.913	3.464	-0.578	-0.502	0.502	0.498	-0.183

Source: ITC data computations made by the author

The results of several disclosed comparative advantage indicators from 2003 to 2021 are shown in Table 1. With the exception of 2006 and 2008, Pakistan's vegetable exports showed a CA across the chosen period, according to the results of the RCA index. According to the RSCA data, Pakistan had a comparative advantage in the other years, but a comparative disadvantage in 2006 and 2008. With the exception of 2006 and 2008, Pakistan likewise appears to have had a comparative advantage in vegetable exports during the chosen period, according to the Vollrath index (RCA#) and LnRCA. The government's assistance, cheap labor costs, market accessibility, climatic circumstances that are beneficial, cultural and religious considerations, and low labor costs are some of the reasons that contribute to Pakistan's comparative advantage in vegetable exports (Anwar et al., 2005), Akhtar et al., 2013, Ahmad et al., 2021).

In addition, the RMA index shows that from 2003 to 2021, Pakistan was at a competitive disadvantage when it came to the import of vegetables. Pakistan was at a net competitive advantage in 2003, but from 2004 to 2021, it was at a net competitive disadvantage, according to the RTA index. Pakistan demonstrated competitiveness in the vegetable business in 2003, but not in the subsequent years, as indicated by the positive RC index. The negative values of the NEI index indicate that Pakistan was not a net-exporter of the vegetable sector during the mentioned time period (Ahmad et al., 2021). The percentage of intra-industry trade in relation to the international trade of Pakistan's vegetable exports is shown by $1-|NEI|$, whereas the percentage of inter-industry trade is indicated by the $|NEI|$.

Figure 1 Various Revealed Comparative Advantage Indices for Vegetable Exports of Pakistan

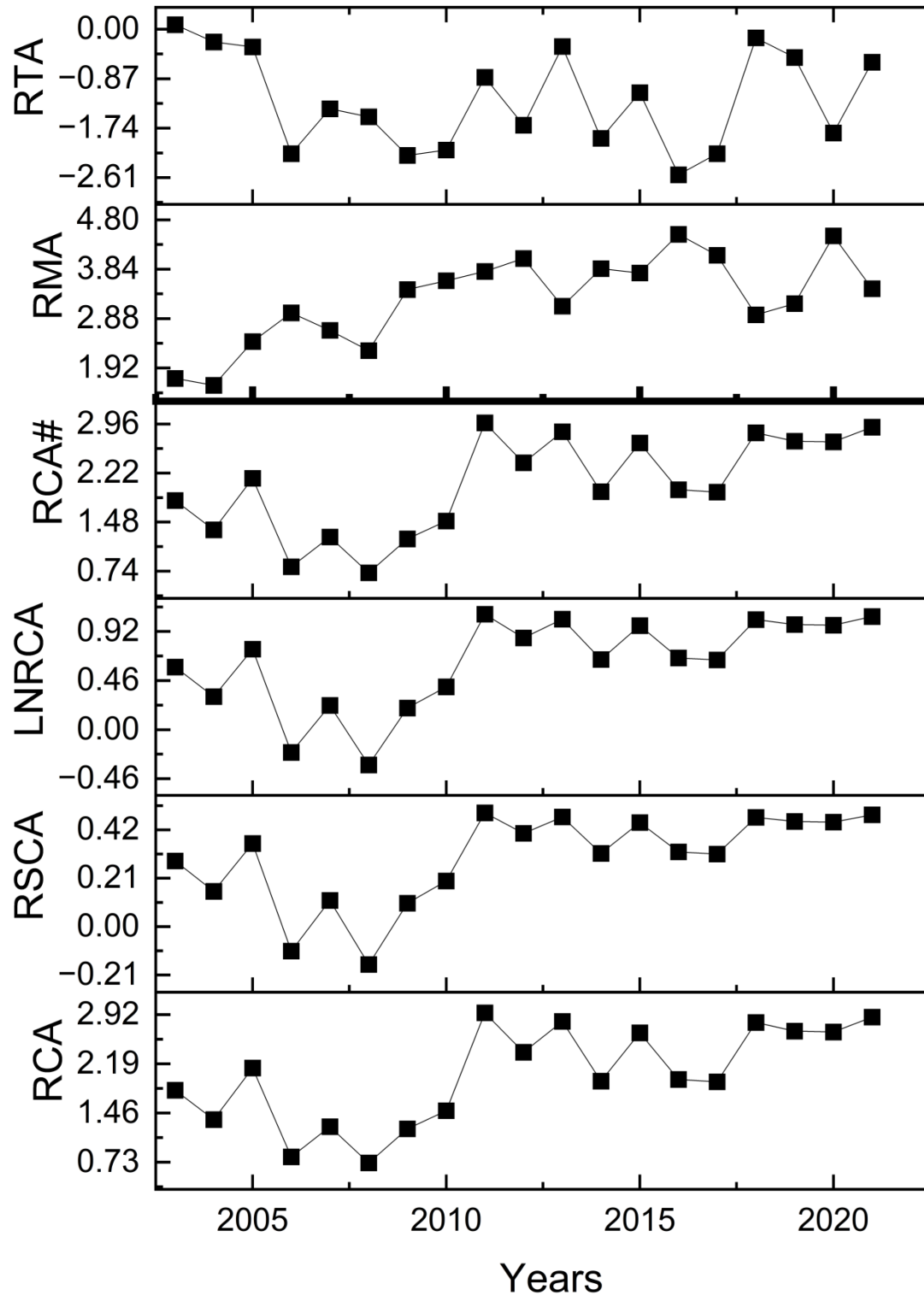




Figure 1 displays the trend of various RCA indexes for Pakistani vegetable exports to the international market from 2003 to 2021.

5. Conclusions

Examining Pakistan's vegetable export sector's competitiveness and export performance in the international market is the goal of this study. The competitiveness was measured in this study using RCA, RSCA, LnRCA, Vollrath index, RMA, RTA, RC, and NEI. Data used for empirical analysis were obtained from ITC between 2003 and 2021. Research results indicated that, with the exception of the years 2006 and 2008, Pakistan experienced a CA in its vegetable exports over the chosen period of time. Based on the RSCA index, Pakistan's vegetable exports were at a comparative disadvantage in 2006 and 2008, but at a comparative advantage in the other years examined. Similarly, Pakistan appears to have held a CA for the chosen period, except 2006 and 2008, according to the Vollrath index and LnRCA.

In addition, the RMA index shows that from 2003 to 2021, Pakistan was at a competitive disadvantage in the vegetable import market. Pakistan had a net competitive advantage in 2003, according to the RTA index, but from 2004 to 2021 it was at a net competitive disadvantage. Pakistan demonstrated competition in the vegetable sector in 2003, but no further competitiveness was shown in the following years, as indicated by the positive RC index. The fact that Pakistan's NEI index was negative over the specified period suggests that the country was not a net exporter of vegetables.

To upsurge export competitiveness of vegetables, the current study suggests enhance infrastructure, investing in R&D, improve in supply chain management, encourage contract farming, quality and management of post-harvest losses and improve the quality of seeds and inputs.

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