

# Export of Fruits from India: Growth, Pattern and SPS Issues

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Paper No. 232

Received: 18 January 2015

Accepted: 25 May 2015

## ABSTRACT

The total export of agricultural products from India has touched \$45 billion during 2013-14 from about \$18 billion during 2009-10. In present context non tariff barriers are playing greater role as compared to tariff in the international trade. This study was conducted to analyze the growth of major fruit (Mango, Grapes, Banana) export, changes in the direction of export and various SPS issues related to export of fruits. Mangoes export has showed significant growth rate of 6.5 per cent per annum in terms of quantity. Export value showed significant growth rate of 8.75 per cent per annum while export price showed significant growth rate of 2.25 per cent per annum. Bananas export has also shown significant positive growth rate of 21.91 per cent per annum. At the same time export value and export price showed significant growth of 25.8 per cent per annum and 3.89 per cent per annum respectively. Growth rate in export quantity, value and price of Grapes was found 12.7, 16.77 and 4.08 per cent respectively during 1990-91 to 2011-12. UAE was found more stable market in case of Grapes and in case of mangoes; Saudi Arabia and Bangladesh were more stable market. Bahrain, Iran and UAE were stable market for banana, therefore it was suggested that the attention should be focused on the market requirement and specifications of those stable markets.

**Keywords:** Export destination, competitiveness, sanitary and phyto sanitary (SPS)

India's merchandise exports reached US\$ 304.6 billion during 2011-12, a growth of 21.3 percent as compared to 40.5 percent during the previous year. India is one of the fastest growing economy among G 20 (Singh 2013). The total export of agricultural products from India has touched \$45 billion during 2013-14 from about \$18 billion during 2009-10. In spite of the recent slowdown faced by India's export, the Compound Annual Growth Rate (CAGR) of 20.3 percent recorded for merchandise exports during 2004-05 to 2011-12. India is among the 15 leading exporters of agricultural products in the world. Agricultural exports increased from ₹ 39863.31 crore in 2004-05 to ₹ 118255 crore in financial year 2012-13. The contribution of fresh fruits and vegetables in total export is about 5 percent only. India is the second largest producer of fruits in the world having a share of 12.5 per cent of total world fruit production; it is the largest producer of fruits like mango, banana, papaya, sapota, pomegranate and aonla. During the

year 2012-13 the area under fruits was 6982 thousand hectare with a production of 81285 thousand MT.

The increased globalization and liberalization of international markets, facilitated by both bilateral trade agreements and the WTO, are opening new export markets for Indian agricultural products, both fresh and processed. Despite being one of the major horticultural producers in the world, India is the small player in the global horticultural export trade. As Indian agricultural exports have shifted in destination to high income countries and in composition to non-traditional exports like fruits and vegetables and marine products, a major challenge is now meeting sanitary and phytosanitary (SPS) standards. Strengthening SPS management capacity in India can contribute to growth and poverty reduction by increasing the competitiveness of Indian exports, improving domestic food safety and promoting adoption of safer and more sustainable

agricultural practices.

Keeping in view the above facts this study was conducted to analyse the growth of fruit export, changes in the direction of export and various SPS issues related to export of fruits.

### Data Base and Methodology

India is the second largest producer of fruits. During the year 2012-13 the area under fruits was 6982 thousand hectare with a production of 81285 thousand MT. On the basis of contribution in export, three fruit crops viz. Grapes, Mangoes and Banana fruit crops were selected for the study. The study was based on secondary data for a period of 22 years from 1990-91 to 2011-12. Compound growth rate of major fruits was worked out to examine the tendency of variable to increase, decrease or stagnant over a period of time. The linear, log-linear, exponential and power functions are some of the important functional forms employed to study the growth rates. Different functional forms were tried in the past for working out of growth rates. Some of the important forms tried were the linear growth model ( $Y = a + bt$ ), exponential function ( $Y = ab^t$ ) and quadratic function ( $Y = a + bt + ct^2$ ). However, it was found that the exponential form of the function  $Y_t = ab^t$  is the better and most frequently used one. In the present study, compound growth rates of exports of major fruits and vegetables from the country were estimated by using the exponential growth function of the form:

$$Y_t = a b^t U_t \dots\dots\dots (1)$$

Where,

$Y_t$  = Dependent variable for which growth rate was estimated (quantity, value and unit value of spices exported in year 't').

$a$  = Intercept

$b$  = Regression coefficient

$t$  = Year which takes values 1, 2... n.

$U_t$  = Disturbance term in year 't'.

The equation (1) will be transformed into log-linear and written as

$$\log Y_t = \log a + t \log b + \log U_t \dots\dots\dots (2)$$

Equation (2) will be estimated by using Ordinary

Least Square (OLS) technique.

The compound growth rate ( $g$ ) will be then estimated by the identity given in equation (3)

$$g = (b-1) \times 100 \dots\dots\dots (3)$$

Where,

$g$  = Estimated compound growth rate per annum in percentage.

$b$  = Antilog of  $\log b$

In order to examine the pattern of export destination of selected fruits Markov chain analysis was done. Annual export data for the period 2006-07 to 2011-12 were used to analyze the direction of trade and changing pattern of exports of selected fruits.

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

Where,

$E_{jt}$  = Exports from India to  $j$ th country during the year  $t$ .

$E_{it-1}$  = Exports to  $i$ th country during the period  $t-1$ .

$P_{ij}$  = Probability that the exports will shift from  $i$ th country to  $j$ th country.

$e_{jt}$  = The error term which is statistically independent of  $E_{it-1}$ .

$t$  = Number of years considered for the analysis

$r$  = Number of importing countries

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

$$0 \leq P_{ij} \leq 1$$

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.

### Results and Discussion

It is evident from table 1 that in terms of volume of grapes trade has shown significant growth rate of 12.7 per cent per annum while value of export has

**Table 1: Growth rate in the export of grapes, mangoes and bananas**

Items	Particulars	Grapes	Mangoes	Bananas
Export quantity	f- value	82.07	86.61	100.15
	R <sup>2</sup>	0.812	0.8201	0.8405
	Growth rate	12.7	6.5	21.91
Export value	f- value	299.19	299.71	82.81
	R <sup>2</sup>	0.9403	0.9404	0.8134
	Growth rate	16.77	8.75	25.8
Export price	f- value	42.86	21.39	9.51
	R <sup>2</sup>	0.6928	0.5295	0.3337
	Growth rate	4.08	2.25	3.89

showed a significant growth rate of 16.77 per cent per annum. Similar results were reported by Smita and Patil (2007). In terms of price it showed a significant growth rate of 4.08 per cent per annum. Fresh grapes are being exported from India to about 30 countries including U.K., Netherlands, U.A.E., Bangladesh, Germany, Belgium, Saudi Arabia, Oman, Kuwait, Sri Lanka, and Bahrain. The requirements of EU countries have been compiled by India which has resulted enhanced export.

Mangoes export has showed significant growth rate of 6.5 per cent per annum in terms of quantity. Export value showed significant growth rate of 8.75 per cent per annum while export price showed significant growth rate of 2.25 per cent per annum as showed in table 1. Vaishali (2010) and Nagaraja (1997) observed similar result for mango exported from India.

The growth in bananas export was also found significant at the rate of 21.91 per cent per annum. At the same time export value and export price showed significant growth of 25.8 per cent per annum and 3.89 per cent per annum respectively. Although banana is the main fruit in international trade and the most popular one, ranking second after citrus in terms of value, main banana producing countries, such as India or Brazil, are hardly involved in it. India exports bananas mainly to Middle East countries viz. U.A.E., Saudi Arabia, Oman, Bahrain, Qatar.

Transitional probability matrix using the Markov chain framework was used to examine the direction

of trade of major spices to different importing countries for the period 2006-07 to 2011-12. The diagonal elements in a transitional probability matrix provide the information on the probability of retention of the trade and probability that export share of a country will be retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country's export. The row elements indicate the probability of loss in trade on account of competing countries and the column elements indicate the probability of gain in trade from other competing countries. In the context of the current application, structural changes were treated as a random process with selected importing countries.

It is evident from table 2 that UAE was one of the most stable markets among the major importers of grapes from India as reflected by high probability of retention of 0.4252 which means that that UAE have retained the major share of 42.52 per cent. It gained considerable amount from Saudi Arabia (34.39%) and other countries (21.43 %). Saudi Arabia, UK, Netherland, Bangladesh and other countries retained 21.66 per cent, 18.19 per cent, 17.16 per cent, 14.52 per cent and 25.00 per cent of the original export share respectively. UAE lost its 52.76 per cent share to Bangladesh, 2.36 per cent to Saudi Arabia and 2.36 per cent to other countries. Saudi Arabia lost its share of 42.68 per cent to Bangladesh, 34.39 per cent to UAE and 1.27 per cent to other countries and it gained a share of 19.08 per cent from Bangladesh and 2.36 per cent share of UAE. UK lost its share to Netherland (31.17%), Bangladesh (15.58%), UAE (6.49%) and other countries (28.57%) and gained share from Netherland (33.58%), Bangladesh (33.20%) and other countries (10.71%). Netherland lost its share of 33.58 per cent to UK, 8.21 per cent to Bangladesh, 6.72 per cent to UAE and 34.33 per cent to other countries and gained a share of 31.17 per cent from UK, 23.24 per cent from Bangladesh and 42.86 per cent from other countries. Bangladesh lost a share of 33.20 per cent to UK, 23.24 per cent to Netherland, 19.08 per cent to Saudi Arabia and a share of 9.96 per cent to other countries while it gained a share of 52.76 per cent from UAE, 42.68 per cent from Saudi Arabia, 15.58 per cent from UK and a share of 8.21 per cent from Netherland.

It may be concluded that UAE is more stable market

**Table 2: Transitional probability matrix of grapes export, 2006-07 to 2011-12**

Country	Bangladesh	Netherland	others	Saudi Arabia	UAE	UK
Bangladesh	0.1452	0.2324	0.0996	0.1908	0	0.332
Netherland	0.0821	0.1716	0.3433	0	0.0672	0.3358
others	0	0.4286	0.25	0	0.2143	0.1071
Saudi Arabia	0.4268	0	0.0127	0.2166	0.3439	0
UAE	0.5276	0	0.0236	0.0236	0.4252	0
UK	0.1558	0.3117	0.2857	0	0.0649	0.1819

in case of Grapes; therefore the attention should be focused on the market requirement and specifications of UAE.

It is revealed from table 3 that Saudi Arabia and Bangladesh were the stable markets among the major importers of mangoes from India as reflected by high probability of retention of 0.3439 and 0.3319 respectively i.e., the probability that Saudi Arabia and Bangladesh retains its shares over the study period were 34.39 per cent and 33.19 per cent respectively. UK and other countries retain a share of 15.59 per cent and 25.00 per cent respectively. Saudi Arabia lost its share of 42.68 per cent to UK, 21.66 per cent to Kuwait and 1.27 per cent to other countries while it gained a share of 42.52 per cent from UAE, 6.72 per cent from Kuwait, 6.49 per cent from UK and 21.43 per cent from other countries. Bangladesh lost its share to UAE (23.24%), Kuwait (19.09%), UK (14.52%) and other countries (9.96%) and gained from Kuwait (33.58%), UK (18.18%) and other countries (10.71%). UK lost its share of 31.17 per cent to UAE, 18.18 per cent to Bangladesh, 6.49 per cent to Saudi Arabia and a share of 28.57 per cent to other countries and gained its share from UAE (52.76%), Saudi Arabia (42.68), Bangladesh (14.52%) and Kuwait (8.21%). UAE lost its share completely to UK (52.76%), Saudi Arabia (42.52%), Kuwait (2.36%) and other countries (2.36%) while gained share from

UK (31.17%), Bangladesh (23.24%), Kuwait (17.16%) and other countries (42.86%).

Kuwait lost its share of 33.58 per cent to Bangladesh, 17.16 per cent to UAE, 8.21 per cent to UK, 6.72 per cent to Saudi Arabia and 34.33 per cent to other countries while it gained from Saudi Arabia (21.66%), Bangladesh (19.09%) and UAE (2.36%).

It may be concluded that Saudi Arabia and Bangladesh are more stable market in case of mangoes. Keeping in view the pattern and recent ban imposed by EU on Indian Alphonso, the attention should be focused on the market requirement and specifications of Saudi Arabia and Bangladesh.

It is evident from table 4 that Bahrain, Iran and UAE retained a share of 3.59 per cent, 0.26 per cent and 2.59 per cent respectively. Bahrain lost its share of 32.33 per cent to UAE and Iran each, 4.79 per cent to Kuwait and 26.95 per cent to other countries and gained share of 95.95 per cent from Iran and 4.82 per cent from other countries. UAE lost its share to Saudi Arabia (50.48%) and Kuwait (46.93%) while it gained a share of 32.34 per cent from Bahrain, 12.21 per cent from Saudi Arabia and 1.19 per cent from Iran. Iran lost its share to Bahrain, Kuwait, UAE and other countries and gained share from Bahrain and Kuwait. Saudi Arabia lost its share completely to Kuwait, UAE and other countries and gained

**Table 3: Transitional probability matrix of mango export, 2006-07 to 2011-12**

Major country	Bangladesh	Others	UAE	UK	Saudi Arab	Kuwait
Bangladesh	0.3319	0.0996	0.2324	0.1452	0	0.1909
others	0.1071	0.25	0.4286	0	0.2143	0
UAE	0	0.0236	0	0.5276	0.4252	0.0236
UK	0.1818	0.2857	0.3117	0.1559	0.0649	0
Saudi Arabia	0	0.0127	0	0.4268	0.3439	0.2166
Kuwait	0.3358	0.3433	0.1716	0.0821	0.0672	0



from UAE and other countries. Kuwait also lost its complete share to Iran and other countries while gained from Saudi Arabia, UAE, Bahrain, Iran and other countries.

It may be concluded that Bahrain, Iran and UAE are more stable market in case of Grapes; therefore the attention should be focused on the market requirement and specifications of Bahrain, Iran and UAE.

In present context non tariff barriers are playing greater role as compared to tariff in the international trade. The recent ban imposed by EU on the import of Indian Alphonso shows growing concern on food safety issues which has resulted into increased rate of notifications of SPS measures to WTO. Import detentions by EU and Us are mainly represented by microbiological contamination and pesticide residues (Jairath and Purohit, 2013). Maximum Residue Limit (MRL) of different pesticide adopted by different countries were reviewed which are presented in Appendix 01. It is revealed from the appendix 01 that some insecticide like aldrin, dieldrin, dichlorovos, fenetrothion, parathion, Phosphamidon, Chlorpyrifos, Paraquat dichloride etc. are permissible in fruits in the range of 0.1- 0.5 mg per kg while insecticide like Copperoxychloride, captan, dicofol etc. are permissible in residual form in the range of 5 -15 mg per kg. The residual limit of same insecticide also varies with fruits.

As evident from appendix 02 that the SPS standard adopted by international organization CODEX, European Union (EU) and the U.S. in the form of MRLs for the fruit crop banana is different under all these standards. There are 19 pesticide listed in table for banana crop out of which only 5 pesticide follows the codex standard in U.S. while EU follows the codex standard of maximum residue limit for almost all pesticides.

It is revealed from the appendix 3 that EU and U.S. do not follow the codex standard for almost all of the pesticide listed above for grapes. Almost for half of the pesticide listed above EU has stricter standard than codex while EU has less stringent standard than codex for more than half of pesticide listed in the table.

## Conclusion

The total export of agricultural products from India has touched \$45 billion during 2013-14 from about \$18 billion during 2009-10. In present context non tariff barriers are playing greater role as compared to tariff in the international trade. Mangoes export has showed significant growth rate of 6.5 per cent per annum in terms of quantity. Export value showed significant growth rate of 8.75 per cent per annum while export price showed significant growth rate of 2.25 per cent per annum. Bananas export has also shown significant positive growth rate of 21.91 per cent per annum. At the same time export value and export price showed significant growth of 25.8 per cent per annum and 3.89 per cent per annum respectively. Growth rate in export quantity, value and price of Grapes was found 12.7, 16.77 and 4.08 percent respectively during 1990-91 to 2011-12. UAE was found more stable market in case of Grapes and in case of mangoes; Saudi Arabia and Bangladesh were more stable market. Bahrain, Iran and UAE were stable market for banana, therefore it was suggested that the attention should be focused on the market requirement and specifications of those stable markets. Food safety standards and other technical and non technical barriers are different for different countries. Therefore, there is a need to disseminate these technicalities to farmers and create awareness among them.

**Table 4. Transitional probability matrix of banana export, 2006-07 to 2011-12**

Major country	Bahrain	Iran	Kuwait	others	Saudi Arab	UAE
Bahrain	0.0359	0.3233	0.0479	0.2695	0	0.3234
Iran	0.9595	0.0026	0.0141	0.0119	0	0.0119
Kuwait	0	0.0019	0	0.9981	0	0
others	0.0482	0	0.1948	0	0.757	0
Saudi Arab	0	0	0.7481	0.1298	0	0.1221
UAE	0	0	0.4693	0	0.5048	0.0259

**Appendix 01: MRLs of different insecticide in fruits**

Insecticide	MRL	Insecticides	MRL
Aldrin, dieldrin	0.1	Parathion Methyl	0.2
Chlordane	0.1	Phosphamidon residues	0.2
D.D.T.	3.5	Pyrethrins	1.0
Diazinon	-	Chloreinvinphos	-
Dichlorovos	0.1	Chlorobenzilate	1.0
Dicofol	5.0	Chlorpyriphos	0.5
Dimethoate	2.0	Formethion	1.0
Endosulfan	2.0	Paraquat dichloride	0.05
Fenitrothion	0.5	Trichlorfon	0.1
Heptachlor	-	Captan	15.0
Hexachlorocycle hexane and its isomers	1.0	Carbofuran	0.10
Malathion	4.0	Copperoxychloride	20
Parathion	0.5		

Source: www.apeda.gov.in

**Appendix 02: Maximum Residue Levels (MRLs) for Bananas across Countries**

S. No.	Pesticide	Codex	US	EU
1.	Azoxystrobin	2.0	2.0	2.0
2.	Chlorpyriphos	2.0	0.1	3.0
3.	Chlorothalonil	0.01	0.5	0.2
4.	Ethoprophos	0.02	0.02	0.02
5.	Febuconazole	0.05	0.3	0.05.
6.	Fenarimol	0.2	0.25	0.2
7.	Glyphosate	0.05	0.2	0.1
8.	Glufosinate ammonium	0.2	0.3	0.2
9.	Imidacloprid	0.05	0.5	0.05
10.	Imizalil	2.0	3.0	2.0
11.	Mancozeb	2.0	4.0	2.0
12.	Myclobutanil	2.0	4.0	2.0
13.	Propiconazole	0.1	0.2	0.1
14.	Pyraclostrobin	0.02	0.04	0.02
15.	Pyrimethanil	0.1	0.1	0.1
16.	Thiamethoxam	0.02	0.02	0.05
17.	Tebuconazole	0.05	0.05	0.05
18.	Terbufos	0.05	0.025	0.05
19.	Thiabendazole	5.0	3.0	5.0

Follows codex standard

Stricter than codex

Less stringent than codex

**Appendix 03: Maximum Residue Levels (MRLs) for Grapes across Countries**

S.No.	Pesticide	Codex	US	EU
1.	2,4-D	0.1	0.1	0.05
2.	Azinophos methyl	1.0	4.0	0.05
3.	Bifenazate	0.7	0.75	0.7
4.	Boscalid	5.0	3.5	5.0
5.	Carbaryl	5.0	10.0	0.05
6.	Clofentezine	1.0	1.0	0.02
7.	Cyprodinil	3.0	3.0	5.0
8.	Dicloran	7.0	10.0	0.1
9.	Ethepon	1.0	2.0	1.0
10.	Fenarimol	0.3	0.1	0.3
11.	Fenbutatin oxide	5.0	5.0	2.0
12.	Fenhexamid	15.0	4.0	5.0
13.	Inorganic Bromide	20.0	20.0	20.0
14.	Malathion	5.0	8.0	0.5
15.	Metaxyl	1.0	2.0	2.0
16.	Methomyl	0.3	5.0	0.05
17.	Paraquat dichloride	0.01	0.05	0.02
18.	Thiophanate Methyl	1.0	5.0	0.1
19.	Triadimefon	0.5	1.0	2.0
20.	Trifloxystrobin	3.0	2.0	5.0

Follows codex standard

Stricter than codex

less stringent than codex

**Appendix 04: Maximum Residue Levels (MRLs) for Mangoes across Countries**

S. No.	Pesticide	Codex	US	EU
1.	Abamectin	-	0.01	0.01
2.	Acephate	-	0.02	0.02
3.	Azoxystrobin	0.7	2.0	0.7
4.	Buprofezin	0.1	0.9	0.1
5.	Cypermethrin	0.7	0.7	0.7
6.	Deltamethrin	-	0.05	0.05
7.	Imidacloprid	0.2	1.0	0.2
8.	Lambda-Cyhalothrin	0.2	0.01	0.2
9.	Malathion	-	8.0	0.02
10.	Mancozeb	2.0	15.0	2.0
11.	Paraquat dichloride	0.01	0.05	0.02
12.	Pyralostrobin	0.05	0.6	0.05
13.	Spirotetramate	0.3	0.6	0.3
14.	Tebuconazole	0.05	0.15	0.1
15.	Thiabendazole	5.0	10.0	10.0

Follows codex standard

Stricter than codex

less stringent than codex

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