Exports of vegetables from India: An economic analysis

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Abstract

The study analyses the export performance of vegetables from India in terms of instability and concentration and also the major Non-Tariff Measures (NTMs) that limit India's export prospects. The export of vegetables has grown significantly during the period from 1988 to 2016, both in quantity and value terms. Onion ranked top among all the major vegetables exported from India both in terms of quantity and value and the country accounted for 9.4 per cent share in the world export of onions. The export of the major vegetables from India also showed declining instability and increasing commodity as well as geographic diversification. The most stable markets for major vegetables exported from India were Nepal, Belgium, Pakistan, Mauritius, Oman, UAE, Sri Lanka and Bangladesh. Major NTMs include differential Maximum Residue Limits (MRLs) for pesticides, equivalence agreement on organic products, protocol on phyto-sanitary measures and organic certification mostly required by the developed countries, which are to be negotiated strategically for better export prospects and sustainability. The inherent issues on the supply side also need to be addressed for maintaining the already achieved growth in the export of vegetables.

Keywords: Growth, Instability, Non-Tariff Measures, Sanitary and Phyto-Sanitary regulations, Vegetable exports

Introduction

Horticultural crops are the key to agricultural diversification owing to their rich biodiversity, adaptability to diverse agro-climatic conditions and ability to ensure year round production and income. For making agriculture a profitable venture, Government of India identified horticulture as a means of diversification since 1980s (Sengupta and Roy, 2011). India witnessed tremendous growth in horticultural production over the last few years and during 2013-2014, the production was 283.5 million tonnes from an area of 24.2 million hectares (GOI, 2015). India, often referred as the fruit and vegetable basket of the world, ranks second in the production of fruits and vegetables. The contribution of vegetables remained highest (59 to 61 per cent) in horticultural crop production since 2013 (GOI, 2015). India is the second largest producer of potatoes, onion (dry), and tomatoes individually in the world, after China. India ranks first in the world in the production of okra (ladies' finger) accounting for about 29 per cent of the world production (TPCI, 2016). Apart from its role in nutrition and improvement of health, the production of vegetables contributes to the economy as an important source of income and employment.

Trade in fruit and vegetable products has been among the most dynamic areas of international agricultural trade, stimulated by rising incomes and growing consumer interest in product variety, freshness, convenience and year round availability (Aksoy and Beghin, 2005). Recent shifts in the

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consumption pattern towards high value food items such as fruits and vegetables and livestock products in raw and processed forms also call for greater opportunities for agribusiness and supply chains (Sidhu, 2013). India produces nearly 11 per cent of all vegetables in the world, but its share in global exports of vegetables is only 1.7 per cent (World Bank, 2007). The total export value of vegetables and vegetable products from India during 2014-2015 was estimated as 1180.8 Million USD (TPCI, 2016). Having a host of favourable factors for growing a variety of vegetables, there is a tremendous potential for India to increase its production and to create a sufficient exportable surplus.

There are various constraints in the export of horticultural products from India including the inefficient production practices and post-harvest technologies, issues related to supply chain, market access, non-tariff restrictions and governmental policies (Chandra and Kar, 2006). NTMs 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). NTMs include a diverse array of policy measures serving different purposes. TRALAC (2010) found that the exports from developing and least developed countries (LDC's) are particularly vulnerable to NTMs, and especially to the new generation of Technical Barriers to Trade (TBTs), Sanitary and Phyto Sanitary (SPS) regulations. Among the broad categories including agriculture, manufacturing and natural resources, agriculture is the most affected, with most of the world agricultural trade subject to forms of SPS and TBT (UNCTAD, 2017). India faces several constraints in the export of vegetables especially to the developed countries, in the form of NTMs, especially in quality issues in connection with SPS regulations, which have considerably increased in the post-liberalization era.

This paper analyzes the performance of major vegetable exports from India in terms of instability, dynamics and divetrsification with respect to commodities and markets and identifies the constraints related to the NTMs faced and suggests appropriate interventions to make this sector more viable and remunerative.

Materials and Methods

The study analyzed the performance of export of vegetables from India using the data on export of vegetables derived from the World Integrated Trade Solution (WITS) and Agricultural and Processed Food Products Export Development Authority (APEDA), India for the period from1988 to 2016. The percentage share of each of the major vegetable in the total export of vegetables was estimated to identify the top eight vegetables exported from the country in terms of quantity. The export performance and dynamics of the selected vegetables were analyzed based on export instability, geographic concentration and Markov chain analysis.

Export instability

Literature on the determinants of export instability is well established and includes commodity concentration, geographic concentration, the ratio of food and raw materials to total exports, per capita income of exporting country, openness of the economy and the export shares in world trade (Sarada et al., 2006). To study the instability in the export of vegetables, Coppock's instability index was used, which could 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 derived as (antilog $\sqrt{V}$ 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 in the series and

M is the arithmetic mean of the difference between the logs of X_t and Xt_{+1}. V log is logarithmic variance of the series (Altman, 1976).

Concentration in the Exports of Vegetables

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 from India.

Gini Concentration Index = $100\sqrt{\sum (X_{it}/X_t)^2}$, where X_{it} is the value of exports of individual vegetable 'i' from India in year 't' and X_t is the values of export of all vegetables from India in year t.

The lower the value of the commodity concentration index, the more evenly are the exports distributed and vice-versa. A declining trend of index indicates greater diversification of exports (Joshy, 1997). When the share of all products exported in total proceeds are the same, the lowest possible value of the coefficient will be obtained and is defined as $100/\sqrt{n}$, where, n is the number of different commodities being sold abroad (Love, 2005).

Geographic Concentration – Hirschman Index

Increased geographic concentration of exports increases the instability due to greater dependence on a few countries, thereby increasing the risks in export earnings. The Hirschman Index was used to measure the geographic concentration in the export of vegetables from India.

Hirschman Index, HI = $100\sqrt{\sum_{i=1}^{n}(X_{it}/X_t)^2}$ where X_{it} is the value of exports of the vegetable from India in year t to the i^{th} country, X_t is the total value of export of vegetable from India in year t and n is the number of countries importing the commodity from India.

The squaring of each commodity's share in total earnings prior to summation is designed to place greater weights on the more important export items. The highest value of the coefficient is 100, which occurs when a country exports only to one market. When the value of the Hirschman coefficient is lower, the greater is the number of export markets and the more even is the distribution of proceeds among these countries.

Stable Export Markets for Indian Vegetables: Markov Chain Analysis

The stable export markets for India's vegetables 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 X_t (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, 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 in total vegetable exports from India

The percentage share of individual vegetable in total vegetables exported from India is given in Table 1. Onions and shallots accounted for the highest percentage share, both in terms of value (36.56 per cent) and quantity (44.02 per cent) in TE 1990, followed by dried leguminous vegetables with 3.04 per cent of the value and one per cent of the quantity of the total vegetables exported from India. It could be further observed that onions and shallots retained the highest percentage share in quantity terms in all the trienniums among all the major vegetables exported, though there was decline in its share to 29.55 per cent in the TE 2000 and subsequent increase to 32.81 per cent in TE 2016. Dried lentils had the highest share of 22.9 per cent in value terms for the TE 2000. Onions and shallots also accounted for the highest share of 29.55 per cent in quantity terms among all the vegetables in the same triennium. Other major vegetables *viz*., dried onions, tomatoes, potatoes and other potatoes increased their percentage share both in value and quantity terms from TE 1990 to TE 2016. Dried leguminous vegetables and dried lentils accounted for the maximum share both in value (7.39 per cent and 22.90 per cent) and quantity terms (4.20 per cent and 14.14 per cent) respectively in the TE 2000. The total quantity of vegetables exported from India

*Table 1.*Dynamics in share of different vegetables in the total vegetables exports from India

Commodities		TE 1990		TE 2000		TE 2010		TE 2016	
		Actual value	Percent share	Actual value	Percent share	Actual value	Percent share	Actual value	Percent share
Onions and shallots (Fresh or chilled)	Value (1000 USD)	47624.90	36.56	48807.70	17.19	423628.80	31.94	377655.70	22.46
	Quantity (1000 Tonnes)	257.32	44.02	276.20	29.55	1533.53	39.29	1384.00	32.81
	Unit value (USD/Kg)	0.20		0.20		0.30		0.30	
Dried onions	Value (1000 USD)	556.60	0.43	8202.50	2.89	39751.10	3.00	118207.90	7.03
	Quantity (1000 Tonnes)	0.53	0.09	6.16	0.66	21.13	0.54	56.66	1.34
	Unit value (USD/Kg)	1.00		1.30		1.90		2.10	
Tomatoes (Fresh or chilled)	Value (1000 USD)	65.80	0.05	206.80	0.07	30576.50	2.31	78848.70	4.69
	Quantity (1000 Tonnes)	0.18	0.03	1.00	0.11	105.58	2.70	243.11	5.76
	Unit value (USD/Kg)	0.40		0.20		0.30		0.30	
Potatoes (Fresh or chilled)	Value (1000 USD)	497.70	0.38	2751.50	0.97	23367.30	1.76	74799.20	4.45
	Quantity (1000 Tonnes)	3.34	0.57	23.28	2.49	113.07	2.90	242.73	5.75
	Unit value (USD/Kg)	0.10		0.10		0.20		0.30	
Other potatoes (Fresh or chilled)	Value (1000 USD)	436.20	0.33	2294.50	0.81	21368.50	1.61	73969.10	4.40
	Quantity (1000 Tonnes)	2.95	0.51	19.42	2.08	107.10	2.74	241.76	5.73
	Unit value (USD/Kg)	0.10		0.10		0.20		0.30	
Dried leguminous vegetables (Shelled)	Value (1000 USD)	3960.90	3.04	20998.60	7.39	4186.60	0.32	19012.20	1.13
	Quantity (1000 Tonnes)	5.84	1.00	39.29	4.20	4.68	0.12	14.02	0.33
	Unit value (USD/Kg)	0.70		0.50		0.90		1.40	
Dried lentils (Shelled)	Value (1000 USD)	3086.70	2.37	65027.30	22.90	271.90	0.02	11292.80	0.67
	Quantity (1000 Tonnes)	3.90	0.67	132.17	14.14	0.23	0.01	10.21	0.24
	Unit value (USD/Kg)	0.80		0.50		1.20		1.10	
Garlic (Fresh or chilled)	Value (1000 USD)	1016.30	0.78	1505.00	0.53	8846.40	0.67	10413.40	0.62
	Quantity (1000 Tonnes)	3.17	0.54	5.42	0.58	9.02	0.23	15.17	0.36
	Unit value (USD/Kg)	0.30		0.30		1.00		0.70	
Other vegetables	Value (1000 USD)	24342.30	8.77	83886.60	22.75	341808.50	24.65	529146.20	30.09
	Quantity (1000 Tonnes)	46.69	3.45	150.08	14.48	466.00	11.60	611.82	13.83
Total vegetables	Value (1000 USD)	130255.30	100.00	283994.80	100.00	1326335.70	100.00	1681428.80	100.00
	Quantity (1000 Tonnes)	584.50		934.67		3903.10		4218.65	

Source: Computed using data from wits.org

Note: Per cent share denotes share in total quantity and value of vegetable exports (Column total)

Table 2. Instability in export of vegetables from India (Coppocks Instability Index)

Commodity		Instability Index (%)		
		1988-1999	2000-2016	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 www.wits.org

increased from 584.50 thousand tonnes valued at 130255.30 thousand USD in TE 1990 to 4218.65 thousand tonnes, with a total value of 1681428.80 thousand USD in TE 2016.

Export instability analysis

The instability indices for exports of vegetables from India estimated using Coppock's Instability Index (Table 2) showed that with the exception of tomatoes, potatoes and other potatoes, the instability in value, quantity and unit value of exports in all other categories of vegetables *viz.,* onions and shallots, dried onions, dried leguminous vegetables, dried lentils and garlic have increased during the period from 2000 to 2016 as compared to the period from 1988 to 1999. For tomatoes, while the instability in value of exports declined from 164.9 during 1988-1999 to 134.3 during 2000-2016, the instability indices for quantity and unit value increased from 136.7 to 187.5 and from 62.3 to 73.1 respectively for the corresponding periods. In case of potatoes and other potatoes, the instability in value, quantity and unit value of exports had increased during the period from 2000 to 2016 when compared to the period from 1988 to 1999.

Concentration of exports

Export concentration reflects the degree to which a country's exports are concentrated on a small number of products or a small number of trading partners. A country that exports one product to only one trading partner has a perfectly concentrated export portfolio. Conversely, a country whose

Table 3. Commodity Concentration of vegetable exports from India (Gini Concentration Index)

Year	Concentration Index (%)
	Vegetables
1988	62.24
1989	60.99
1990	57.18
1991	62.21
1992	51.43
1993	57.65
1994	50.27
1995	41.48
1996	45.32
1997	42.68
1998	36.41
1999	39.45
Mean (1988-1999)	50.61
2000	40.83
2001	37.54
2002	36.36
2003	40.84
2004	45.98
2005	39.14
2006	40.06
2007	44.74
2008	46.72
2009	56.17
2010	50.09
2011	42.04
2012	40.66
2013	48.31
2014	33.88
2015	39.78
2016	36.29
Mean (2000-2016)	42.32
Overall Mean (1988-2016)	45.75

Source: Computed using data from www.wits.org

exports are comprised of a larger number of products and that trades with a larger number of trading partners has a lower export concentration ratio, i.e., more diversified 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 from India estimated using Gini Concentration Index (GCI) is given in Table 3. The average value of the concentration index for vegetables was 50.61 for the period from 1988 to 1999, which declined to 42.32 during the period from 2000 to 2016. The declining commodity concentration index for vegetables implies comparatively more diversification of products in the vegetable export basket and this declining trend is shown in Figure 1.

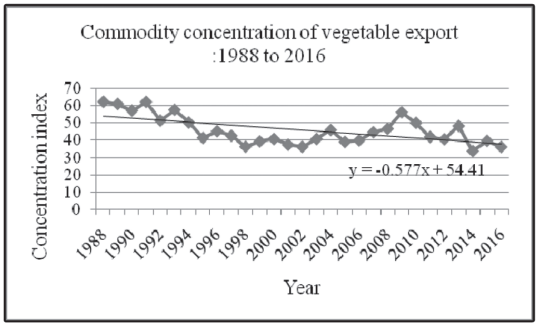

Figure1. Commodity Concentration of vegetable exports from India

Table 4. Geographic Concentration of vegetable export from India (Hirschman Concentration Index in %)

Year	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	41.89	45.39	91.34	56.34	62.36	53.55
1989	47.93	54.97	57.55	50.10	50.65	52.39
1990	42.29	40.85	65.88	67.77	73.37	49.67
1991	46.69	56.09	81.71	71.97	71.97	60.62
1992	41.63	43.84	91.21	61.94	62.49	53.69
1993	41.15	41.47	67.28	47.92	51.17	49.17
1994	45.45	43.29	54.93	47.02	41.34	47.28
1995	45.04	41.11	63.11	40.54	41.15	53.79
1996	42.55	45.02	81.64	58.36	60.35	40.94
1997	42.19	40.70	61.25	67.18	70.56	34.88
1998	39.91	45.78	79.69	69.63	69.98	36.95
1999	46.34	41.11	91.55	76.75	80.74	35.06
Mean (1988-1999)	43.59	44.97	73.93	59.63	61.35	47.33
2000	46.28	42.14	69.57	77.62	77.92	32.78
2001	45.52	37.03	80.95	54.73	50.39	32.56
2002	43.03	36.62	97.19	56.17	64.29	34.98
2003	48.39	29.93	67.22	71.82	75.53	31.48
2004	52.41	33.61	85.02	59.18	63.08	30.59
2005	49.42	28.08	76.51	54.17	56.55	27.33
2006	44.27	27.47	68.33	50.36	51.85	35.87
2007	44.71	31.61	68.22	48.44	49.48	37.57
2008	48.01	30.77	84.16	52.98	57.74	34.47
2009	51.39	29.70	79.90	49.99	52.53	39.62
2010	48.44	26.06	68.09	54.87	55.48	39.12
2011	40.01	26.45	77.29	49.54	49.69	34.32
2012	37.91	23.70	64.74	65.60	66.85	46.24
2013	38.03	25.05	72.79	50.78	51.66	52.23
2014	39.42	24.37	83.57	54.93	55.31	47.46
2015	39.22	34.03	76.28	51.33	51.95	44.16
2016	34.13	25.02	75.64	64.92	66.00	48.18
Mean (2000-16)	44.15	30.10	76.21	56.91	58.61	38.17
Overall Mean (1988-2016)	43.85	35.38	75.31	58.38	59.98	41.26

Source: Computed using data from www.wits.org

Table 5. Stable export markets for India's vegetables identified based on Markov Chain Analysis

Vegetables	Stable Markets				
Onions and shallots	Nepal	Singapore	Kuwait	Bangladesh	UAE
	(0.7898)	(0.6364)	(0.6350)	(0.6188)	(0.5611)
Dried onions	Belgium				
	(0.6037)	-	-	-	-
Tomatoes	Pakistan	Bangladesh			
	(0.8002)	(0.6302)	-	-	
Potatoes	Mauritius	Nepal	Sri Lanka	UAE	
	(0.972)	(0.9015)	(0.8460)	(0.6817)	
Other potatoes	Oman	Nepal	Sri Lanka	Hong Kong, China	UAE
	(0.9192)	(0.8193)	(0.7797)	(0.6870)	(0.681)
Dried leguminous vegetables	UAE	Sri Lanka	Nepal	US	
	(0.8109)	(0.7412)	(0.6907)	(0.6385)	-
Dried lentils	Sri Lanka	UAE	Bangladesh	Kuwait	
	(0.8104)	(0.7848)	(0.7523)	(0.5325)	-
Garlic	Bangladesh	Pakistan	Philippines	Thailand	
	(0.8556)	(0.5452)	(0.5238)	(0.5233)	-

Source: Computed using data from www.wits.org by Markov chain analysis

Note: Figures in parentheses indicate the retention probabilities of the respective countries

Geographic concentration

The geographic concentration index for the export of vegetables from India is presented in Table 4. The index value of 40 and above is considered to indicate higher degree of concentration. The overall concentration index for the export of dried onion was less than 40 (35.38), which indicates its higher diversification in terms of geographic coverage and reduction in the possibility of risk from price variability of exports. The higher value of the concentration indices for tomatoes (75.31), other potatoes (59.98), potatoes (58.38), onion and shallots (43.85) and dried leguminous vegetables (41.26) indicate greater dependence of these commodities in the economic conditions of few countries. The average value of geographic concentration index for export of vegetables during the period from 2000 to 2016 declined for all the major vegetables when compared to the corresponding figures for the period from 1988 to 1999, with the exception of onions and shallots which increased from 43.59 to 44.15 and tomatoes, from 73.93 to 76.21 during the corresponding periods. The decline in the average value of geographic concentration index except for onions and shallots and tomatoes indicated increased geographic diversification in the export of other major vegetables *viz*., dried onions, potatoes and other potatoes and dried leguminous vegetables.

Stable export markets for India's vegetables: Markov Chain Analysis

Markov Chain analysis was used to identify the major and consistent markets for vegetables exported from India and the results are presented in Table 5. The retention probability value of 0.5 and above was considered to represent the stable markets for exports, indicating the loyalty of importing country to India's exports.

The most stable markets for onion and shallots were identified as Nepal, Singapore and Kuwait with retention probability values of 0.7898, 0.6364 and 0.6350 respectively. This means that the probabilities that Nepal, Singapore and Kuwait would retain their export share of onions and shallots from India from one year to next year were 79 per cent, 64 per cent and 63 per cent respectively. In case of dried onions and tomatoes, the most stable export markets were Belgium and Pakistan which would retain their export share from one year to the next year with probabilities of 60 and 80 percent respectively. The stable markets identified for potatoes and other potatoes were Mauritius and Oman with probability values of 0.972 and 0.919 respectively. United Arab Emirates (0.8109), Sri Lanka (0.8104) and Bangladesh (0.8556) were the stable export markets identified for dried leguminous vegetables, dried lentils and garlic

respectively. The probability that the countries UAE, Sri Lanka and Bangladesh would retain their export share from one year to the next year was 81 per cent for both dried leguminous vegetables and dried lentils and 86 per cent for garlic, respectively.

Constraints and NTMs

Gupta and Garg (2012) found that one of the major challenges for India consequent to the dismantling of Quantitative Restrictions (QRs) on imports is to raise the level of productivity and quality standards to international competitive levels which in turn have variations and may lead to trade conflicts and disputes. The EXIM Bank (2013) reported that the challenges faced by the fruit and vegetable sectors were across the value chain from supply side (which includes production and post-harvest management) to demand side (which include NTMs). The present study examined the NTMs that affected the export of vegetables from India.

Non Tariff Measures

Though various multilateral rounds under the General Agreement on Tariffs and Trade (GATT) and the agreements under World Trade Organization (WTO) have contributed significantly to the reduction of tariffs among WTO members, NTMs *viz.,* TBT, SPS and other technical measures that allow countries to impose restrictions on the imports have been extensively used over the years (Ghodsi et al., 2015). The prevalence of various types of NTMs differs across economic sectors and agriculture tends to be regulated by SPS and export measures. Even though both TBT and quantity and price measures are used to regulate most economic sectors, the latter cover only much smaller percentage of trade (UNCTAD, 2017). The important NTMs, as identified by APEDA, that adversely affected the export of Indian horticultural commodities and against which the Government have initiated some pragmatic actions were examined (Table 6).

Maximum Residue Limits (MRLs) of pesticides vide European Union's (EU) Regulation in 2008 are applied to both products of animal and plant origin. But default level of the MRLs for pesticides and drugs is quite high and does not have a risk assessment based scientific justification. While the member countries like UK, Netherlands and Germany have set up MRLs for some compounds, the EU is yet to harmonize these compounds. The issue of quota for mushrooms is a long standing demand from India. Under the Agreement on Agriculture (AoA), the EU is expected to provide market access to a certain extent every year. It is observed that they have increased market access in case of preserved mushrooms, that too in the case of countries that do not have the capacity to fulfill even half of their quota. Thus, the policy followed by the EU under their mushroom quota regime is a clear example of denying market access. EU has also notified equivalence of Indian organic standards with those of the European Union and India was included in the list of third countries eligible to export organic products certified by accredited certification bodies in India. The provision that products of Indian origin only are allowed to be certified by the accredited certification bodies is trade restrictive as they are not able to expand their business outside the shores of India.

Consequent to the temporary restriction on import of rice from India in 2006, Russia also imposed

Table 6. Non Tariff Measures affecting the export of vegetables from India

Country	Non Tariff Measures
European Union	Different MRLs by the member countries for pesticides, drugs and other contaminants
	Market Access For Mushrooms
	Equivalence Agreement on organic Products
Russian Federation	Ban on Plant Products Import from India
China	Delay in finalization of protocol on Phyto Sanitary Measures and certification procedures
USA	Organic products

Source : www.apeda.gov.in

temporary restriction on import of all plant products from India and also the imports from third countries for which phyto-sanitary certificate was issued from India.

There is an inordinate delay from the part of China in the finalization of protocol on phyto-sanitary measures and certification procedures related to 17 items including fruits and vegetables for which India have submitted the formal request in accordance with International Plant Protection Convention (IPPC) on pest risk analysis to the Chinese authorities during the year 2000. After going through a rigorous process the country has succeeded in getting market access for Indian mangoes in June 2003 and for grapes and bitter gourd in April 2005.

India's certification bodies accredited under the National Programme for Organic Production (NPOP) are authorized to certify organic products as per United State's Department of Agriculture (USDA's) National Organic Programme (NOP) standards. Presently, there are 11 Indian accredited certification bodies that are authorized to certify. However, the scope of certification is limited to organic products originating from India and the USDA should extend the scope of certification for Indian accredited certification bodies to certify organic products originating in other countries.

As reported by Idris et al., (2015) consignments of fruits and vegetables accounted for 16 per cent of the total affected consignments (856) from India for which EU issued notifications during the period from 1988 to 2011. India, as a member of the WTO, raised 22 specific trade concerns (STCs) in the SPS Committee of the WTO between 2014 and 2016 of which 8 were against EU. The other 8 STCs included 4 against US and 4 against China. The STC Number 374, raised against EU for the first time in July 2014 related to the ban on mangoes and certain vegetables. It was further observed that in spite of India's persistent efforts to raise this STC six times subsequently between July 2014 and October 2016,

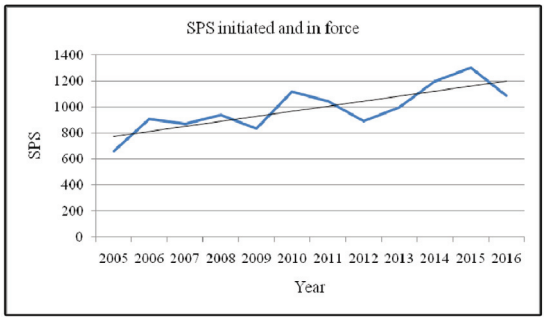

Figure 2. Sanitary and Phyto Sanitary (SPS) measures initiated and in force
Source: Computed using data from WTO

the status remain "not reported" (ICRIER, 2017). It was further observed that India had raised fewer concerns when compared to Brazil and China who had raised 31 and 33 STCs respectively during the same period.

Even though the tariffs have come down, thereby increasing the exports, the NTMs, especially quality issues in connection with SPS regulations have increased in the post- liberalization era, especially for fruits and vegetables. The figure (2) shows the increase in SPS measures that were in force and those initiated by the members of WTO from the period 2005 to 2016. It is the prevalence of NTMs (including domestic NTMs), rather than the tariffs or tariff's escalation, that limit the ability of developing countries to increase the export of processed agricultural products. As reported by FAO, phyto-sanitary controls imposed by importers are critical for developing countries exporting fresh fruits and vegetables. These controls are particularly stringent in the USA, Australia and Japan. With a high share of agriculture in Gross Domestic Product and in exports, the costs associated with complying with NTMs in agriculture have a relatively higher overall economic impact in developing countries than in high-income countries (Mohan, 2016).

It could be concluded that there should be an overall effort to streamline and improve the export supply chain of vegetables for which India has favorable factors *viz*., year round production, diversity and

technology. The post production and marketing part of the supply chain should be given more importance to make the country's products more competitive, which could help to enter new markets capable of providing more export earnings than those found stable at present. Separate strategies are to be developed to adapt to the genuine demands of the importing countries in terms of product safety and quality. There should be more vigilance and expertise for countering the challenges posed by the NTMs and to raise the relevant issues in the SPS Committee of the WTO.

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