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Performance, Competitiveness and Determinants of Tomato Export from India*

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Abstract

The performance and competitiveness of export of tomato and its products from India have been analyzed to find (i) production and export performance of tomatoes in India, (ii) impact of trade liberalization on export of tomato and its products, (iii) major destinations of Indian tomato and tomato products, and (iv) determinants of tomato export. The export performance ratio (EPR) has been estimated to examine the export competitiveness of India in tomato and tomato products. Annual compound growth rate and coefficient of variation for two periods, before (1985-1994) and after (1995-2004) the commencement of WTO have been estimated to study the impact of trade liberalization on the export performance of India in tomato and its products. Export demand function has been estimated using OLS technique and the factors affecting the export of tomato and its products from India have been identified. The study has revealed that the existence of high instability in export of tomato and its products require the attention of policymakers to retain hold on the international market.

Introduction

Tomato is one of the most important vegetable crops in India, accounting for about 8.23 per cent of the total vegetable production in the country. Tremendous progress has been made in tomato production during the past four and half decades. Tomato production has increased by almost 15-times, from a mere 0.54 Mt in 1961 to about 8.2 Mt in 2005 (FAO, 2007). At present, India is the fourth largest producer of tomato, accounting for 6.6 per cent of the world production and the second largest in terms of acreage,

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accounting for 11.8 per cent of area under tomato in the world. Sometimes, the surplus production of tomato causes glut in the market, causing distress sale and low profit to the growers. One of the probable solutions to the problem of this glut is to export the surplus tomato production in fresh or processed form.

Although, India started the export of tomatoes during the 1970s, the export has been only about 0.1 per cent of the total production compared to its export of about 3.9 per cent of total production in the world market. Keeping in view these facts, it is important to analyse its performance and identify the factors affecting it, particularly under the present regime of WTO and trade liberalization. This paper has discussed some of these issues with the following specific objectives: (i) to study the performance and competitiveness of tomato export from India, (ii) to find impact of WTO and trade liberalization on the export of tomato and its products, (iii) to enlist the major destinations of Indian tomato and tomato products, and (iv) to identify the determinants of tomato export from India

Methodology

The present study is based on secondary data. The time-series data on production and trade of tomato and tomato products for India vis-à-vis world were obtained from FAO production yearbook and trade yearbook, respectively. The values of export and imports have been referred in US dollars to net out the effect of changes in the exchange rate. To study the performance and composition of exports of different tomato products, per cent shares were worked out on a decade basis to take into account the problems of wide fluctuations in the value of export and imports. The Export Performance Ratio (EPR) was estimated to examine the comparative advantage of India in tomato export, using the method suggested by Balassa (1965). Accordingly, the EPR of India in tomato and tomato products was estimated by equation (1):

$$EPR = S_{it} / S_{wt} \quad \dots(1)$$

where,

S_{it} = Share of tomato in India's total export, and

S_{wt} = Share of tomato in the total world export.

Since EPR is based on observed pattern of trade flows, it is also called Revealed Comparative Advantage (RCA). If EPR/RCA is greater than unity, the country has the comparative advantage in export of the concerned commodity and vice versa. As suggested by Laursen (1998), RCA was made symmetric by obtaining the index as $(RCA-1/RCA+1)$. This index is

known as Revealed Symmetric Comparative Advantage (RSCA) and varies from -1 to +1. The data from the trade yearbook of FAO were used for the analysis. Annual compound growth rate (ACGR) and coefficient of variation were computed to examine the trends in tomato trade and instability in export of tomato and tomato products. The growth rates and coefficient of variation were calculated for the two periods, viz. before the commencement of WTO (1985 to 1994) and after WTO (1995 to 2004) for a better understanding of trade performance of India vis-à-vis world.

The factors influencing the export of tomatoes were identified using Cobb-Douglas type of demand function, as used by Shende and Bhole (1999):

$$Y = a Q^{b_1} T^{b_2} (PR)^{b_3} (ER)^{b_4} U \quad \dots(2)$$

where,

Y = India's export of tomato (Mt)

Q = Tomato production in India (Mt)

T = Volume of international trade in tomato (Mt)

PR = Ratio of Indian export price and non-Indian international prices of tomato

ER = Exchange rate (Rs/US\$)

a = Intercept

$b_{i,s}$ = Elasticity of respective variables, and

U_i = Random-error terms, $u_i \sim N(0, \sigma^2_{ui})$.

The Indian export and international prices of tomato and its products have been represented by their respective unit values. The unit value of Indian export was derived from the data on quantity and value of tomatoes export available in the FAO trade yearbook. Similarly, the world prices (non-Indian) were estimated from the data available in the FAO trade yearbook. The total world trade in tomatoes, also available from the FAO trade yearbook, were taken for the analysis. The historical exchange rate data was obtained from the web site of RBI, Govt. of India. The regression analysis was carried out for a time span of 20 years (1985-2004), using the ordinary least squares (OLS) method.

Results and Discussion

Production and Trade Performance

Production, export and import of tomato and its products from India during different decades since 1960s have been presented in Table 1. During 1960s, the production of tomatoes in India was about 0.5 Mt per annum

Table 1. Area, production and trade in tomato in India (1960s-early2000s)

Period	Area '000 ha	Production Mt	Yield t/ha	Total value of trade		
				Export (^{'000} US\$)	Import (^{'000} US\$)	Net export (^{'000} US\$)
1960s	57.5 (3.28)	0.54 (1.70)	9.35 (51.79)	0.0 (0.00)	0.00	0.00
1970s	104.1 (4.67)	0.94 (2.03)	8.98 (43.19)	0.9 (0.0001)	0.00	0.09
1980s	247.4 (9.05)	2.69 (4.14)	10.88 (44.64)	52.0 (0.002)	15 (0.001)	37.0
1990s	369.8 (10.92)	5.92 (6.60)	16.00 (59.89)	319.8 (0.007)	252.00 (0.006)	67.8
2000-04	497.8 (11.84)	7.62 (6.59)	15.31 (56.06)	1609.5 (0.027)	1202.00 (0.021)	407.5

Note: Figures within the parentheses indicate their percentages to world values.

Source: Based on FAO, 2007 @faostat.fao.org

from an area of 57.5 thousand hectares with an average productivity of 9.35 t/ha. The production of tomato increased throughout the study period and reached 7.6 Mt per annum during the early 2000s. The contribution of India in world tomato production has increased from 1.7 per cent during 1960s to 6.6 per cent during early 2000s. The share in world area under tomato has increased from 3.28 per cent during 1960s to 11.84 per cent during early 2000s and yield has increased from 9.35 t/ha to about 15.5 t/ha during this period.

Export in tomato from India started in 1978 and in tomato products during 1980s. The total value of export in tomato and tomato products which was only US \$ 52 thousand per annum during 1980s increased to US \$1.6 million per annum during the early 2000s. Although India contributes about 6.6 per cent to the world tomato production, its contribution in total value of export in tomato and tomato products is only 0.03 per cent. This shows the existence of ample scope for increasing the export of tomato and tomato products from India.

Although, India started import of tomato and tomato products during late-1980s, with a total value of US \$15000 per annum, it remained highly erratic. The value of import has increased to US \$ 1.2 million during the early 2000s, after removal of quantitative restriction in vegetable import in September, 1998. Despite surging imports, the net export from India in tomato and tomato products has maintained an increasing trend, as is evident from Table 1.

Composition of Tomato Trade

The export and import of major tomato products in terms of their quantity and value in different decade since 1960s have been presented in Table 2. India trades mainly in tomato, peeled tomato, tomato paste and juice of tomato. The Indian export in tomato and its products during 1970s was of the value US \$ 900 per annum, which was of fresh tomatoes only. During 1980s the export basket of tomato products expanded and the share of tomatoes in their total export value became 42.7 per cent, followed by tomato juice (39.8%), tomato paste (14.62%) and peeled tomato (2.89%). During the early 2000s, India has exported tomato and tomato products worth US\$1.6 million per annum, in which tomato constituted about 85.6 per cent, followed by tomato paste (5.9%), peeled tomato (5.6%) and tomato juice (2.9%). Thus, tomato has been the major contributor in the export basket of tomato and its products and the shares of tomato products like peeled tomato, tomato paste and juice of tomato have remained very small, which needs to be increased to reap the benefit of value-addition in the country. The value-addition at the production cites will increase income and employment

Table 2. Trade performance of tomato in India during different decades: 1970s-2000s

(Qty in tonnes per annum and value in 1000 US \$ per annum)

Period	Peeled tomatoes		Tomato paste		Tomatoes		Tomato juice		Total value
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	
Export									
1970s	0.0	0.0	0.0	0.0	3.1	0.9 (100.0)	0.0	0.0	0.9
1980s	3.7	1.5 (2.89)	15.9	7.6 (14.62)	71.6	22.2 (42.69)	23.2	20.7 (39.8)	52.0
1990s	35.7	27.1 (8.47)	16.0	26.7 (8.35)	688.7	131.6 (41.15)	145.9	134.3 (42.0)	319.8
2000-04	149.7	90.5 (5.62)	90.7	95.0 (5.90)	8263.5	1378.0 (85.62)	58.0	46.0 (2.86)	1609.5
Import									
1980s	0.00	0.00	0.00	0.00	0.00	0.00	14.00	15.0 (100.0)	15.00
1990s	22.00	33.00 (13.23)	189.0	168 (66.54)	0.00	0 (0.00)	67.00	51.00 (20.13)	252.00
2000-04	128.0	73.00 (6.05)	1565.0	961 (79.91)	9.00	7.00 (0.56)	117.0	162.00 (13.48)	1202.0

Note: Figures within the parentheses indicate their percentages to total value of export in tomato products.

Source: Based on FAO, 2007 @faostat.fao.org

opportunity for rural youth in the country. The new food processing policy of Govt. of India is expected to give a boost to the tomato processing industry, which in turn is likely to increase the export of processed tomato products from the country.

Import in tomato and tomato products started during 1980s with mere 14 tonnes of tomato juice per annum; it diversified to peeled tomatoes, tomato paste and juice of tomato during 1990s. During early 2000s, tomatoes have been added to this list and the total value of import has been about US \$1.2 million per annum. Tomato paste constituted about 80 per cent of the total import value of tomato and its products, followed by tomato juice (13.5%), peeled tomatoes (6%) and tomatoes (0.6%). It was also observed that India has turned into a net importer of tomato paste and tomato juice and is on the verge of being net importer of peeled tomatoes from being net exporter of all these commodities till 1990s. This indicates that consumption/demand of processed tomato products in India is increasing at a fast rate which the domestic industries are not able to meet. The spurt in demand of tomato products may be due to the opening of a large number fast food centres like Mc Donald, Pizza huts, etc. throughout the country and also due to changes in life-style and food habits of the growing population.

Export Competitiveness

The Export Performance Ratio/Revealed Comparative Advantage (RCA) and Revealed Symmetric Comparative Advantage (RSCA) for export in tomato and tomato products were estimated to compare the export competitiveness of India and have been presented in Table 3.

It can be viewed from Table 3 that RCAs in both tomatoes and tomato products were far less than unity and the RSCAs were negative, almost -1.

Table 3. RCA and RSCA of India in tomato and its products: TE1985 to TE2003

Period	RCA			RSCA		
	Tomatoes	Processed tomatoes	Total	Tomatoes	Processed tomatoes	Total
TE 1985	0.0007	0.0017	0.0011	-0.9987	-0.9966	-0.9977
TE 1988	0.0067	0.0164	0.0107	-0.9867	-0.9677	-0.9789
TE 1991	0.0043	0.0020	0.0032	-0.9915	-0.9961	-0.9935
TE 1994	0.0073	0.0066	0.0070	-0.9855	-0.9869	-0.9861
TE 1997	0.0062	0.0404	0.0194	-0.9876	-0.9223	-0.9620
TE 2000	0.0108	0.0090	0.0101	-0.9787	-0.9822	-0.9800
TE 2003	0.0517	0.0148	0.0388	-0.9017	-0.9707	-0.9253

Note: Data are for triennium ending (TE) average

Source: Based on FAO, 2007 @faostat.fao.org

This indicates that India was not competitive in tomato export throughout the study period; however, an increasing trend in RCAs and RSCA was observed during recent years with a reversal in some years. The RCAs declined during 1994-1997, but the trend reversed afterwards in the case of tomato, but a mixed trend was observed in processed tomatoes. A similar declining trend in RCA and hence the export competitiveness of horticultural products including tomato during post-WTO era (1994-1997) has been observed by Jha (2000). An increasing trend in RCAs in recent years indicates improvement in the export competitiveness of India in tomato and its products with the passage of time. Therefore, it is required to give a support to improve India's competitiveness by adopting some appropriate measures like improvement in infrastructural facilities like cold chain, faster transportation at cheaper rates, better port facilities and socialization of improved and efficient technology in production and processing of tomato with quality improvement as per demand in the international market (Hirashima, 2002).

Impact of World Trade Organisation (WTO) Regime

Growth Rate in Trade

The annual compound growth rates (ACGR) for India vis-à-vis world in export and import of tomato and its products before (1985-1994) and after (1995-2004) the commencement of WTO regime were estimated to assess the impact of WTO on the trade performance of India in tomato and its products and have been presented in Table 4.

The growth rates for the export of tomato and its products were found significant for all the four product groups, except tomato juice in the case of world, while for India, growth rates were significant for only tomato during both the periods, for tomato paste during the post-WTO period and for peeled tomato and juice of tomato during the overall period (1985-2004). Export of tomato and its products from India has registered a very high growth during both the pre- and post-WTO periods than the world. Among the tomato and its products, peeled tomato has registered the highest growth rate of 146 per cent, followed by tomatoes (96.86%), tomato paste (89.27%) and tomato juice (54.69%). A comparison of growth rates during both the periods indicated that growth in the export of tomato and its products was lower during the post-WTO period than that in pre-WTO period, but the growth rate in all the tomato and tomato products, except tomato juice, remained very high (more than 27%) during the post-WTO period which indicates the existence of favourable environment for the export of tomato and its products from India.

Table 4. Annual compound growth rate of trade in tomato and its products from India

Commodity	Quantity of export		Quantity of import	
	World	India	World	India
Pre- WTO period (1985-1994)				
Tomatoes	3.12*	347.48*	3.34*	NIL
Peeled Tomatoes	2.80 *	40.69	5.55*	NIL
Tomato Paste	4.83*	108.97	5.38*	NIL
Tomato juice	-1.79	118.59	4.41*	NIL
Post- WTO period (1995-2004)				
Tomatoes	3.89*	41.57*	3.77*	208.93*
Peeled Tomatoes	2.16*	210.9	1.79*	401.29*
Tomato Paste	6.53*	27.06*	6.54*	481.44*
Tomato juice	-9.25*	1.51	4.21*	197.77
Overall period (1985-2004)				
Tomatoes	4.41*	96.86*	4.05*	46.07
Peeled Tomatoes	2.80*	146.0*	3.25*	175.27*
Tomato Paste	5.42*	89.27*	4.99*	228.90*
Tomato juice	0.74	54.69*	3.93*	128.01*

Note: * indicates significance at 10% level of significance.

Source: Based on FAO, 2007 @ faostat.fao.org

Import of tomato and its products which was almost nil during the pre-WTO period, had a very high growth rate during the post-WTO period. It could be due to their increased demand in the domestic market and increased export competitiveness of developed countries after WTO. Developed countries have either maintained or increased the high level of their subsidies to agriculture after WTO also by manipulating the provisions of different boxes of subsidies in Agreement on Agriculture under WTO. This has increased the export competitiveness of their agri-products (Chand, 2002a; Sharma, 2003). Higher growth rate (ACGR) in import than export in all the tomato and tomato products indicates that if corrective measures were not taken, India will turn out to be a net importer of all the tomato products in the near future, which will harm the interest of Indian vegetable growers, particularly the poor tomato growers. Tariff escalations prevailing in many developed countries, particularly the OECD countries have prevented the imports of processed food from developing countries, while imports have been increasing in developing countries, which has resulted in marginalization of small producers and adding to unemployment and poverty in these countries (Naik and Chaturvedi, 2002; Sharma, 2006).

Table 5. Coefficient of variation in production and export of tomatoes from India

Commodity	Quantity of export		Value of export	
	World	India	World	India
Pre- WTO period (1985-1994)				
Tomatoes	12.54	134.07	26.46	114.82
Peeled tomatoes	12.15	225.97	18.48	263.96
Tomato paste	15.08	221.15	26.35	161.27
Tomato juice	16.54	174.55	18.03	187.47
Post- WTO period (1995-2004)				
Tomatoes	12.12	126.24	19.09	124.52
Peeled tomatoes	7.37	101.85	16.55	99.20
Tomato paste	19.24	88.82	15.45	84.18
Tomato juice	31.89	260.70	39.45	262.76
Overall period (1985-2004)				
Tomatoes	26.22	187.41	36.69	180.39
Peeled tomatoes	17.11	151.56	23.82	147.60
Tomato paste	32.13	130.12	28.27	127.08
Tomato juice	31.70	316.81	39.60	317.67

Source: Based on FAO, 2007 @faostat.fao.org

Instability in Tomato Export from India

To examine instability in tomato export from India, the coefficients of variation (CV) in export of tomato and tomato products were estimated and are presented in Table 5. The values of CV in export of all tomato and its products, except tomato juice, have come down during the post-WTO than pre-WTO period, which indicate that export of tomato and tomato products (except tomato juice) from India has become more stable during post- than pre-WTO period. However, stability of export from India in comparison to that of the world has been highly dwindling during both the periods. This high instability may be due to involvement of mainly small private traders having short-term interest in the business to earn profit during the period of high international prices. To deal with such a scenario it has been suggested by Chand (2002 b) to encourage the establishment of big export houses having long-term interest in tomato trade.

Destinations for Export of Tomato and Tomato Products

Destinations for exports depend on several factors like geographical and political proximities, differences in comparative advantage and degree of trade barriers. The shares of different countries in export of tomato and tomato products during TE 2005 were estimated and are presented in Table

6. Bangladesh, Pakistan, Nepal, USA, UAE and Maldives have been the major importers of tomato and tomato products from India and their share was about 93 per cent in total export of tomato and its products from India in value terms in TE2005. Bangladesh was the largest importer (45.2%) in terms of total value of export of tomato and its products from India, followed by Pakistan (26.7%), Nepal (10.7%), USA (5.6%), UAE (3.1%) and Maldives (1.8%). Individual products-wise also, Bangladesh topped the list of importers of 'tomato' from India (52.5%), followed by Pakistan (21.5%), Nepal (18.9%), UAE (3.6%), Maldives (1.8%) and USA (0.7%). USA was the largest importer of all the tomato products. A perusal of Table 6 revealed that 'tomato' is being exported mainly to the neighbouring countries like Bangladesh, Pakistan, Nepal and Sri Lanka, while 'tomato products' are being exported to distant markets like, USA, France, UK, Israel, and New Zealand. It is due to the perishable nature of tomato. The export of processed products to the European countries and the US indicates that SPS and HACCAP standards and other quality requirements were being met by the Indian products and these were not the bottleneck in the export of these products.

Table 6. Export destinations of tomatoes and tomato products from India during TE 2005

(percentage of total)					
Country	Quantity	Value	Country	Quantity	Value
Tomatoes			Tomato juice		
Bangladesh	52.48	51.78	USA	44.86	50.24
Pakistan	21.45	30.09	Estonia	18.11	7.25
Nepal	18.87	10.61	Pakistan	12.35	13.04
UAE	3.61	2.68	New Zealand	9.05	7.25
Maldives	1.82	2.05	Nepal	8.23	9.18
Others	1.75	2.78	Others	7.40	13.04
Total (Qty in tonnes and value in 1000 US\$)	10158.67	1743.67		81.00	69.00
Peeled tomato			Tomato paste		
USA	73.23	63.54	USA	14.07	12.23
Nepal	9.45	11.60	Nepal	12.23	12.77
Israel	7.09	8.29	UAE	11.01	11.41
Kenya	2.76	4.42	France	10.70	10.05
UAE	2.76	2.76	Sri Lanka	8.26	5.16
UK	1.97	2.21	Australia	7.34	8.42
Others	2.75	7.17	Others	36.40	39.94
Total (Qty in tonnes and value in 1000 US\$)	84.67	60.33		109.00	122.67

Source: Based on FAO, 2007 @faostat.fao.org

Table 7. Estimates of export demand model for Indian tomato

Items	Coefficients	Standard error
Constant	-118.948**	33.410
Volume of international trade in tomato (Mt)	10.880***	2.227
Domestic production of tomato (Mt)	-2.600*	1.480
Ratio of Indian and non-Indian international export prices	1.019***	0.848
Exchange rate (Rs/US\$)	-0.116 ns	1.449

Note: *, ** and *** indicate level of significance at 10 per cent, 5 per cent and 1 per cent levels, respectively.

Source: Based on FAO, 2007 @faostat.fao.org

Determinants of Tomato Export

To identify the factors affecting demand for export of tomato, regressing analysis was carried out using time series data for the period 1985-2004 and the results have been presented in Table 7. Four factors, viz. volume of international trade in tomato, domestic production of tomato, ratio of Indian and non-Indian international export price and exchange rate could explain about 98 per cent of the total variations in the export of tomato from India. The coefficients for all the variables, except exchange rate, were statistically significant. Demand for tomato from India was found to increase with increase in the international trade in tomatoes; with one per cent increase in the world tomato trade, demand for Indian tomato would increase by about 108 per cent. The ratio of Indian and non-Indian international export prices was positive and highly significant. This indicates that price realization for exports from India in relation to world export price also increased with rise in tomato export from India. Domestic production had a negative impact on tomato export from the country. This may be due to the fact that increase in domestic production had coincided with the increased international production, causing depressed international prices and hence lower exports from India. The exchange rate did not have theoretically a correct sign; however, it was not significant. Therefore, it could be concluded that exchange rate does not play any significant role in the export of tomato from India.

Conclusions

The production and export performance in tomato have revealed that India has ample scope to increase export of tomato and its products. The export of tomato and its products has registered an impressive growth during the recent years, after the liberalization of trade. However, during the same period, import of tomato and tomato products has also got momentum and the net export in some of processed tomato products has turned out to be

negative within a very short period, after the removal of quantitative restrictions (QRs) in vegetables imports. This trend in import needs to be checked by improving the competitiveness of Indian tomato and tomato products, otherwise increase in tomato import will jeopardize the economic and food security of a large number of poor farmers involved in tomato cultivation in the country. Export competitiveness of Indian tomato and its products can be improved through socialization of improved techniques of production and processing and also by providing adequate government support for making production and marketing of these products more economical. Establishment of infrastructure for various sanitary and phytosanitary measures may also help in improving Indian competitiveness in the international market.

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