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Fruit and vegetable exports in the post-liberalization era: The Indian experience

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ABSTRACT

The liberalization of agricultural trade brought about by the economic reforms of 1991, the subsequent WTO agreement and the proliferating Regional Trading Agreements have opened opportunities as well as challenges for India's horticultural trade. This paper analyses the performance of horticultural exports from the country in terms of growth, instability, dynamics, diversification and stability with respect to commodities and markets and the constraints in terms of the Non-Tariff Measures (NTMs) faced and delineates the opportunities and strategies required to be followed by the sector for a sustainable growth. The horticultural exports from the country have grown significantly in both quantity and value terms during the period from 1991 to 2016. The highest share in the exports of horticultural products from India was accounted by grapes for which the major markets were Netherlands, Russia, United Kingdom, UAE, Germany and Saudi Arabia. Among the vegetables, India accounted for about 9.4 per cent of share in world exports of onion and the main destinations were Bangladesh, Malaysia, UAE and Sri Lanka. The horticultural exports have shown increased commodity diversification as well as geographical diversification due to increased market access in developed countries. Even though the tariffs have come down there by increasing the exports, the NTMs, especially quality issues in connection with sanitary and phyto-sanitary regulations have increased in the post- liberalization era. Given the inherent potential and rising competiveness of the India's horticultural sector, the removal of product specific constraints, especially production of commodities of international standards could definitely help in sustaining the growth of horticultural exports.

Key words: Exports, growth and instability, non-tariff Measures, sanitary and phyto-Sanitary regulations

INTRODUCTION

India is one of the world's largest producer and consumer of the horticultural commodities especially, fruits and vegetables. The production of horticultural crops in India was about 283.3 million tonnes in 2015-16. Over the last five years, the contribution of vegetables (59-61 %) remain highest in the horticulture crop production followed by fruits (31-32 %). There is a wide diversification in the production of these commodities all over the country and it increased significantly in the recent decades. India is the second largest producer of fruits and vegetables in the world. It produced 91.4 million tonnes of fruits and 166.6 million tonnes of vegetables during 2015-16 (GoI, 2016). Even though India's share in global market is only around one percent, there is increasing demand for India's horticulture products in the global market.

The liberalization of agricultural trade brought about by the economic reforms of 1991, the subsequent WTO agreement and the proliferating Regional Trading Agreements have opened opportunities as well as challenges for India's horticultural trade internationally. These negotiations also focus more on international agricultural commodity markets in the context of improvement in market access and reduction of export subsidies (Dastagiri, 2017). At the same time this has

also paved the way for increase in non-tariff barriers that restricts the international trade in horticultural commodities. Non-tariff measures are the policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both (UNCTAD, 2013). As reported by FAO, phyto-sanitary controls imposed by importers are critical for developing countries exporting fresh fruit and vegetables. These controls are particularly stringent in the USA, Australia and Japan. India faces several constraints in the export of vegetables and fruits, especially to the developed countries, in the form of NTMs especially quality issues in connection with sanitary and phyto-sanitary regulations which have increased in the post- liberalization era. The non-tariff barriers established by the importing countries combined with other factors like zero tolerance to insects and pests, and issues in certification, cause difficulties to the exporters. Rejection or additional checks at the entry points create considerable financial loss, delay in delivery to the client, loss of quality and reputation of Indian exports (Idris *et al*., 2015).

In the above setting, this paper analyses the performance of horticultural exports from India in terms of growth, instability, dynamics, diversification and stability with respect to commodities and markets and the constraints in terms of the Non-Tariff Measures (NTMs) faced and delineates the opportunities and strategies required to be followed by the sector for a sustainable growth.

MATERIAL AND METHODS

The study was conducted based on the data on India's fruits and vegetables exports from the year 1988 to 2016. The data on quantity and value of exports and destinations of fruits and vegetables and information on the non-tariff barriers were collected. The data sources were World Integrated Trade Solution (WITS) and Agricultural Produce Export Development Authority (APEDA). The percentage share of each of the major vegetables and fruits in the total export of vegetables and fruits was estimated and based on this percentage share, top 8 vegetables and top 7 fruits were identified for which the analyses on export instability, geographic concentration and Markov chain analysis were done.

Export instability

To study the export instability, Coppocks instability index was used which can be expressed in the following estimable form

$$V\log = \frac{1}{N-1}\Sigma\left\{\log\left(\frac{X_{t+1}}{X_t}\right) - M\right\}^2$$

The instability index is = (antilog √V log – 1) x 100

Where, X_t is the value of exports in year or volume of exports in year t, N is number of years and M is the arithmetic mean of the difference between the logs of X_t and X_{t+1} etc., V log is logarithmic variance of the series.

Concentration in the Exports of Vegetables and Fruit

Commodity concentration – Gini Concentration Index

Diversification of export basket can reduce the vulnerability of domestic producers and consumers to external shocks and it can also reduce the volatility in export earnings. Gini Index was used to measure the concentration in the export of total vegetables and fruits from India.

$$\text{Gini Concentration Index} = 100\sqrt{\Sigma(X_{it}/X_t)^2}$$

Where, X_{it} is the value of exports of commodity 'i' from India in year 't' and X_t is the values of export of all commodities from India in year t.

Geographic Concentration – Hirschman Index

Increased geographic concentration increases the instability and thereby the risks in export earnings. The Hirschman Index was used to measure the geographic concentration in the export of fruits and vegetables.

$$\text{Hirschman Index, HI} = 100\sqrt{\sum_{i=1}^{n}(X_{it}/X_t)^2}$$

Where, X_{it} is the value of exports of commodity from India in year t to the i^{th} market, X_t is the total value of export of the commodity from India in year t and n is the number of countries importing the commodity from India.

Stable Export Markets for India's Vegetables and Fruits: Markov Chain Analysis

The stable export markets for India's vegetables and fruits were identified by estimating retention probabilities using Markov chain analysis. The model is a stochastic process which describes the finite number of possible outcomes Si (i=1,2…r) which is a discrete random variable Xt (t=1,2…T) and which assumes that (a) the probability of an outcome on the t^{th} trial depends only on outcome of the preceding trial, and (b) this probability is constant for all time periods (Lee *et al*., 1970). Central to Markov chain analysis is the estimation of the transitional probability matrix P. The element P_{ij} of this matrix indicates the probability that exports will switch from country i to country j with the passage of time. The diagonal element P_{ij} where, i=j, measures the probability that the export share of a country will be retained. Hence, an examination of the diagonal element indicates the loyalty of an importing country to a particular country's exports (Atkin and Blandford, 1982).

The average exports to a particular country was considered to be a random variable which depends only on its past exports to that country and which can be denoted algebraically as,

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

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

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

RESULTS AND DISCUSSION

Share of different vegetables and fruits in total vegetables and fruits exports from India

The share of individual vegetables in total vegetables export from India is given in **Table 1.** It could be observed from the table that during Triennium Ending (TE) 1990, onions and shallots accounted for 36.56 percent and 44 percent of the total vegetables exports in value terms and quantity terms respectively. It was followed by dried leguminous vegetables which accounted for 3 percent of value and 1 percent of quantity of vegetables exports from India. It could be observed from the table that in quantity terms onions and shallots accounted for the maximum share in all the trienniums, whereas in value terms, the only exception to this was Triennium Ending 2000. In Triennium Ending 2000, dried lentils accounted for the maximum share in total value of vegetables exports from India. Even though onion and shallots occupied the first position in Triennium Ending 2010 and Triennium Ending 2016, the other vegetables like dried onions, tomatoes, potatoes, other potatoes have increased in shares in both quantity and value terms, which is a clear indication of diversification of India's export basket of vegetables.

The share of individual fruits in total fruits export from India is given in **Table 2.** It could be observed that during Triennium Ending 1990, cashew nuts accounted for 76.37 percent of the total fruits exports in value terms.

It was followed by guavas, mangoes and mangosteens which accounted for 6.38 percent of value of fruits exports from India. In terms of quantum of exports, guavas, mangoes and mangosteens and fresh grapes accounted for 22.8 percent and 6.11 percent respectively. It could be observed from the table that in value terms, cashew nuts accounted for the maximum share in all the trienniums under consideration, whereas in quantity terms, the highest share was accounted by guavas, mangoes and mangosteens in all the trienniums. While the share of cashew nuts declined in Triennium Ending 2010 and Triennium Ending 2016, the other fruits like guavas, mangoes and mangosteens, fresh grapes, bananas, dried grapes have increased in shares in both quantity and value terms, which is a clear indication of diversification of India's export basket of fruits.

The results of the instability analysis for export of fruits given in **Table 4** shows that the instability in export value, quantity and unit value for bananas, dried grapes and lemon and lime declined during the period from 2000 to 2016 while it increased in case of guavas, mangoes and mangosteens, fresh grapes and walnuts. For cashew nuts the instability in value increased but in terms of quantity and unit value it declined.

Table 1. Dynamics in Share of Different Vegetables in Total Vegetables Exports from India

Commodities		TE 1990 Percent share	TE 2000 Percent share	TE 2010 Percent share	TE 2016 Percent share
Onions and shallots (fresh or chilled)	Value	36.56	17.19	31.94	22.46
	Quantity	44.02	29.55	39.29	32.81
Dried onions	Value	0.43	2.89	3	7.03
	Quantity	0.09	0.66	0.54	1.34
Tomatoes (fresh or chilled)	Value	0.05	0.07	2.31	4.69
	Quantity	0.03	0.11	2.7	5.76
Potatoes (fresh or chilled)	Value	0.38	0.97	1.76	4.45
	Quantity	0.57	2.49	2.9	5.75
Other potatoes (fresh or chilled)	Value	0.33	0.81	1.61	4.4
	Quantity	0.51	2.08	2.74	5.73
Dried leguminous vegetables (shelled)	Value	3.04	7.39	0.32	1.13
	Quantity	1	4.2	0.12	0.33
Dried lentils (shelled)	Value	2.37	22.9	0.02	0.67
	Quantity	0.67	14.14	0.01	0.24
Garlic (fresh or chilled)	Value	0.78	0.53	0.67	0.62
	Quantity	0.54	0.58	0.23	0.36
Other vegetables	Value	8.77	22.75	24.65	30.09
	Quantity	3.45	14.48	11.6	13.83
Totalvegetables exports (actual value)	Value (1000 USD)	130255.3	283994.8	1326335.7	1681428.8
	Quantity (1000 Tons)	584.5	934.67	3903.1	4218.65

Source: Computed using data from wits.org Note: Per cent share denotes share in total quantity and value of vegetable exports

Table 2. Dynamics in Share of Different Fruits in Total Fruits Exports from India

Commodities		TE 1990 Percent share	TE 2000 Percent share	TE 2010 Percent share	TE 2016 Percent share
Cashew nuts	Value	76.37	79.5	55.55	51.8
	Quantity	0.05	30.17	16.79	13.17
Guavas, mangoes and mangosteens	Value	6.38	2.94	19.92	12.35
	Quantity	22.8	14.35	33.65	23.02
Fresh grapes	Value	1.79	1.91	8.03	12.02
	Quantity	6.11	4.79	13.35	14.32
Bananas, including plantains	Value	0.02	0.62	1.76	3.13
	Quantity	0.62	2.77	6.04	9.95
Dried grapes	Value	0	0.03	1.19	1.99
	Quantity	0	0.04	1.09	2.92
Walnuts without shell	Value	3.1	2.54	3.43	1.34
	Quantity	3.39	1.8	0.96	0.36
Lemons and limes	Value	0.01	0.17	0.67	0.63
	Quantity	0.1	0.91	2.82	2.11
Other fruits	Value	12.32	12.3	9.46	16.75
	Quantity	66.93	45.16	25.28	34.15
Total fruits exports (actual value)	Value (1000 USD)	286305.63	606959.54	1085762.6	1571229.11
	Quantity (1000 Tons)	92.86	287.48	725.31	836.9

Source: Computed using data from wits.org Note: Per cent share denotes share in total quantity and value of fruit exports

Instability Analysis

The instability indices for vegetables export from India given by Coppock's Instability Index **(Table 3)** shows that the instability in value, quantity and unit value of exports for onions and shallots, dried onions, dried leguminous vegetables, dried lentils and garlic have increased in the period from 2000 to 2016 when compared to the period from 1988 to 1999. For potatoes and other potatoes, the instability in export declined. The instability in value for tomatoes declined but the instability in export quantity and unit value increased during the period from 2000 to 2016.

Concentration of Exports

Commodity concentration and geographic concentration of exports were considered to be the major contributing factors in the instability of export earnings.

Commodity Concentration

The commodity concentration in the export of vegetables and fruits from India given by the Gini Concentration Index is given in **Table 5.** The average value of the concentration index for the period from 1988 to 1999 was 50.61 and 78.89 for export of vegetables and fruits respectively. During the period from 2000 to 2016, the average value of the commodity concentration index for vegetables and fruits declined to 42.32 and 64.51 and this declining trend in commodity concentration for export of vegetables and fruits is shown in **figure 1 and 2** respectively. The higher commodity concentration index for export of fruits from India indicates greater dependence on the export of only few commodities which is often thought to be the inherent cause for the fluctuations in export earnings. The lesser concentration index for vegetables export than fruits implies comparatively more diversification in the export basket of vegetables.

Table 3. Instability in Export of Vegetables from India (Coppocks Instability Index)

COMMODITY		INSTABILITY INDEX (%)		
		1988-99	2000-16	1998-2016
Onions and shallots (fresh or chilled)	**Values**	20.6	37.1	31.3
	Quantity	34.1	35.2	34.8
	Unit Value	18.7	48.6	37.6
Dried onions	**Values**	58.3	72.9	68.6
	Quantity	55.1	81.0	71.2
	Unit Value	23.9	73.3	55.1
Tomatoes (fresh or chilled)	**Values**	164.9	134.3	146.6
	Quantity	136.7	187.5	164.3
	Unit Value	62.3	73.1	67.5
Potatoes(fresh or chilled)	**Values**	108.8	90.7	97.6
	Quantity	100.3	84.3	90.6
	Unit Value	45.4	41.9	42.6
Other potatoes (fresh or chilled)	**Values**	104.2	96.8	98.6
	Quantity	110.4	94.3	99.4
	Unit Value	46.4	42.4	43.3
Dried leguminous vegetables (shelled)	**Values**	24.9	97.0	71.1
	Quantity	26.3	99.9	74.9
	Unit Value	10.9	18.6	16.6
Dried lentils(shelled)	**Values**	72.3	379.8	248.7
	Quantity	72.6	459.6	292.7
	Unit Value	13.8	19.5	17.8
Garlic (fresh or chilled)	**Values**	176.3	344.3	269.0
	Quantity	181.7	446.6	323.7
	Unit Value	15.8	64.5	47.9

Source: Computed using data from wits.org

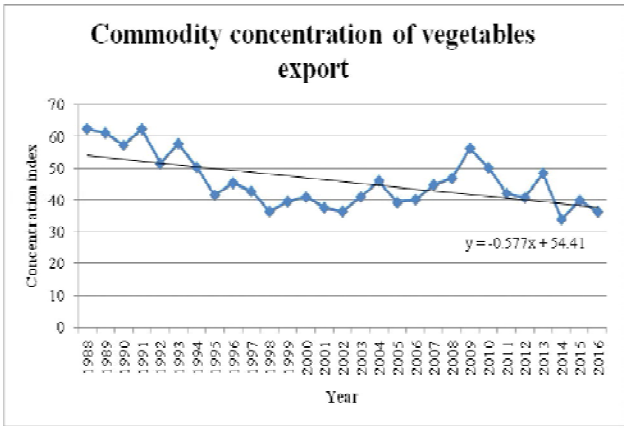

Fig. 1. Commodity Concentration of Vegetables Export from India

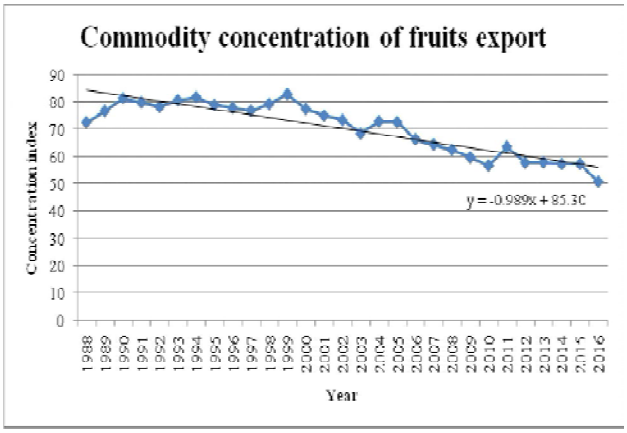

Fig. 2. Commodity Concentration of Fruits Export from IndiaStable Export Markets for India's Vegetables and Fruits: Markov Chain Analysis

Table 4. Instability in Export of Fruits from India (Coppocks Instability Index)

COMMODITY		INSTABILITY INDEX (%) 1988-99	2000-16	1998-2016
Cashew nuts (fresh or dried)	**Values**	13.7	21.0	19.6
	Quantity	604.6	17.1	259.7
	Unit Value	631.9	15.6	263.5
Guavas, mangoes and mangosteens, (fresh or dried)	**Values**	23.5	40.5	35.1
	Quantity	23.7	44.2	36.0
	Unit Value	12.7	18.9	17.8
Fresh grapes	**Values**	37.5	44.2	41.1
	Quantity	44.2	46.1	44.4
	Unit Value	12.7	31.4	24.8
Bananas, including plantains (fresh or dried)	**Values**	291.1	38.4	143.8
	Quantity	357.1	43.5	169.7
	Unit Value	81.0	25.6	51.4
Dried grapes	**Values**	377.1	342.6	345.7
	Quantity	442.6	299.9	344.4
	Unit Value	67.4	32.6	49.2
Walnuts without shell (fresh or dried)	**Values**	23.6	35.8	32.4
	Quantity	24.0	25.7	26.3
	Unit Value	14.8	29.4	23.8
Lemons and limes (fresh or dried)	**Values**	47.0	29.7	38.4
	Quantity	54.3	49.8	52.8
	Unit Value	50.3	38.2	42.7

Source: Computed using data from wits.org

Geographic Concentration

The average value of geographic concentration index for vegetables export **(Table 6)** declined for all the major vegetables during the period from 2000 to 2016, with the only exception of tomatoes for which it increased from 73.93 (1988 to 1999) to 76.21 (2000 to 2016) which indicates the diversification of the vegetables export from India to different countries, except in case of tomatoes. The concentration index value of 40 and above is considered to indicate higher degree of concentration. The overall concentration

Table 5. Commodity Concentration of Vegetables and Fruits Exports from India (Gini Concentration Index)

Mean Value	Concentration Index (%)	
	Vegetables	Fruits
1988-1999	50.61	78.89
2000-2016	42.32	64.51
Overall (1988-2016)	45.75	70.46

Source: Computed using data from wits.org

Table 6. Geographic Concentration of Vegetables Export from India (Hirschman Concentration Index in %)

Mean Value	Onions and shallots (fresh or chilled)	Dried onions	Tomatoes (fresh or chilled)	Potatoes (fresh or chilled)	Other potatoes (fresh or chilled)	Dried leguminous vegetables (shelled)
1988-99	43.59	44.97	73.93	59.63	61.35	47.33
2000-16	44.15	30.1	76.21	56.91	58.61	38.17
Overall (1988-2016)	43.85	35.38	75.31	58.38	59.98	41.26

Source: Computed using data from wits.org

index for onions and shallots, tomatoes, potatoes, other potatoes and dried leguminous vegetables was more than 40 and this indicate the greater dependence of these commodities in the economic conditions of few countries. The overall concentration index for dried onions export was less than 40 (35.38) which imply its higher diversification in terms of geographic coverage and thus limiting the possibility of risk from price variability of exports.

Table 7 shows the geographic concentration index for fruits export from India. The average value of geographic concentration index declined for cashew nuts, guavas, mangoes and mangosteen, fresh grapes, bananas, dried grapes and shelled walnuts in the period from 2000-2016, with the only exception of lemons and limes for which it increased significantly from 63.64 (1988-1999) to 75.47 (2000-2016) and which indicate the increased diversification in the export of fruits from India to different countries, with the exception of lemons and limes, for which the export was increasingly concentrated in few countries. The overall concentration index for cashew nuts, fresh grapes, guavas, mangoes and mangosteen, bananas, dried grapes and lemons and limes was more than 40 and this indicate their greater dependence on economic conditions in few countries. The overall concentration index for shelled walnuts export was less than 40 (35.38) which imply its higher diversification in terms of geographical coverage and thus limiting the possibility of risk from export price volatility.

Table 7. Geographic Concentration of Fruits Export from India (Hirschman Concentration Index in %)

Mean Value	Cashew nuts	Guavas, mangoes and mangosteens	Fresh grapes	Bananas, including plantains	Dried grapes	Walnuts without shell	Lemons and limes
1988-99	45.29	49.63	58.92	50.41	66.23	35.33	63.64
2000-16	42.01	35.01	46.02	44.67	46.28	31.22	75.47
Overall (1988-2016)	43.73	40.15	50.85	46.36	53.54	32.26	72.24

Source: Computed using data from wits.org

Stable Export Markets for India's Vegetables and Fruits: Markov Chain Analysis

The major and consistent export markets of vegetables and fruits were identified using Markov Chain Analysis and the results are given in **Table 8.** The retention probability value of 0.5 and above is considered to represent the stable market for exports indicating the loyalty of the importing country to India's exports.

The most stable markets for onions and shallots, dried onions, tomatoes, potatoes, other potatoes, dried leguminous vegetables, dried lentils and garlic were identified as Nepal, Belgium, Pakistan, Mauritius, Oman, UAE, Sri Lanka and Bangladesh respectively. The probability that the countries Nepal, Belgium, Pakistan, Mauritius, Oman, UAE, Sri Lanka and Bangladesh retained their export share from one year to the next year were 79 percent for onions and shallots, 60 percent for dried onions, 80 percent for tomatoes, 97 percent for potatoes, 92 percent for other potatoes, 81 percent for dried leguminous vegetables, 81 percent for dried lentils and 86 per cent for garlic respectively.

The UAE was the most stable export market for Indian cashew nuts, guavas, mangoes and mangosteen and lemons and lime. The probability that the UAE retained its export share was 94 percent for cashew nuts, 85 percent for guavas, mangos and mangosteen and 97 percent for lemons and lime. Netherlands and the United Kingdom were the most stable export markets for fresh grapes as the probability that both the countries retained their export share was 88 percent. Oman (90 percent), Saudi Arabia (60 percent) and Spain (68 percent) were identified as the most stable markets for

Table 8. Stable Export Markets for India's Vegetables and Fruits Identified based on Markov Chain Analysis

Vegetables						
Onions and shallots (fresh or chilled)	Nepal (0.7898)	Singapore (0.6364)	Kuwait (0.6350)	Bangladesh (0.6188)	UAE (0.5611)	
Dried onions	Belgium (0.6037)					
Tomatoes (fresh or chilled)	Pakistan (0.8002)	Bangladesh (0.6302)				
Potatoes (fresh or chilled)	Mauritius (0.972)	Nepal (0.9015)	Sri Lanka (0.8460)	UAE (0.6817)		
Other potatoes (fresh or chilled)	Oman (0.9192)	Nepal (0.8193)	Sri Lanka (0.7797)	Hong Kong, China (0.6870)	UAE (0.681)	
Dried leguminous vegetables (shelled)	UAE (0.8109)	Sri Lanka (0.7412)	Nepal (0.6907)	US (0.6385)		
Dried lentils (shelled)	Sri Lanka (0.8104)	UAE (0.7848)	Bangladesh (0.7523)	Kuwait (0.5325)		
Garlic (fresh or chilled)	Bangladesh (0.8556)	Pakistan (0.5452)	Philippines (0.5238)	Thailand (0.5233)		
Fruits						
Cashew nuts fresh or dried)	UAE (0.9378)	US (0.8094)	Korea, Rep. (0.6990)	Japan (0.6088)	Kuwait (0.6002)	Germany (0.5212)
Guavas, mangoes and mangosteens (fresh or dried)	UAE (0.84483)	Saudi Arabia (0.7348)	Qatar (0.7022)	Yemen (0.6101)	China (0.5901)	
Fresh grapes	Netherlands (0.8813) Russian Federation (0.6762)	UK (0.8784) Bangladesh (0.6362)	Switzerland (0.8415) Norway (0.5129)	UAE (0.8222)	Saudi Arabia (0.7563)	
Bananas, including plantains (fresh or dried)	Sultanate of Oman (0.9041)	UAE (0.7665)	Nepal (0.6340)	Malaysia (0.5945)		
Dried grapes	Saudi Arabia (0.6005)	UAE (0.5218)				
Walnuts without shell (fresh or dried)	Spain (0.6807)	Other Asia, nes (0.6488)	Belgium (0.5599)			
Lemons and limes (fresh or dried)	UAE (0.9710)	Bangladesh (0.7240)	Maldives (0.6218)	Nepal (0.5823)		

Source: Computed using data from wits.org Note: Figures in parentheses indicate the retention probabilities of the respective countries

bananas, dried grapes and shelled walnuts exports respectively.

Constraints: Non Tariff Measures

The **figure 3** shows the increase in SPS measures that were in force and those initiated by the members of World Trade Organization (WTO) from the period 2005 to 2016. There was constantly increasing trend in the SPS measures.

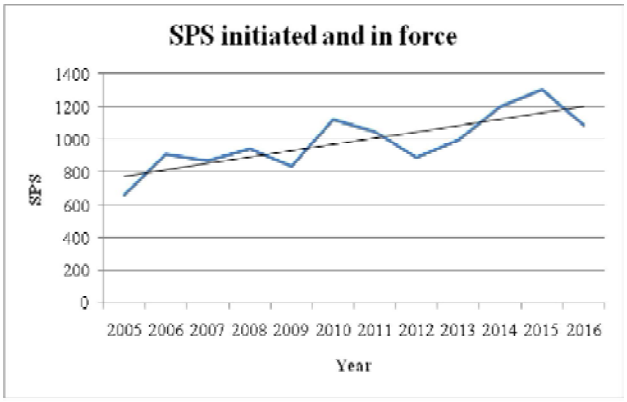

Fig. 3. Sanitary and Phyto Sanitary (SPS) measures initiated and in force
Source: Computed using data from WTO

The important non-tariff barriers as identified by Agricultural Products Export Development Authority **(APEDA)** that adversely affected the export of Indian horticultural commodities are given in **Table 9**. Japan imposed a ban on import of fresh grapes from India by quoting the reason that there was threat of infestation of oriental fruit fly in Pakistan while importing fresh grapes. But the data collected from survey which was conducted for three years revealed that there was no such infestation on Indian grapes. The export of mangoes to the USA involved higher cost of certification that involves the complex process of market access including a number of agreements and protocols and also the cost involved in irradiation process. USA also imposed a ban on the import of fresh grapes for using sulphur pads in package boxes. But this need not be a concern for the US as the US producers of grapes were also understood to be using these procedures. Australia and New Zealand imposed ban on Indian mangoes and others fruits due to presence of fruit flies and stone weevils. China delayed the finalization of protocol on phyto-sanitary measures and certification procedures that affected the Indian fruits such as mango, guava, grapes, watermelons, muskmelon, papayas and other fruits and the vegetables such as cucumber, gherkins, beans and other leguminous vegetables, aubergines, capsicum and others. The default MRL (Maximum Residue Levels) set by the European Communities was very high and the risk assessment of this level do not have scientific justification and also the member states like UK, Netherlands and Germany have set up MRLs for some compounds which were not harmonized by the EC. Even though the tariffs have come down there by increasing the exports, the NTMs, especially quality issues in connection with sanitary and phyto-sanitary regulations have increased in the post- liberalization era, especially for fruits and vegetables.

CONCLUSION

The purpose of the study was to analyze the performance of horticultural exports that includes the vegetables and fruits from India. The study reveals that the highest share in the vegetables export from India was accounted by onions and shallots both in value (22.46 %) and quantity terms (32.81 %) followed by dried onions and tomatoes in value terms. The highest share in the fruits export was accounted by cashew nuts (51.8 %) followed by guavas, mangoes and mangosteens together and

Table 9. Non Tariff Barriers Affecting India's Export

Countries	Non Tariff Barriers
Japan	Ban on the import of fresh grapes from India on the basis of report of the incidence of oriental fruit fly on grapes in Pakistan and vapor heat treatment (VHT) for mango fruit flies
USA	Mangoes – High Cost of Certification and irradiation for stone weevil infection
	Grapes – Use of Sulphur Pads
Australia	Ban on import of Indian mangoes and other fruits due to presence of fruit flies and weevil
China	Delay in finalization of protocol on phyto sanitary measures and certification procedures
New Zealand	Ban on import of Indian mangoes and other fruits due to presence of fruit flies and weevil
European Communities	Different MRLs by the member countries for pesticides, drugs and other contaminants

Source: APEDA

fresh grapes in value terms. In terms of quantity, the highest share was accounted by guavas, mangoes and mangosteens (23.02 %) followed by fresh grapes and cashew nuts. The shares of different vegetables and fruits in the total vegetables and fruits exports from India in Triennium Ending 2010 and Triennium Ending 2016 indicate increasing diversification of India's export basket of vegetables and fruits.

Varying trend in the instability of different vegetables and fruits were identified and it was also revealed that the instability declined for majority of the commodities. There was declining trend in the commodity concentration for both vegetables and fruits indicating the diversification in the export basket of vegetables and fruits and lesser dependence on the export of few commodities and thus reducing the risk of export fluctuations. The lesser geographic concentration was identified for dried onions and shelled walnuts exports indicating their higher diversification in terms of geographical coverage and thus limiting the possibility of risk from price variability of exports.

The most stable markets for the India's export of onions and shallots, dried onions, tomatoes, potatoes, other potatoes, dried leguminous vegetables, dried lentils and garlic were identified as Nepal, Belgium, Pakistan, Mauritius, Oman, UAE, Sri Lanka and Bangladesh respectively.The most stable export markets for fruits were UAE for cashew nuts, guavas, mangoes and mangosteen and lemons and lime, Netherlands and the United Kingdom for fresh grapes and Oman, Saudi Arabia and Spain for bananas, dried grapes and shelled walnuts respectively.

The important cases of non-tariff barriers that affected Indian fruits and vegetables export were ban on the import of fresh grapes from India on the basis of report of the incidence of oriental fruit fly on grapes in Pakistan by Japan, high cost of certification for mangoes and ban on grapes for using sulphur pads by USA, ban on import of Indian mangoes and other fruits due to presence of fruit flies and weevil by Australia and New Zealand, delay in finalization of protocol on phyto sanitary measures and certification procedures in China and different MRLs by the member countries of European Communities for pesticides, drugs and other contaminants.

Given the inherent potential and rising competiveness of the India's horticultural sector, the strategies such as removal of product specific constraints, especially production of commodities of international standards, research support for improvement in the productivity and shelf life of fruits and vegetables which make their availability longer in international market, providing training and technical assistance for the producers with regard to export, improvement in the infrastructure facilities such as cold storage facilities and regulations in the non-tariff barriers could definitely help in sustaining the growth of horticultural exports.

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