Journal of Agricultural Development and Policy, 2020
Volume 30, No. 2, 114-123

Trade Direction and Competitiveness of Mango Export from India

Chavan Sanket and M K Sekhon

Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, Punjab, India

Abstract

This study has examined the trade direction and export competitiveness of mango from India during 1995-96 to 2017-18 using markov chain analysis, RCA and CEP respectively. Though India is the largest producer of the choicest varieties of mango, the country is not a major player in the export market, either fresh mango or processed mango products. The findings showed that Mexico, Netherlands, Brazil, Peru and India are the top most exporters. USA, Netherlands, Germany, UAE, and UK are the major mango importing countries of the world accounting for more than half of the total world imports of mango. For Indian fresh mango UAE was the most loyal market both in pre-NHM and post-NHM, but for mango pulp most stability was changes from YAR to USA in post-NHM period. For mango dried slices and mango flour the most favorable markets were USA and Nepal .India has enjoyed comparative advantage in mango exports in the world market over Brazil, China, Mexico and Indonesia during the study period. The increasing share of other countries clearly shows the need to explore and exploit the market potential of other countries. Efforts are also needed to improve the efficiency of production and quality in order to stabilize the markets and also to make the product acceptable and price competitive in other importing countries.

Keywords: Mango, mango products, trade, competitiveness

JEL Classification: Q10, Q17, Q19

Introduction

International trade has made a tremendous contribution in the growth of less developed countries in the 19th and 20th centuries (Rana and Verma, 2010). International trade can be possible through export and import of goods and services. Export is an important activity to accelerate the speed of economic development of any country (Sujata *et al* 2003; Adhikari et al 2016). The recent trend in Indian agriculture clearly shows that the crop sector is diversifying towards non-food grain and high value commodities, such as livestock and fruits and vegetables. Diversification towards the horticulture crops has been suggested as a viable option to enhance agriculture growth, increasing farmer's income and employment opportunities (Vyas 1996). Horticulture is an important segment of agriculture accounting for a significant share in the Indian economy. Among these, the most important high-value export products are fruits and vegetables. In recent years, there has been a great deal of interest among policy makers and trade analysts regarding the role of horticultural products as a principle means of agricultural diversification and foreign exchange earnings in developing countries. Horticultural products have high income elasticity of demand, if income goes up the demand raises rapidly. India is recognized as the fruits and vegetables basket of the world. India holds second position for fruit production in the world after China (Patil *et al* 2018). Major fruits produced in India are banana, grapes, mango and cashew among these fruits mango is recognized as king of fruits. Major mango producing countries in the world are India, China, Thailand, Pakistan, Mexico, Indonesia, Brazil, Bangladesh, Philippines and Nigeria. In the year 2017-18, India produced 21.82 million tonnes mango from the area about 2.25 million ha contributing 22.41 per cent to total fruit production (GOI 2018a). Uttar Pradesh,

Corresponding author email: sanket.chavan203@gmail.com

Andhra Pradesh, Maharashtra, Karnataka, Bihar, Tamil Nadu, Odisha are the leading mango producing states while many other states also contribute to the mango production. Uttar Pradesh holds the first position in India producing 4.54 million tonnes followed by the Andhra Pradesh 4.48 million tonnes (GOI 2018a). Indian mangoes are emerging fast as an important foreign exchange earning fruit crop and enjoy GI unique place in the international market. 'Alphonso' is the leading export cultivar of India, followed by Totapuri, Banganapalli and Kesar. The export performance of mangoes in 2000-01 was 37,109 MT and it rose to 49180.48 MT in 2017-18. The worth of exported mango in the year 2017-18 was Rs.382.64 crores (GOI 2018b). The present, study focuses to estimate the trend and instability of mango export, export competitiveness and direction of trade for fresh mango and major mango products.

Data Sources and Methodology

This **s**tudy was based on secondary time series data. Data on India's fresh mango and mango pulp export both in terms of quantity and value to major importing destinations for the period of 1995-96 to 2017-18 and other major mango products for the period 2004-05 to 2017-18 (depending up on the availability of the data) were collected from Agriculture and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industries, Govt of India. The similar data for other countries and their major export markets were collected from Trade Map database developed by the International Trade Centre (ITC) and UNCTAD/WTO.To analyze direction of trade and changing the pattern of Indian mango export first order Markov chain analysis was used. The estimation of the transitional probability matrix is central to Markov chain analysis. The elements P_{uv} of the matrix P indicates the probability that export will switch from u^{th} country to v^{th} country with the passage of time (Dent, 1967; Lee *et al* 1970; Gillet, 1976). The diagonal elements of the matrix measure the probability that the export share of a country will be retained. Element in the row indicate loss in trade and element in Column indicate gain in trade. Hence, an examination of the diagonal elements indicates the preference of an importing country to a particular country's exports.

$$E_{vt} = \sum_{U=1}^{r} Eut\text{-}1^{*} Puv + evt$$

Where,

E_{vt} = Exports from India to v^{th} country during the year t.

E_{ut-1} = Exports from India to u^{th}country during the period t-1.

P_{uv} = Probability that the exports will shift from u^{th} country to v^{th} country.

e_{vt} = The error term which is statistically independent of Eu_{t-1}.

t = Number of years considered for the analysis

r = Number of importing countries

The transitional probabilities P_{uv} which can be arranged in a (c x r) matrix have the following properties.

$$O < P_{uv} < 1$$

$$\sum_{V=1}^{r} P_{uv} = 1 \text{ for all u}$$

Thus, the expected export shares of each country during period t were obtained by multiplying the export to these countries in the previous period (t-1) with the transitional probability matrix.

To estimate the transitional probability indices, minimum absolute deviation (MAD) estimation procedure was used which minimises the sum of absolute deviations. The conventional linear programming technique was employed owing to the fulfilment of the properties of transitional probabilities of non-negativity restrictions and row sum constraints in estimation.

The linear programming formulation is expressed as

Min OM* +Ie

Subject to,

XM* + V = Y, GM* = 1, M* > 0

Where,

0 = vector of zeroes.

M* = vector in which probability P_{uv} are arranged.

I = appropriate dimensioned column vector of units.

e = vector of absolute error (|U|).

Y = vector of export to each country.

X = block diagonal matrix of lagged values of Y

V = vector of errors

G = grouping matrix to add the row elements of P as arranged in P* to unity.

Revealed Comparative Advantage (RCA)

In this study, Revealed Comparative Advantage (RCA) has been used to compute comparative advantage on the basis of a country's specialization in exports relative to some reference group countries. The Revealed Comparative Advantage (RCA) index is measured by this formula

$$RCA = Ln \left[\frac{X_{iB} / X_B}{X_{iA} / X_A} \right]$$

Where,

X_{iB} : India's exports of good i to a particular country group

X_B : India's total merchandise export to the particular country group

X_{iA} : The rival country's exports of good i to a particular country group

X_A : The rival country's total merchandise export to the particular country group

If the RCA value is positive, then it is interpreted that India has comparative advantage over its competing countries. Negative value of RCA indicates that rival countries have comparative advantage against India in particular commodity export

Comparative Export Performance (CEP)

The competition strength among the counties can be measured using different indices. Balassa Comparative Export Performance (CEP) index is one the most commonly used index among them. This index measures the export specialization of a country with respect to the world exports.

$$CEP = Ln \left[\frac{X_{iZ} / X_Z}{X_{iW} / X_W} \right]$$

Where,

X_{iZ} : Country Z's exports of goods *i*

X_Z : Country Z's total agricultural exports

X_{iW} : Total world exports of goods *i*

X_W : Total world agricultural exports

An index value of India higher than the index value of any other country indicates relative comparative advantage of India against that country.

Results and Discussion

World scenario of mango production and trade

Mango is one of the major fruit crop produced in the world. Mango is the commodity grown in more than 80 countries in the world (Kshirsagar *et al* 2018). India, China, Indonesia, Thailand and Mexico are the top five mango producing countries over the world. Table 1 presents the world scenario of mango from the 1995 to 2018. Global production of mango in 1995 was 23.02 million tonnes and it increased more than double to 55.38 million tonnes during 2018. India ranks first in the production of mango, accounting about 39 per cent of global mango production in 2018, and it's share in global production was fluctuating over the period. India is figured among the top producers mainly because of its large area under mango cultivation, not due to higher productivity. The average mango productivity in India was far below than average world productivity. China is the second largest producer of mango followed to India. It contributes 9.01 per cent to world production producing 4.99 million tonnes during 2018. The other major producers of mango in the world are Thailand, Indonesia, and Mexico etc. The contribution of these countries towards mango production of the world was 6.85 per cent, 5.57 per cent and 3.93 per cent respectively during 2018.

Global trade of mango

The international mango trade is relatively insignificant, despite being a widely consumed fruit. The quantity of mango traded among countries was 0.83 million tonnes in 2008, which accounts for no more than 2.5 percent of world mango production. Only a very small proportion of total mango production enters international trade, and most of the world production is consumed by local or domestic markets (Calatrava 2014). Since 1995 total world mango export increased from 291.4 million dollars to 2474.80 million dollars in 2017 (Annexure 1). Mexico, Netherlands, Brazil, Peru and India are the top most exporters. The country-wise mango export showed that Mexico was the largest exporter of mango in the global context. Mexico's export share in global market was 16.33 per cent in 2017. However, its share in world mango export has declined from 35.96 per cent in 1995 to 16.33 per cent during 2017. It can be inferred that global trade in

Table 1. Production of Mango in the World, 1995 to 2018 **(Million tonnes)**

Country	1995	2000	2005	2010	2015	2018
India	11.00	10.51	11.83	15.03	18.53	21.82
	(47.79)	(42.14)	(37.08)	(39.51)	(38.55)	(39.40)
China	2.01	3.21	4.25	4.27	4.78	4.99
	(8.72)	(12.88)	(13.32)	(11.22)	(9.95)	(9.01)
Thailand	1.19	1.62	1.80	2.55	3.33	3.79
	(5.18)	(6.51)	(5.65)	(6.71)	(6.93)	(6.85)
Indonesia	1.17	1.03	1.66	1.58	2.18	3.08
	(5.07)	(4.14)	(5.19)	(4.14)	(4.53)	(5.57)
Mexico	1.34	1.56	1.68	1.63	2.07	2.18
	(5.83)	(6.26)	(5.26)	(4.29)	(4.31)	(3.93)
Others	6.32	7.00	10.69	12.98	17.18	19.52
	(27.42)	(28.08)	(33.50)	(34.12)	(35.74)	(35.24)
Total	23.02	24.93	31.90	38.03	48.07	55.38
	(100)	(100)	(100)	(100)	(100)	(100)

Source: Data compiled from faostat.org
Note: Figures in parenthesis indicate percentage to total

mango has been diversifying over the years. Mexico was followed by Netherlands and Thailand having share of 13.35 per cent and 9.89 per cent respectively in total export of mango during the year 2017.

The total volume of Mango import has increased from $404.7 million in 1995 to $2474.8 million in 2017 (Annexure II). Major importing countries in world are USA, Netherlands, Germany, UK and UAE accounting for more than half of the total global imports in 2017. USA stood at top position over the study period, but trend shows that its share has declined over the period. The share of other countries in mango import has been increasing indicating the emergence of new markets.

Direction of trade of mango and its product export from India

Fresh Mango

The changes in the direction of fresh mango export from India in pre-NHM period i.e., 1995-96 to 2017-18 are given in Table 2. The major six partners for Indian fresh mango were selected as UAE, Saudi Arabia, Kuwait, UK, Bahrain and Qatar. The rest of the countries were kept under 'others' category. The results revealed that UAE is most stable market for Indian fresh mango during the pre-NHM period as it retains the probability 59.79 per cent of its previous value. It has lost 12.57 per cent share to Saudi Arabia and 15.67 per cent share to other countries. At the same time, UAE gained 46.49 per cent share of export value from Saudi Arabia and 30.42 per cent from others countries. After UAE second most stable market is Kuwait and it retained 55.70 per cent to its original value export to its previous share. Kuwait has lost it's 44.30 per cent share to Saudi Arabia. Results revealed that U K, Bahrain and Qatar are the unstable markets for Indian fresh mango as having probability zero. Study revealed that, UAE is the major gainer from importing countries as it is likely to gain 46.49 per cent from Saudi Arabia and 30.42 per cent from others. Saudi Arabia is likely to gain from Kuwait and UAE as 44.30 per cent and 12.57 per cent share respectively. Among the unstable markets UK is likely to gain 73.35 per cent and 68.72 per cent from Bahrain and Qatar respectively.

The table also revealed the change in direction of trade of fresh mango export from India during post NHM period (2006-07 to 2017-18). Results showed that like pre NHM period UAE again was one of the most stable markets among the major importers of Indian fresh mango as exhibited by the highest probability of retention at 0.7140 i.e. UAE had retained its original export share of 71.40 per cent during the period 2006-07 to 2017-18. Kuwait had probability of retention of 0.3420, retaining its original export share of 34.20

Table 2 .Transitional probability matrix of Indian fresh mango export, 1995-96 to 2005-06

Country	UAE	Saudi Arabia	Kuwait	UK	Bahrain	Qatar	Others
Period (1995-96 to 2017-18)							
United Arab Emirates	**0.5979**	0.1257	0.0471	0.0570	0.0149	0.0008	0.1567
Saudi Arabia	0.4649	**0.2485**	0.0113	0.1000	0.0854	0.0897	0.0000
Kuwait	0.0000	0.4430	**0.5570**	0.0000	0.0000	0.0000	0.0000
United Kingdom	0.0000	0.0000	0.0000	**0.0000**	0.0000	0.0000	1.0000
Bahrain	0.0703	0.0000	0.0000	0.7335	**0.0000**	0.0000	0.1961
Qatar	0.0000	0.0000	0.0000	0.6872	0.0000	**0.0000**	0.3128
Others	0.3042	0.0000	0.0000	0.0194	0.0280	0.0000	**0.6484**
Period (2006-07 to 2017-18)							
United Arab Emirates	**0.7140**	0.0540	0.0370	0.0612	0.0087	0.0113	0.1139
Saudi Arabia	0.9422	**0.0000**	0.0000	0.0000	0.5776	0.0000	0.0000
Kuwait	0.0000	0.0000	**0.3420**	0.0000	0.0841	0.5738	0.0000
United Kingdom	0.7190	0.0633	0.0117	**0.0660**	0.0240	0.0215	0.0946
Bahrain	0.0000	0.0000	0.0000	0.0000	**0.3516**	0.0000	0.0000
Qatar	0.0000	0.0000	0.0000	1.0000	0.0000	**0.0000**	0.0000
Others	0.2365	0.0125	0.0000	0.2062	0.0074	0.0000	**0.5373**

per cent. Similarly, Bahrain had retained its original export share 35.16 per cent. Same can be defined in case of UK. This implies that Bahrain and Kuwait were also the stable importer of Indian fresh mango. On the contrary, Saudi Arabia and Qatar were having a probability of retention as zero indicating that both are unstable importer of Indian fresh mango during post-NHM period.

The major gainer among importer of Indian fresh mango during post-NHM was UAE which is having a transfer probability of 0.9422 from Saudi Arabia, 0.7190 from UK and 0.2365 from others. In similar manner, Bahrain gained 57.76 per cent market share from Saudi Arabia and 8.41per cent and 2.40 per cent from Kuwait and UK respectively. UAE in addition to having high probability of retention is also likely to gain 11.56 per cent market share from Kuwait. In contrary, UAE is also likely to lose 16.03 per cent market share to Iran and 1.71 per cent to Kuwait. On the other hand, Qatar, which is unstable market of Indian fresh mango, is likely to gain 57.38 per cent market share from Kuwait.

Mango Pulp

The change in direction of mango pulp export from India is shown in Table 3. This table revealed that Yamen Arab Republic was the most stable importer of Indian mango pulp as it gives highest probability retention to its previous year's export value i.e. 0.4537. Second most stable market for mango pulp is UK as its retained 33.23 per cent of its previous export value share. Likewise, Netherlands and Saudi Arabia had probability of retention 0.2566 and 0.1235 which can be similarly defined as the stable markets for Indian mango pulp. One the other hand UAE and USA are the unstable markets for Indian mango pulp as both have retained the zero probability of their previous year export value share.

Saudi Arabia is major gainer among the all importers of Indian mango pulp during pre-NHM period having transfer probability of 0.4527 and 0.5463 from the Netherlands and YAR respectively. At the same time it loses 56.58 per cent share to others countries. UK is also major gainer as it gained 59.24 per cent from UAE and has lost also its 22.37 per cent own export value share to USA. The most stable market gained 15.71 per cent from Netherlands and 7.90 per cent from Saudi Arabia. Contrary to this, UAE is unstable market and is likely to gain 42.85 per cent share from UK and 13.35 per cent from Netherlands. Similarly, USA is likely to gain from UK and UAE.

In post-NHM period, USA emerged as the most stable market owing to its improvement in its retention

Table 3. Transitional probability matrix of mango pulp export from India during 1995-96 to 2017-18

Country	Saudi Arabia	UK	UAE	Netherlands	YAR	USA	Others
Period (1995-96 to 2005-06)							
Saudi Arabia	**0.1235**	0.0000	0.0000	0.2310	0.0797	0.0000	0.5658
UK	0.0000	**0.3323**	0.4285	0.0155	0.0000	0.2237	0.0000
UAE	0.0000	0.5924	**0.0000**	0.0000	0.0000	0.3263	0.0813
Netherlands	0.4527	0.0000	0.1335	**0.2566**	0.1571	0.0000	0.0000
YAR	0.5463	0.0000	0.0000	0.0000	**0.4537**	0.0000	0.0000
USA	0.0000	0.0000	0.0000	0.0000	0.0000	**0.0000**	1.0000
Others	0.4211	0.0000	0.1522	0.0298	0.0000	0.0095	**0.3874**
Period (2006-07 to 2017-18)							
Saudi Arabia	**0.2041**	0.0905	0.0719	0.1620	0.0000	0.0469	0.4244
UK	0.0000	**0.5598**	0.0000	0.0000	0.0000	0.0122	0.4279
UAE	0.7855	0.0000	**0.2144**	0.0000	0.0000	0.0000	0.0000
Netherlands	0.0000	0.0000	0.2272	**0.4928**	0.0000	0.0000	0.2799
YAR	0.4822	0.0000	0.0000	0.0846	**0.2352**	0.0000	0.0000
USA	0.0000	0.0000	0.0000	0.0000	0.2251	**0.7748**	0.1979
Others	0.2903	0.0000	0.0113	0.0156	0.1935	0.0000	**0.4891**

share to 77.48 per cent which were unstable in pre-NHM period. UK had retained 55.98 per cent share of its previous export value. It is revealed that USA and UK are the most stable and loyal markets for Indian mango pulp during the post-NHM period. Noteworthy point is that UAE was unstable market in pre-NHM market and it has retained 21.44 per cent of its previous share in post-NHM period. Netherland also increased its retention ability to 49.28 per cent from 25.66 per cent which in pre-NHM period. Similarly, Saudi Arabia and YAR have shown stability in their share with 20.41per cent and 23.52 per cent respectively.

In post-NHM period the major gainer among all the importing countries was Saudi Arabia as it grabbed 78.55 per cent and 48.22 per cent and 29 per cent from UAE, YAR and others. On the other hand it has given up its has remaining share to UK (9.05 %), UAE (7.19 %), Netherland (16.20 %) and other (42.44%). UK grabbed 9.05 per cent share from Saudi Arabia and sacrificed its share to USA (1.22 %) and others (42.79 %). In case of Netherland it has given up 22.72 per cent share to UAE and 27.99 per cent to other countries. It is clearly noted that USA is most stable market retaining 77.48 per cent but it looses its remaining share to YAR i.e., 22.51 per cent. In case of other countries India had held 48.91 per cent of its previous share and has lost the remaining share Saudi Arabia (29.03 %), YAR (19.35%), UAE (1.13 %) and Netherlands (1.56 %).

Mango dried slice

During the study period USA and Netherlands were major stable markets for Indian mango dried slices as they exhibited higher retention capacity of 0.9267 and 0.8091, which means they have retained 92.67 and 80.91 per cent of their previous export value share (Table 4). Contrary to this, Japan, UK and Saudi Arabia are the unstable markets as these importers exhibit zero retention share of previous year of export value.

During this period USA was the major gainer among the top importers as it gained 34.02 per cent from UK and 19.09 per cent from Netherlands. At the same time it has given up its remaining share to Japan (3.98%), Netherlands (1.13%0 and others (2.21 %). Netherlands grabbed 6.42 per cent share from UK, 11 per cent from Saudi Arabia and 1.13 per cent from USA. It has lost 19.09 per cent of remaining share to USA also. In case of unstable markets, Japan has lost its 100 per cent share to Saudi Arabia (25.08 %) and others (74.92 %). Similarly, Saudi Arabia transferred its whole share to Netherlands (11%), UK (1.77%) and others (87.22 %). Finally, UK has lost it its total share to USA (34.02%), Japan (7.18 %), Netherlands (6.42 %) and others (52.38

Table 4. Transitional probability matrix of mango dried sliced export from India during 2004-05 to 2017-18

Country	USA	Japan	UK	Saudi Arabia	Netherlands	Others
USA	**0.9267**	0.0398	0.0000	0.0000	0.0113	0.0221
Japan	0.0000	**0.0000**	0.0000	0.2508	0.0000	0.7492
UK	0.3402	0.0718	**0.0000**	0.0000	0.0642	0.5238
Saudi Arabia	0.0000	0.0000	0.0177	**0.0000**	0.1100	0.8722
Netherlands	0.1909	0.0000	0.0000	0.0000	**0.8091**	0.0000
Others	0.0000	0.1479	0.1498	0.3050	0.0000	**0.3974**

%). In case of other countries India had held 39.74 per cent of its previous share and the remaining share was lost to Japan (14.79 %), UK (14.98 %) and Saudi Arabia (30.50 %).

Mango flour

The study revealed that USA and UK were the major stable markets for Indian mango flour as they exhibited higher retention capacity of 0.8663 and 0.6407 which means that they retained 86.63 and 64.07 per cent of their previous export value shares (Table 5). Contrary to this, UAE and Canada are the unstable markets exhibiting zero retention share of previous year of export value.

During the study period USA was the major gainer among the top importers as it gained 39.87 per cent from UAE, 24.46 per cent from UK and 12.93 per cent from Nepal, at the same time it has given up its remaining share to UAE (2.35%), Canada (2.11% and others (8.911 %). UK grabbed 31.53 per cent share from Canada and 24.74 per cent from others. It has lost 11.48 per cent of remaining share to UAE and 24.46 per cent USA. In case of unstable markets, UAE has lost its 100 per cent share to USA (39.87 %) and others (60.13 %). Similarly, Canada has transferred its whole share to Netherlands (11%), UK (1.77%) and others (87.22 %). Finally, UK has lost it its total share to UAE (62.85%), UK (31.53%), and Nepal (5.63%). In case of other countries India had held 40.96 per cent of its previous share and the remaining share was lost to UAE (10.82%), UK (24.74%), Canada (20.25%) and Nepal (3.24%).

Mango squash

Mango squash is one of the major processed products of mango in India. The change in trade pattern of mango squash exported is represented in Table 6 using transitional probability matrices during the study period of 2004-05 to 2017-18. The major markets selected for study were Netherlands, UAE, UK, USA and Nepal. The remaining countries were kept under other category.

This study revealed that Nepal was the most stable market as it has recognised the highest retention probability as 0.5447. It showed that Nepal had retained 54.47 per cent export value share of its previous value. Study revealed that UK is second most stable market for Indian mango squash as it had retained 29.50 per cent share of its previous export value. Similarly, Netherland and UAE both have retained 27.11 per cent and 3.89 per cent share respectively. Contrary to this, USA had showed zero retention probability making it clear that

Table 5. Transitional probability matrix of mango flour export from India during 2004-05 to 2017-18

Country	UAE	UK	USA	Canada	Nepal	Others
UAE	**0.0000**	0.0000	0.3987	0.0000	0.0000	0.6013
UK	0.1148	**0.6407**	0.2446	0.0000	0.0000	0.0000
USA	0.0235	0.0000	**0.8663**	0.0211	0.0000	0.0891
Canada	0.6285	0.3153	0.0000	**0.0000**	0.0563	0.0000
Nepal	0.0000	0.0000	0.1293	0.7927	**0.0781**	0.0000
Others	0.1082	0.2474	0.0000	0.2025	0.0324	**0.4096**

Table 6. Transitional probability matrix of mango squash export from India, 2004-05 to 2017-18

Country	Netherland	UAE	UK	USA	Nepal	Others
Netherland	**0.2711**	0.0000	0.0000	0.0000	0.2738	0.4550
UAE	0.0000	**0.0389**	0.0000	0.0000	0.0000	0.9611
UK	0.6150	0.0000	**0.2950**	0.0000	0.0622	0.0271
USA	0.0000	0.0000	0.0000	**0.0000**	0.0000	1.0000
Nepal	0.0000	0.0000	0.1978	0.1771	**0.5447**	0.0805
Others	0.2573	0.1304	0.0198	0.0488	0.0000	**0.5437**

USA is unstable market among the all major importers of Indian mango squash.

Competitiveness of Indian mango

Principle of comparative advantage is one of the best tools to determine production and export of commodity of any a nation. The comparative advantage tells about the capability of a nation to export a particular commodity in the international market. Comparative advantages of top mango exporting countries were computed by revealed comparative advantage (RCA) and comparative export performance (CEP).

Revealed comparative advantage (RCA) of mango

Several developments have taken place after trade liberalization (i.e., after 1995) and National Horticulture Mission (i.e., after 2005) seemed to have a notable effect on the Indian mango exports either directly or indirectly. A brief perusal of the Table 7 revealed that India is having higher comparative advantage over Mexico and Brazil in the whole period with their RCA being positive. During the pre-NHM period Mexico showed the weakening comparative advantage of India and during 2007 it tends to have negative which exposed the comparative advantage over India. As a special case to China, India tries to overcome the comparative disadvantage with declining negative ratio at the end of period (-1.86) from the starting (-8.17) which were higher comparative advantage of china over the India. Pakistan and Indonesia have increasing comparative advantage over India in Asian market. Up to period 2011 Thailand had comparative advantage over India in Asian Market but afterwards India builds up advantage against Thailand.

Comparative export performance (CEP) of mango

Another index used to study the comparative advantage was the comparative export performance index, which assess the export specialization of a country for a particular product. The country with higher CEP index has higher comparative advantage against other competing countries and vice versa. Table 8 represents the Comparative Export Performance of mango in top exporting countries in the world. Among all the

Table 7. Revealed comparative advantage (RCA) of mango in India against top exporter in Asia market from 2001 to 2017

Year	Mexico	China	Pakistan	Indonesia	Brazil	Thailand
2001	3.22	-8.17	-	-4.37	0.00	-3.13
2003	1.98	-5.88	-0.66	-2.14	0.01	-2.11
2005	0.07	-5.43	-0.72	-2.64	0.02	-1.76
2007	-0.13	-6.01	-0.52	-2.96	0.02	-1.48
2009	0.01	-6.11	-0.52	-2.81	0.02	-0.81
2011	0.41	-5.80	-1.12	-2.40	0.02	-0.40
2013	1.71	-5.07	-1.28	-2.71	0.02	0.36
2015	1.92	-3.66	-1.23	-1.64	0.02	0.29
2017	1.23	-1.86	-2.30	-2.43	0.05	1.47

Table 8. Comparative export performance of mango in top exporting countries in the world from 2001 to 2017

Year	India	Mexico	China	Pakistan	Indonesia	Thailand	Brazil
2001	1.16	2.72	-3.85	-	-0.18	0.51	1.00
2003	2.35	2.55	-2.81	2.80	0.22	0.03	1.16
2005	2.54	2.08	-2.10	2.75	-0.47	0.57	0.80
2007	2.20	2.04	-2.72	2.60	-1.17	0.52	0.63
2009	2.47	2.05	-2.89	2.29	-1.16	1.07	0.45
2011	1.85	2.12	-2.80	2.07	-1.35	0.82	0.43
2013	1.36	2.27	-2.36	2.13	-1.87	1.43	0.26
2015	1.48	2.07	-1.24	1.36	-1.06	1.11	0.40
2017	0.94	1.97	-0.65	1.47	-2.76	1.24	0.21

competitors, Mexico recorded the higher comparative advantage in mango export in global market during all the periods. Followed this Pakistan also reported the higher advantage over India in mango export except for the period 2009 and 2013. India reports higher comparative advantage over the China, Indonesia and Brazil.

Conclusion and Policy Implications

It was concluded from the analysis that Mexico, Netherlands, Brazil, Peru and India are the top most exporters of mango. USA, Netherlands, Germany, UAE, and UK are the major mango importing countries of the world accounting for more than half of the total world imports of mango. For Indian fresh mango UAE was the most loyal market both in pre-NHM and post-NHM as it retained 59.79 per cent and 71.40 per cent of its previous value respectively. For mango pulp stability was changes from YAR (45.37 %) to USA (77.48%) in later period. In case of mango dried slices and mango flour the most favorable market was USA; and Nepal was the loyal market for mango squash. India has enjoyed comparative advantage in mango exports in the world market over Brazil, China and Indonesia during the study period. Study revealed that India still has scope to expand mango export. Production strategy should target not only meeting the domestic and export demand of fresh product but also of the processed products.

References

Adhikari A, Sekhon M K and Kaur M 2016. Export of rice from India: Performance and determinants. *Agricultural Economics Research Review.* **29**: 135-50

Calatrava J 2014. Economic Importance and World Trade. In: *Mango Importance and International Trade*. Pp 1-45. Institute of Agricultural Research, Granda, Spain.

Dent, W. T. 1967. Application of Markov analysis to international wool flows. *The Review of Economics and Statistics*. 613-16

Gillet B E 1976. Introduction of operation research - A computer oriented algorithmic approach, MaGraw - Hill Inc, New York, USA.

GOI 2018a. *Horticulture Statistics at Glance.* Horticulture Statistics Division, Department of Agriculture and Farmers' Welfare, Ministry of Agriculture and farmers Welfare, Government of India.

GOI 2018b. Agricultural and Processed Food Products Export Development Authority (APEDA). Ministry of Commerce and Industry, New Delhi.

Kshirsagar PJ, Phuge SC, Anapandj VN and Yadav M 2018. Performance and Determinants of Mango export from India. *Bulletin of Environment, Pharmacology and Life Sciences.* **8**: 149-53

Lee TC, Judge GG and Zeellenner A 1970. Estimating the parameters of the probability Model from aggregate time series data, North-Holland publishing company, Amsterdam.

Patil RS, Deshmukh RG, Bhaskar K R and Jahagirdar SW 2018. Growth and Export Performance of Mango in India. *International Journal of Curent Microbiol Application Sciences.* **6**: 2667-73

Rana KC and Verma KN 2010. International Economics. Pp.9. Vishal publishing Co., Jalandher, India.

Sujatha, R. V., & Prasad, Y. E. 2003. Export Scenario of Mangoes From India. *Indian Journal of Agricultural Marketing*. **17**: 142-50

Vyas VS 1996. Diversification in Agriculture, Concept and Approaches. *Indian Journal of Agricultural Economics.***5**: 636-43

Received: January 3, 2020 Accepted: March 15, 2020

Annexures

Major exporter countries of mango in the world **(Million Dollar)**

Country	1995	2000	2005	2010	2015	2017
Mexico	104.8	111.10	86.60	163.40	328.40	454.90
	(35.96)	(28.81)	(13.93)	(14.13)	(16.89)	(16.33)
Thailand	1.7	4.10	4.30	80.10	173.10	275.50
	(0.58)	(1.06)	(0.69)	(6.93)	(8.90)	(9.89)
India	12.3	16.50	122.70	228.60	183.60	182.90
	(4.22)	(4.28)	(19.73)	(19.78)	(9.44)	(6.57)
Brazil	22.1	35.70	72.60	119.60	184.90	205.40
	(7.58)	(9.26)	(11.68)	(10.35)	(9.51)	(7.37)
Netherlands	26.3	36.30	83.60	158.90	236.30	371.90
	(9.03)	(9.41)	(13.44)	(13.75)	(12.15)	(13.35)
Peru	6.93	23.30	38.30	89.30	194.10	191.70
	(2.38)	(6.04)	(6.16)	(7.72)	(9.98)	(6.88)
Other	117.27	158.60	213.70	316.10	644.00	1103.30
	(40.24)	(41.13)	(34.37)	(27.34)	(33.12)	(39.61)
World total	291.4	513.10	784.40	1172.80	2036.90	2474.80
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Data compiled from faostat.org
Note: Figures in parenthesis indicate percentage share to total.

Major importer countries of mango in the world **(Million Dollar)**

Country	1995	2000	2005	2010	2015	2017
USA	137.38	164.5	202.6	287.2	447.1	506.7
	(33.95)	(32.06)	(25.83)	(24.49)	(21.95)	(20.47)
Netherlands	46.2	67.2	106.5	185.5	273.9	307.4
	(11.42)	(13.10)	(13.58)	(15.82)	(13.45)	(12.42)
UAE	17.3	13.2	25.3	45.4	95.2	98.4
	(4.27)	(2.57)	(3.23)	(3.87)	(4.67)	(3.98)
Germany	18.8	24.9	52.3	88.2	172.1	203.1
	(4.65)	(4.85)	(6.67)	(7.52)	(8.45)	(8.21)
UK	22.2	25.9	64.2	75.1	161.1	169.1
	(5.49)	(5.05)	(8.18)	(6.40)	(7.91)	(6.83)
Other	162.82	217.4	333.5	491.4	887.5	1190.1
	(40.23)	(42.37)	(42.52)	(41.90)	(43.57)	(48.09)
World total	404.7	513.1	784.4	1172.8	2036.9	2474.8
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Data compiled from faostat.org
Note: Figures in parenthesis indicate percentage share to total