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Competitiveness and Export Performance of Pakistan's Horticultural Sector

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Abstract:
The current study examines the export performance and competitiveness in the horticultural sector of Pakistan. The data has been collected from International Trade Center UN-COMTRADE statistics for the horticultural exports from 2004-2019. This study has utilized numerous indices of revealed comparative advantage such as RCA, InRCA, Vollrath index (RCA#), Revealed symmetric comparative advantage (RSCA), revealed trade advantage (RTA), Relative import advantage index (RMA) and net export index (NEI) to measure competitiveness in the horticultural exports of Pakistan. The findings of the analysis indicate that Pakistan had a comparative and competitive advantage in the horticultural sector during 2004-2019. The positive NEI index highlights Pakistan was a net-exporter of horticultural sector in the years of 2004 and 2013, while in the remaining years Pakistan remained a net-importer in this sector. The index of RMA depicts that Pakistan had a competitive advantage in the imports of horticultural sector in the year 2004, whereas Pakistan had a competitive disadvantage in the imports from 2005-2019. The RTA index reveals that Pakistan had a net comparative disadvantage in the years 2006, 2007 and 2009, on the other hand Pakistan had a net comparative advantage in the remaining years.

Keywords: Comparative Advantage, Competitiveness, Horticultural Sector, RCA, Export Performance

I. Introduction

The concept of competitiveness and comparative advantage helps to realize the objectives of the world trade benefits (Khalid *et al.*, 2021). Reduction in trade barriers, builds the competitive pressures and creates the technology transfer potential that leads to

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productivity gains and restricts a country towards its comparative advantage (Batra and Khan, 2005). Competitiveness is an economic activity in which a company, organization or a country brings its available resources in the production of goods and services at a suitable price which meets the world standards. Several factors, including comparative advantage, real exchange rate, terms of trade, geographic concentration, trade policies and world income, etc. are generally used to measure export performance or export competitiveness (Saqib and Xin, 2017)

Economic reforms like trade liberalization would induce a change in the composition of exports to reflect comparative advantage of Pakistan in the world economy (Manzoor *et al*., 2020). As the theory of comparative advantage explains the pattern of specialization an economy at the global level without facing any trade obstacle in the markets. In the presence of state intervention, a commodity even if it has comparative advantage cannot compete in the world market or in spite of having no comparative advantage a commodity may succeed to compete (Valenciano *et al*., 2012).

As rapid expansion in the international trade of fruit and vegetables has been observed in the decade since 1980, the demand of fresh and processed horticulture product has also increased considerably in the world economy (Surabhi, 2007). Horticulture products are in a strategic position for any agrarian developing economy since these commodities have numerous benefits including food, biopharmaceuticals and aesthetic one (Chasanah *et al.,* 2017). These benefits attract more market opportunities especially for countries like Pakistan, whose agro-climate and biodiversity support production of a variety of horticultural products.

Pakistan with its diverse soil and climate comprising several agro-ecological regions are suitable for the production of numerous types of tropical, subtropical, temperate fruits, vegetables and ornamentals. Further, the numerous crops including condiments, root and tuber crops, flowers, medicinal and aromatic plants, spices and mushrooms also form a significant part of aggregate horticultural products in the economy of Pakistan. The southern part of the country is suitable for tropical horticultural products, while northern areas are favorable for temperate crops (Ullah *et al.,* 2018). The trade of horticulture commodities across the globe has been expanded from US$ 51 billion in 2001 to US$ 200 billion in 2018 over the last two decades. Despite its natural endowments such as the availability of land and irrigation systems, sizable agrarian workforce and more importantly diverse agro-climatic conditions, the exports of Pakistan in this sector is limited. Pakistan cannot capitalize from the growth in worldwide demand owing to lack of focus and insufficient investment in requisite infrastructure such as processing units, packing houses, proper logistics and cold chain. Pakistan's horticultural exports are restricted to a few commodities, and the top six commodities (citrus, dates, mango, potato, onion and tomato) constitute almost 80 percent of the total exports of the overall horticulture sector (Husiani and Rehman, 2020).

For the time being, there has been a great deal of interest among both trade analysts and policymakers regarding the role of horticultural commodities as a principal source of agricultural diversification and foreign exchange earnings in developing nations (Aneja, 2017). In agricultural diversification, *new sources of income are developed by adding business activities to traditional farming methods.* It is a shift in cultivation of alternative fruit trees or food crops to diversify a traditional farm practices for commercial purpose (Tobgay, 2006) *where resources are moved* from low-value commodities to high-value ones. Due to wide diversification in horticulture production pattern the number of commodities and variety in the production is increased excessively around the globe, which has increased the supply and income (Weinberger and Lumpkin, 2005)

Horticultural industry of Pakistan is characterized by a large number of small-scale producers, but each contributes a very small output (Mallawaarachchi and Ahmad, 2018). Horticulture as a sub-sector contributes 11 percent in the agriculture sector and it occupies 6 percent of arable land of the country (ITC, 2015). Currently, almost all the horticulture output of Pakistan is consumed domestically. Export is stagnant and tiny fraction of production is exported. Pakistan is generally considered to be under developing nation as far as its agricultural export potential is concerned (Sharif *et al., 2015).* Pakistan represents only 0.3 percent horticulture export of the world which is 4 percent of total horticulture production and 1 percent of total exports of the country (Jayasuriya *et al*., 2021).

Favorable ecological environment of Pakistan permits to produce about 30 types of fruit. Fruit crops make significant part of GDP of Pakistan as, fruits contribute nearly 2.48 percent value addition to agricultural GDP (GOP, 2019) and has remarkable export potential (PHDEC, 2017). Citrus fruits, mangoes, and dates are most significant export fruit, constituting roughly 78% of the total value of Pakistan's fruit exports (Akhtar *et al.*, 2009).

Pakistan produces more than 35 types of vegetables in its different geographical locations and only 3% of the total cropped area of Pakistan is under vegetables cultivation (Feasibility Study Report Fruit & Vegetable Canning Unit Agriculture Department Government of Punjab, 2108) The major vegetables grown in Pakistan includes potato, onion, chilies, peas tomato, carrot, turnip, okra, cauliflower and tinda gourd covering 78% of the overall area under vegetables which account 81% of the total production (Khokhar, 2014).

Table 1: Export and import growth in the horticultural sector of Pakistan during 2004-19 (US 000$)

YEARS	HEOP	HEOW	TEOP	HIOP
2005	36.198	11.74	27.53	125.531
2006	-25.609	10.908	5.4994	32.8467
2007	22.744	16.169	5.3478	7.96758
2008	-3.3149	12.894	13.682	1.05342
2009	51.493	-3.112	-13.43	33.4037
2010	28.992	10.618	21.979	14.6964
2011	52.481	14.452	18.356	9.38831
2012	-5.834	-0.079	-2.881	7.29411
2013	27.373	9.5238	2.0607	-13.657
2014	-12.906	3.5573	-1.587	37.423
2015	9.1594	-2.881	-10.65	10.5821
2016	-5.7809	5.645	-7.041	33.5189
2017	-13.692	6.2852	6.5453	4.04719
2018	28.694	3.0359	8.0132	-34.508
2019	-4.3255	1.6467	0.7952	-3.8293

Sources; Author's own calculations based on ITC data. Where, HEOP= Horticultural exports of Pakistan, HEOW= Horticultural exports of the World, TEOP= Total exports of Pakistan and HIOP= Horticultural Imports of Pakistan

Floriculture also known as flower farming is another discipline of horticulture which deals with development, cultivation and marketing of flowering and ornamental plants. Pakistan has great potential to develop a strong floriculture sector as it is blessed by cheaper labor, variety of soils and favorable agro climatic conditions. But only 0.5 percent cropped area of agriculture is under the flower farming (ITC, 2015). Pakistan is ranked 62^{nd} position among floriculture exporting countries in worldwide (Planing commission, 2020).

Table 1 explains the export and import growth of horticultural exports of Pakistan and the world during 2004-2019. The current study is organized in such a way that the section 1 deals with the introduction of the study and section 2 deals with the literature review. The data and methodology of the studyare discussedin section 3. The discussion of empirical results and conclusion of the analysis is dealing in section 4 and 5 respectively.

II. Literature Review

The theory of comparative advantage is extensively employed in economic studies to appraise the patterns of trade and specialization of economies in products having a competitive edge (Prasad, 2004). The idea of CA based on David Ricardo's (1817) study is one of the oldest trade theory in the global market (Ricardo, 2007). The competitiveness of Pakistan's agricultural exports was measured by Riaz *et al.*, (2010) by employing different RCA indices. The results of this study illustrated that Pakistan was competitive in cereals and horticultural products, while had a comparative disadvantage in the livestock sector. The RCA index was utilized by Tahir *et al.*, (2012) to measure the comparative advantage and competitiveness in the Tomato exports. The study concluded that Pakistan was not competitive in the exports of Tomato during 1998-2008. The index of RCA was employed by Hassan (2013) to measure the competitiveness of the selected agricultural commodities from 2001-2010. This study concluded that rice had a strong comparative advantage, while the other products had not a strong comparative advantage. Akhtar *et al.*, (2013) applied a number of revealed comparative advantage indices to measure the CA in the horticultural sector of Pakistan from 1990-2009, and the results highlighted that Pakistan had a comparative advantage in the selected products during the selected time span. The competitiveness of Ghana agro-processed products was measured by Offei and Oduro (2014) by making use of four indices of RCA from 2004-2011. The findings of the study illustrate that the share of these selected products in which Ghana had a CA decreased over the mentioned time period. Sachithra *et al*., (2014) identified the export competitiveness of the Sri Lankan exports in the international market by using different indices of revealed comparative advantage and pointed out that Sri Lanka had comparative advantage in the leading exports. Similarly, several indices of revealed comparative advantage were utilized by lgnjatijevic *et al* ., (2014) to measure the competitiveness of the food sector of Danube region economies from 2005-2011, and it was observed that the CA of Serbia, Czech Republic, Germany, Hungary and Ukraine increased considerably.

Erkan and Saricoban (2014) used different indices of RCA to study the competitiveness of the science-based commodities of EU+13 economies and Turkey. This study concluded that these selected products had not a significant impact on the rise of export share of these economies. The method of OLS and Johensen's co-integration test was employed by Rehman *et al*., (2015) to determine the relationship between output of major crops and agricultural GDP of Pakistan during 1950- 2015. The findings of the analysis illustrated that cotton, wheat and rice had a positive significant relationship with the GDP of Pakistan, while sugarcane had a negative. The method of RCA was used by Irshad and Xin (2017) to examine the export competitiveness of Pakistan's economy in the global market during 2003-2015. The findings reveal that Pakistan was competitive in vegetables, skin and hides and textile sector during 2003-2015.

Naseer *et al*., (2018) employed revealed symmetric comparative advantage index (RSCA) to study the competitiveness of 15 leading Mandarin export-countries of the world. This study concluded that the RSCA index pattern varied among the selected economies, and only five countries, including Pakistan showed a comparative advantage in Mandarin exports in the selected time span. Qadir *et al.*, (2019) measured the competitiveness in the ICT industries of the Punjab (Pakistan) by using data from 360 farmers. The indices of RCA were utilized by Maqbool *et al*.,(2019) to measure the competitiveness in the cotton sector of Pakistan. The RCA and RSCA indices of comparative advantage were employed by Ali *et al*., (2020) to examine the competitiveness in the selected commodities of agricultural of Pakistan. The findings of the current study illustrated that Pakistan had a competitive advantage in onion, rice, dates, guava, mango and mangoes-teen from 1980-2013.The comparative advantage and competitiveness in the mineral sector of Pakistan was examined by Maqbool *et al*., (2020) by using several RCA indices during 2003-2018. The results indicated that Pakistan had not a comparative advantage in 2003, while it had during the 2004-2018 in the selected sector. Similarly, these indices were also employed by Maqbool *et al*., (2020) to inspect the competitiveness in the cereal sector of Pakistan. The study concluded that Pakistan was competitive in these products during 2003-2018.

The key purpose of the current study is to identify the comparative advantage and competitiveness in the horticultural sector of Pakistan during 2004-2019. The present study has employed a set of RCA indices such as RCA, RSCA, RCA#, InRCA, RMA, RTA and NEI to examine the competitiveness of Pakistan's horticultural sector in the global market. Further, this study also developed "product mapping" by using RSCA and NEI indices. Though a number of studies have employed different indices to measure the comparative advantage and competitiveness of different sectors including the horticultural, yet no valuable study has applied such number of indices to determine comparative advantage and competitiveness of horticultural sector as the current study has. The present study will assist the other researchers and academicians to examine the comparative advantage and competitiveness of different sectors by employing these indices.

III. Data and Methodology

This study collected the data from International Trade Center UNCOMTRADE statistics on the exports of horticultural sector of Pakistan for the time period 2004-2019. The HS 4digit data were taken for the product groups such as product group 06, 07 and 08.Liesner (1958) was first who proposed the RCA index and Balassa was one who operationalized it in order to examine comparative advantage (Balassa 1965). The RCA defined as the ratio of an economy's export in specific product categories to its share in aggregate merchandize exports (Balassa and Noland, 1989). For international competitiveness RCA is considered a more sophisticated and comprehensive measure. Balassa presented the RCA index in the form of ratios of two shares. The numerator shows the share of a country's export of a particular product in its total global export. The denominator reveals the share of the world's export of that product in total world export. The product indicates revealed comparative advantage if the value of index exceeds unity and vice versa (Rizwan-ul-Hassan, 2013).

The Balassa index is used to compare the country's performance in a single commodity or sector to the reference group of countries' performances by using export flows based on "revealed" data or observed export patterns. The values of RCA index range from "Zero" to "Infinity" where 1 is break-even point. RCA value (< 1) indicates that the commodity has not comparative advantage in export, while a value (>1) shows that the commodity has a "revealed" export comparative advantage (Riaz et al., 2010).

$$RCA = \frac{H_i^t / \sum H_i^t}{H_i^w / \sum H_i^w}$$ (Source: Erkan and Kazim, 2014)

Where, H_i^t= Horticultural exports of Pakistan, $\sum H_i^t$ = Pakistan's total exports, H_i^w = Global Horticultural exports and $\sum H_i^w$=Total exports of the world. The present study utilizes logarithms to the Balassa index and InRCA>0 depicts CA, while LnRCA<0 illustrating comparative disadvantage (Faustino, 2008).

The overall trade balance of a country affects the net export index of revealed comparative advantage. The NEI values range between -1 and 1. The net export index indicates that a country is net-exporter when NEI equals 1. Contrarily, -1 NEI values make a country net importer. Moreover, NEI with zero value shows that country's export is equal to its import.

$$NEI = (Xij-Mij)/(Xij+Mij)$$ (Source: Erkan and Kazim, 2014)

To solve the asymmetry problem, Vollrath (1991) suggested taking a log transformation of the Balassa index. The recommendation added another problem that the Balassa index is unable to be defined where export is zero. Dalumet *et al*., (1998) provided another symmetrical index, which resolved the zero export problems which is known as revealed symmetric comparative advantage index (RSCA). The RSCA is an approximation of a log transformation of the Balassa index (De Benedictis and Tamberi, 2001).

The value of RSCA ranges between -1.0 and +1.0 and avoids the issue with zero values which arise in the logarithmic transformation (where an arbitrary constant is not attached to the RCA). Laursen (1998) found that the distribution of RSCA meets the normality assumption more frequently than that of RCA.

$$RSCA = \frac{RCA - 1}{RCA + 1}$$ (Source: Erkan and Kazim, 2014)

Vollrath (1991) established his index for comparative advantage, and it is believed to be a good measure of competitiveness because this index eradicates the problem of double-counting in the world trade (Gnidchenko and Salnikov, 2015). This index is explained as follow;

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

Where, $W_{ij} =$ Pakistan's horticultural exports, $\sum_i W_{ij} =$ Pakistan's total exports, $\sum_j W_{ij} =$ World's horticultural exports and $\sum_j \sum_i W_{ij} =$ World's total exports. With an export index of RCA (at the same time) the study has also employed import index of RMA and further calculate revealed trade advantage RTA (Ferto and Hubbard, 2002).

Vollrath (1991) presented an alternative specification of RCA, known as relative trade advantage RTA, which accounts for both exports as well as imports. RTA is measured as the difference between relative export advantage RCA and relative import advantage RMA. (Gopal*et al*.,2009).

The value of RTA is greater than "zero" reveals comparative trades advantage i.e. a sector in which trade of an economy is more competitive. And RTA values smaller than "zero" indicates all those product groups or sectors lack of comparative trade advantage and for products/commodities comparative trade disadvantage. When the value of RTA is equal to "zero", there is neither trade advantage nor trade disadvantage (Bojnec and Ferto, 2007).

$$RTA = RCA\text{-}RMA = \frac{H_i^t / \sum H_i^t}{H_i^w / \sum H_i^w} - \frac{M_i^t / \sum M_i^t}{M_i^w / \sum M_i^w}$$ (Source: Erkan and Kazim, 2014)

The relative import advantage RMA index computes through interpreting and formulating the revealed comparative advantage RCA index with corresponding import M values. The RMA index is very similar to the RCA index. The difference is that RMA considers imports, symbolized by M and that the elucidation is reversed from that of the RCA. The value of the index with unity reveals competitive disadvantage, whereas competitive advantage when the value is less than unity (Pilinkien, 2014).

$$RMA = \frac{M_i^t / \sum M_i^t}{M_i^w / \sum M_i^w}$$ (Source: Erkan and Kazim, 2014)

In addition, this study developed "products mapping" by employing the RSCA and NEI indices. This product classification is present in figure 1 and it is divided into four groups such as A, B, Cand D.

Figure 1

Group; A	**Group; B**
CA The economy is net-exporter. (RSCA >0 and NEI >0)	CA The economy is net-importer. (RSCA >0 and NEI <0)
Group; C Comparative Disadvantage The economy is net-exporter. (RSCA <0 and NEI >0)	**Group; D** Comparative Disadvantage The economy is net-importer. (RSCA <0 and NEI <0)

(Source: Widodo, 2009)

IV. Results and discussion

This study employed several indices of revealed comparative advantage to measure export performance and competitiveness in the horticultural sector of Pakistan during 2004-2019.

Table 2: Pakistan's Revealed Comparative Advantage of the horticultural export and Import Sector in Global Scale

Years	RCA	RSCA	LNRCA	RCA#	RMA	RTA	NEI	|NEI|	1-|NEI|
2004	1.3408	0.146	0.293	1.3458	0.807	0.5337	0.1205	0.121	0.8795
2005	1.4562	0.186	0.376	1.4635	1.148	0.3081	-0.1304	0.13	0.87
2006	1.0705	0.034	0.068	1.0712	1.345	-0.274	-0.3978	0.39	0.61
2007	1.2421	0.108	0.217	1.2452	1.313	-0.071	-0.3425	0.342	0.658
2008	1.0809	0.039	0.078	1.0818	1.039	0.0416	-0.3618	0.362	0.638
2009	1.5089	0.203	0.411	1.5185	1.516	-0.007	-0.3054	0.305	0.695
2010	1.7627	0.276	0.567	1.7783	1.613	0.15	-0.2512	0.251	0.749
2011	2.3771	0.408	0.866	2.4136	1.622	0.7555	-0.0904	0.09	0.91
2012	2.3456	0.402	0.853	2.3799	1.734	0.6119	-0.1546	0.155	0.845
2013	2.7601	0.468	1.015	2.8161	1.398	1.3621	0.0385	0.039	0.9615
2014	2.3583	0.404	0.858	2.3962	1.726	0.6321	-0.1873	0.187	0.813
2015	2.5798	0.441	0.948	2.6334	1.813	0.7665	-0.1935	0.194	0.806
2016	2.4011	0.412	0.876	2.4487	2.117	0.2845	-0.3543	0.354	0.646
2017	2.0000	0.331	0.689	2.018	1.868	0.1234	-0.4332	0.433	0.567
2018	2.541	0.435	0.933	2.5917	1.249	1.2916	-0.1254	0.125	0.875
2019	2.3088	0.396	0.837	2.3496	1.403	0.9056	-0.1279	0.128	0.872

Sources; (Authors' own calculations based on ITC)

In table 2, the results illustrate that Pakistan had a comparative advantage in the horticultural sector of Pakistan during the 2004-2019 (Akhtar *et al.,* 2013 & Manzoor *et al.,* 2020). The findings also highlight that Pakistan had a weak comparative advantage during 2004-2010, while it had moderate comparative advantage from 2011-2019. The positive values of RSCA and LnRCA depict that Pakistan had CA in the horticultural sector of Pakistan in the selected time period (Akhtar *et al.,* 2013). The competitive advantage was also observed by employing Vollrath index (RCA#) from the 2004-2019.Pakistan faces production and marketing sides constraints in the horticulture sector. Weak competitiveness is a results of absence of high yielding hybrid varieties, adoption of mechanized farming, and proper farm size.From marketing prospective, Pakistan is lacked with proper processing, marketing transportation and infrastructre facilities which are the important source of weak competitiveness in this sector(Irshad and Xin., 2017).The positive values of NEI index showing Pakistan wasa net-exporter of horticultural sector in the years of 2004 and 2013, whereas Pakistan remained net-importer in the remaining years.

The absolute values of |*NEI*| illustrate the portion of inter-industry trade, while 1-|*NEI*| indicating the portion of intra-industry trade relative to the world trade of horticultural exports of Pakistan. The RMA index shows that Pakistan had a competitive advantage in the imports of horticultural sector in the year 2004, while Pakistan had a competitive disadvantage in the imports during 2005-2019 (Akhtar *et al.,* 2013 & Manzoor et al., 2020).The RTA index describes that Pakistan had a net comparative disadvantage in the years 2006, 2007 and 2009, while Pakistan had a net comparative advantage in the remaining years (Akhtar *et al*., 2013 & Manzoor *et al*., 2020). The results of “ product mapping” describe that Pakistan’s horticultural sector lies in group A in the years 2004and 2013, whereas Pakistan lies in group B in the remaining years.

V. Conclusion

The primary objective of the current analysis is to measure export competitiveness of horticultural sector of Pakistan. Data have been collected from international trade center ITC during 2004-2019.This study employed various indices of revealed comparative advantage such as RCA,RSCA,LNRCA,RCA#,RMA,RTA and NEI to examine competitive and comparative advantage in this sector.The findings illustrate that Pakistan had a comparative and competitive advantage in the horticultural sector of Pakistan from 2004-2019. The positive NEI index indicates Pakistan was a net-exporter of horticultural sector in the years of 2004 and 2013, while Pakistan remained net-importer in the remaining years.

The index of RMA shows that Pakistan had a competitive advantage in the imports of horticultural sector in the year 2004, whereas Pakistan had a competitive disadvantage in the imports from the time span 2005-2019. The RTA index portrays that Pakistan had a net comparative disadvantage in the years 2006, 2007 and 2009, on the other hand Pakistan had a net comparative advantage in the remaining years. To enhance the exports of horticultural Pakistan should lay emphasis on growing high yielding hybrid varieties, adoption of mechanized farming, improved production method like hydroponic techniques and most importantly training and skills programs for farmers in this sector can improve the production of horticultural commodities. Further, for marketing scenario, there is a dire need to promote cluster marketing, exploring new markets and processing, canning and branding can improve competitiveness of this sector in Pakistan.

Likewise, these results highlight that Pakistan should lay emphasis on both production and marketing sides. First, from production prospective there is a need to grow high yielding hybrid varieties, adoption of mechanized farming, improved production method like hydroponic techniques and most importantly training and skills programs for farmers in this sector can improve the production of horticultural commodities. For marketing scenario, there is a dire need to promote cluster marketing, exploring new markets and processing, canning and branding can improve competitiveness of this sector in Pakistan.

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