

Direction and Destination Pattern of Indian Mango & Mango Pulp's Exports

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ABSTRACT

This study explores growth dimensions, instability, sources of growth and variability of mango and mango pulp exports to major importing countries. The secondary data on volume and value of mango and mango pulp exports from India collected for 30 years from the year 1987-2016 were analyzed using Markov Chain and accordingly the future exports were forecasted. UAE and Kuwait for fresh mango and Saudi Arabia, UAE and Netherland for mango pulp were the most stable markets. It was predicted that quantum of mango export to countries Viz; Saudi Arabia, Kuwait and UK are expected to increase while quantity exported to UAE, Bangladesh and other countries are expected to decline from the year 2016-17. On the other hand, for mango pulp, forecasting revealed that in terms of quantity its export to UK, UAE, Netherland and USA would rise and quantity exported to Saudi Arabia, YAR and other countries would decline. A need for more concentration on export promotion to tap the potential and strengthening of existing processing units by providing access to information on modern technology, packaging, markets, food laws and hygiene requirements of different market are suggestions emerged from the study.

Highlights

- Export promotion through access to information on modern technology, packaging, markets, food laws and hygiene requirements of different market will help to boost the export are the key findings of the study.

Keywords: Fresh mango, mango pulp, markov chain, prediction of export

India is the largest producer of mangoes with 41.63 per cent of the total world production. India's share in world mango market is less than 20 per cent, but mangoes account for about 40 per cent of the total fruit exports from India. Nearly 200 million dollar had earned through export of mango and mango based products (Kumaresh and Sekar, 2013). Mango is cultivated in area of 2.2 million ha with a production of 15.5 million tonnes in the country (Anon., 2011). The export earnings from unit area of mango were higher when compared to that from the unit area of other crops. Even though export of mangoes is increasing, the share of quantity exported (0.38%) out of total production is meager

(Kusuma and Basavaraja, 2014). India exports mango to over 50 countries worldwide. The export value of fresh mangoes has increased from ₹ 35.2 crores in 1991-92 to ₹ 215.09 crores in 2016 (Anon., 2011). The major export markets for Indian mangoes are U.A.E, United Kingdom, Saudi Arabia, Qatar, Kuwait, Nepal, Bahrain and Bangladesh, both in quantity and value terms. Mango pulp is also the major source of export earnings. It is exported to Saudi Arabia, Netherland, Yemen Republic, United Kingdom *etc.* India is also a major exporter of

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Mango pulp in the world. The country has exported 1,05,873 MT of Mango pulp to the world for the worth of ₹ 657.66 crores / 93.95 USD Millions during the year 2018-19 (Anon., 2019). India's contribution to the world's mango production is the highest (1,84,31,330 MT) as compared to Thailand (35,97,589 MT) who is the leading exporter of mango in world. However, India's share in total export of mango is only 2.00 per cent (42,555 MT) in International market and in the value terms, it earns USD 48,255 as compared to Thailand whose share is 16.85 per cent (2,02,507 MT) and in value terms, it earns USD 4,07,296 which is higher than India (Anon., 2015). This study addresses the direction of trade and destination pattern of export of mango & mango pulp and forecasting the future exports to major importing destinations from India

Methodology

Padmanaban *et al.* (2014) studied the export of cashew kernel from India: its direction and prediction by using Markov chain approach. To examine direction of trade in export of mango and mango pulp from India, country wise export data collected from Agricultural & Processed Food Products Export Development Authority (APEDA), India and National Horticulture Board (NHB), New Delhi from the year 1987-88 to 2016-17, split into four periods *viz.* pre-WTO (Period I (1987-88 to 1995-96)), trans-WTO (Period II (1996-97 to 2004-05)), post-WTO (Period III (2005-06 to 2016-17)) and overall period (Period IV (1987-88 to 2016-17)). The collected data were analyzed using the first order Markov chain approach for estimation of the transitional probability matrix '*P*' whose elements, P_{ij} indicates the probability of exports switching from country '*i*' to country '*j*' over time. The diagonal element P_{ij} measures the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country's exports. The average exports to a particular country were considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as:

$$E_{jt} = \sum_{i=1}^n (E_{(i-1)t} * P_{ij} + e_{jt}) \quad \dots(1)$$

Where, E_{jt} is exports from India to the j^{th} country in the year t ; $E_{(i-1)t}$ is exports of i^{th} country during the

year $t = 1$; P_{ij} is probability that exports will shift from i^{th} country to j^{th} country; e_{jt} is error term which is statistically independent of $E_{(i-1)t}$ and N is number of importing countries.

The transitional probabilities P_{ij} , which can be arranged in a $(c \times n)$ matrix, have the following properties,

$$\sum_{n=1}^n (P_{ij}) = 1 \text{ and } 0 \leq P_{ij} \leq 1 \quad \dots(2)$$

Thus, the expected export share of each country during period ' t ' was obtained by multiplying the exports to these countries in the previous period $(t - 1)$ with the transitional probability matrix. The probability matrix was estimated for the period 1987-88 to 2016-17. Thus, transitional probability matrix (T) was estimated using linear programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD).

$$\text{Min, } OP^* + I e \dots \quad \dots(3)$$

Subject to,

$$X P^* + V = Y \quad \dots(4)$$

$$G P^* = 1 \text{ and } P^* \geq 0$$

Where, P^* is a vector of the probabilities P_{ij} ; O is the vector of zeros; I is an appropriately dimensional vectors of export quantity/ export value; E is the vector of absolute errors; Y is the proportion of exports to each country; X is a block diagonal matrix of lagged values of Y ; V is the vector of errors and G is a grouping matrix to add the row elements of P arranged in P^* to unity.

Prediction of quantity of fresh mango and mango export was made by using the Transitional Probability Matrix from year 2018-19 to 2022-23.

$$B_t = B_0 * T \quad \dots(5)$$

$$B_{t+i} = B_{t+i-1} * T \quad \dots(6)$$

Where, B_0 is quantity exported in base years; B_{t+i} is quantity exported in next year and T is transitional probability matrix.

To test whether the observed shares of exports to different countries and the predicted shares from the Markov chain model follow similar distributions,

the chi square statistics of the following types was used.

$$\chi^2_{(r-1)T} = \sum_t^T \cdot \sum_i^r N(t) \{Y_i(t) - y_i(t)\}^2 / y_i(t) \quad \dots(7)$$

Where, $Y_i(t)$ is observed proportions of i^{th} country's share at time t ; $y_i(t)$ is predicted proportions of i^{th} country's share at time t ; $N(t)$ is total number of countries at time t ; R is countries and T is Year.

The destination pattern of export of mango and mango pulp from India to different countries of world were analysed on the basis of percentage share of respective countries in terms of volume and value of exports.

RESULTS AND DISCUSSION

The Trade matrices were estimated using Markov chain approach and the primary impetus was to identify important relationships that exist among importing countries. These loyalty characteristics are long term phenomenon and Markov Transitional probability matrix facilitates a reasonable estimate of the same (Manjunath *et al.* 2017). The major Indian fresh mango importing countries were UAE, Kuwait, Bangladesh, Saudi Arabia, UK and all other importing countries grouped under the category of the "Other countries". The row elements in the transitional probability matrix provide the information on the extent of loss in trade, on account of competing countries. The columns element indicates the probability of gains in volume of trade from other competing countries and the diagonal element indicates probability of retention of the previous year's trade volume by the respective country.

It is evident that UAE was one of the most stable markets among the major importers of Indian mango as reflected by the probability of retention

at 0.5667, *i.e.* the probability that UAE retains its export share over the study period was 56.67 per cent (Table 1). Fresh mango export to UAE was retained to the tune of 56.67 per cent of its previous year's share in the current period; of the remaining 43.33 per cent of UAE market share, 3.33 per cent was directed to Saudi Arabia, 30.00 per cent to Bangladesh, and 10.00 per cent to other countries. These results are in line with findings of Tirlapur *et al.* (2014). Thus, UAE was the most reliable and loyal market for Indian mango because of the reason that Indian mango exports have been subjected to vapour heat treatment, which improved the quality of fruits by eradicating the maggots present in the fruits.

A high probability of retention of Kuwait (0.5000) implied that it had lost half of its share to other importing countries. Out of its remaining 50 per cent market share, 16.67 per cent was directed to Saudi Arabia, 20.00 per cent to UK and 13.33 per cent to Bangladesh. These results are in line with findings of Bisht *et al.* (2015). Moderate probability retention was observed in Bangladesh *i.e.* 0.3448, which means it retains its export share of 34.48 per cent. This implied that it had lost most of its share to other importing countries; of the remaining 65.52 per cent of Bangladesh market share, 27.59 per cent was lost to UAE, 3.45 per cent to Saudi Arabia, 10.34 per cent each to UK and Kuwait and remaining 13.79 per cent was diverted toward other countries.

The remaining countries such as UK and Saudi Arabia had the retention of 30.00 per cent and 33.33 per cent of its original share respectively. This indicates that they were also the stable importers of Indian mango, whereas those countries, which imported mango in less quantity from India, were pooled under the 'Other' countries which showed moderate stability, which retained 33.33 per cent of its original share.

Table 1: Transitional Probability Matrix for quantity of fresh mango export from India (1987-87 to 2016-17)

Destination	U.A.E.	Saudi Arabia	Kuwait	U.K.	Bangladesh	Other countries
U.A.E.	0.5667	0.0333	0.0000	0.0000	0.3000	0.1000
Saudi Arabia	0.0333	0.3333	0.0667	0.2333	0.0667	0.2667
Kuwait	0.0000	0.1667	0.5000	0.2000	0.1333	0.0000
U.K.	0.0000	0.2333	0.2667	0.3000	0.0333	0.1667
Bangladesh	0.2759	0.0345	0.1034	0.1034	0.3448	0.1379
Other countries	0.1333	0.2000	0.0667	0.1667	0.1000	0.3333

The major gainer among importers of Indian mango over a period of time has been UK, which has a transfer probability of 0.2333 from Saudi Arabia, 0.2000 from Kuwait, 0.1034 from Bangladesh and 0.1667 from other countries. The probability that Bangladesh would gain in the export share of Indian mango over the study period at the cost of Saudi Arabia, Kuwait, Bangladesh and other countries were 0.2333, 0.2000, 0.1034 and 0.1667 respectively. Therefore, UK loses about 70.00 per cent of its total imports. Saudi Arabia could retain its original share of 33.33 per cent and gained 3.33 per cent from UAE, 16.67 per cent from Kuwait, 23.33 per cent from UK, 3.45 per cent from Bangladesh and 20.00 per cent from other countries. Whereas, it lost its share to the tune of 56.67 per cent to UAE, 30.00 per cent to Bangladesh and 10.00 per cent to other countries. Bangladesh sustained its original share of 34.48 per cent and gained 30.00 per cent from UAE, 6.67 per cent from Saudi Arabia, 13.33 per cent from Kuwait, 3.33 per cent from UK and 10.00 per cent from other countries. Whereas 27.59 per cent was lost to UAE, 3.45 per cent to Saudi Arabia, 10.34 per cent each to UK and Kuwait and remaining 13.79 per cent was to other countries. Therefore, Bangladesh lost 65.52 per cent and retained the rest. UAE had retained its original share of 56.67 per cent and gained 3.33 per cent from Saudi Arabia, 27.59 per cent from Bangladesh and 13.33 per cent from other countries. Kuwait sustained its original share of 50.00 per cent and gained 6.67 per cent from Saudi Arabia, 26.67 per cent from UK, 10.34 per cent from Bangladesh and 6.67 per cent from other countries. Whereas, 16.67 per cent was directed from Kuwait to Saudi Arabia, 20.00 per cent to UK and 13.33 per cent to Bangladesh. Therefore, Kuwait lost about half of its share and retained the rest. Other countries retained its original share of 33.33 per cent and gained 67.13

per cent from other nations, 10.00 per cent from UAE, 26.67 per cent from Saudi Arabia, 16.67 per cent from UK and 13.79 per cent from Bangladesh. Whereas it lost 13.33 per cent from UAE, 20.00 per cent from Saudi Arabia, 6.67 per cent from Kuwait, 16.67 per cent from UK and 10.00 per cent from Bangladesh. Therefore, the total loss of other countries was 66.67 per cent.

The transitional probabilities estimated through MAD method presented in Table 2 revealed that no single export market shows high probability of retention in mango pulp export. It was evident that UAE was one of the most stable countries among major importers of Indian mango pulp as reflected in the probability that UAE retains its export share from one period to another period was about 33.33 per cent. Remaining 66.67 per cent of UAE market share, 6.67 per cent was directed to Saudi Arabia, 16.67 per cent to UK, 20 per cent to Netherland, 3.33 per cent to other countries and 10 per cent to each YAR and USA. Saudi Arabia had the probability retention of 0.3103, which retains its export share of 31.03 per cent. This implied that it had lost 68.97 per cent of its share to other importing countries; of the remaining 68.97 per cent of Saudi Arabia market share, 3.45 per cent was directed to both Netherland and USA separately. Similarly, 13.79 per cent share was directed to both UK and YAR and remaining 34.48 per cent directed to other countries.

USA had moderate probability retention of 0.2667, which retains its export share of 26.67 per cent. This implied that it had lost most of its share to other importing countries; of the remaining 73.33 per cent of UAE market share, 3.33 per cent was lost to Saudi Arabia, 23.33 per cent to UK, 6.67 per cent to UAE, 16.67 per cent to Netherland and 23.33 per cent was to YAR.

Table 2: Transitional Probability Matrix for quantity of mango pulp export From India (1987-87 to 2016-17)

Destination	Saudi Arabia	U.K.	U.A.E.	Netherlands	YAR	U.S.A.	Other Countries
Saudi Arabia	0.3103	0.1379	0.0000	0.0345	0.1379	0.0345	0.3448
U.K.	0.1333	0.2333	0.3000	0.1000	0.0000	0.1667	0.0667
U.A.E.	0.0667	0.1667	0.3333	0.2000	0.1000	0.1000	0.0333
Netherlands	0.1000	0.1000	0.1000	0.3000	0.1667	0.1667	0.0667
YAR	0.0667	0.0667	0.1000	0.1667	0.2000	0.2000	0.2000
U.S.A.	0.0333	0.2333	0.0667	0.1667	0.2333	0.2667	0.0000
Other Countries	0.3000	0.0667	0.1000	0.0333	0.1667	0.0333	0.3000

The remaining countries such as UK and YAR had the retention of 23.33 and 20.00 per cent of its original share, respectively. This implied that UK and YAR were not stable importers of mango pulp because they did not retain their share even though the quantity imported by UK and YAR was higher. However, countries which imported mango pulp in less quantity from India were pooled under the 'Other' countries showed moderate stability, which retained 30.00 per cent of its original share. These results are in line with the findings of Kumaresh and Sekar (2013).

The major gainer among importers of Indian mango pulp over a period of time has been YAR, which has a transfer probability of 0.1379 from Saudi Arabia, 0.1000 from UAE, 0.1667 from Netherland, 0.2333 from USA and 0.1667 from other countries. The probability that YAR would gain in the export share of Indian mango pulp over the study period at the cost of Saudi Arabia, UAE, Netherland, USA and other countries would be 0.1379, 0.1000, 0.1667, 0.2333 and 0.1667, respectively.

Netherland could retain its original share of 30.00 per cent and gained 3.45 per cent from Saudi Arabia, 10.00 per cent from UK, 20.00 per cent from UAE, 16.67 per cent each from YAR and USA and 3.33 per cent from other countries. United Kingdom sustained its original share of 23.33 per cent and gained 13.79 per cent from Saudi Arabia, 16.67 per cent from UAE, 10.00 per cent from Netherland, 10.00 per cent from YAR, 6.67 per cent from USA and 10.00 from other countries. Whereas it lost 13.33 per cent to Saudi Arabia, 30.00 per cent from UAE, 10.00 per cent from Netherland, 16.67 per cent from USA and 6.67 per cent to other countries. Therefore, UK lost about 76.67 per cent and retained the rest. UAE had retained its original share of 33.33 per cent and gained 30.00 per cent from UK, 10.00 per cent from Netherland, 10.00 per cent from YAR, 6.67 per cent from USA and 10.00 per cent from other countries. Whereas it lost 6.67 per cent from Saudi Arabia, 16.67 per cent from UK, 20.00 per cent from Netherland, 10.00 per cent from YAR, 10.00 per cent from USA and 3.33 per cent from other countries.

USA sustained its original share of 26.67 per cent and gained 3.45 per cent from Saudi Arabia, 16.67 per cent from UK, 10.00 per cent from UAE, 16.67 per cent from Netherland, 20.00 per cent from YAR and 3.33 per cent from other countries. On the other

hand, it lost 73.34 per cent share from other export destinations. Therefore, USA lost totally about 73.34 per cent and retained the rest. Saudi Arabia has the highest retention among all importing destinations. It sustained 31.03 per cent of its original share and gained 13.33 per cent from UK, 6.67 per cent from UAE, 10.00 per cent from Netherland, 6.67 per cent from YAR, 3.33 per cent from USA and 30.00 per cent from other countries. Other countries retained its original share of 30.00 per cent and gained 34.48 per cent from Saudi Arabia, 6.67 per cent from UK, 3.33 per cent from UAE, 6.67 per cent from Netherland, 20.00 per cent from USA. Contrary to this, they lost 30.00, 6.67, 10.00, 3.33, 16.67 and 3.33 per cent to Saudi Arabia, UK, UAE, Netherland, YAR and USA, respectively. Therefore, the total loss of other countries was 70 per cent. Among importing countries, Saudi Arabia, UK and UAE were the major markets for Indian fresh mango and mango pulp. Though a larger proportion of Saudi Arabia, UK and UAE share was diverted to some other nations in both mango and mango pulp. This was indicative that both European and Gulf countries were the most potential markets of Indian fresh mango and mango pulp and India needs to hold its share intact for the recent competition from other countries. Similar results were also found by Prakash (2012) while analyzing export potential of grapes from northern Karnataka through Markov Chain Analysis.

Using the one-step transitional probability, shares of major importers of Indian mango were estimated and same were compared with observed export shares (Table 3). A close look at the observed and expected shares in all the countries has revealed that the differences were by and large small. The calculated chi square (39.17) was less than the table value (174.10) at 145 degrees of freedom indicating that the observed and predicted proportions of exports of mango are identically distributed. That means, the observed proportions of export shares are consistent with the predicted shares of exports which are derived from the Markov process validating the use of Markov chain model for estimating the shares of different countries by using transitional probabilities. It was clear that UAE was the major importer of Indian fresh mango. UAE the major importer in 1987-88 with about 68.81 per cent share in the total Indian exports is

Table 3: Country wise observed and predicted share (%) of quantity of mango export from India

Year	U.A.E.		Saudi Arabia		Kuwait		U. K.		Bangladesh		Other	
	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.
1987-88	68.81		14.60		7.50		3.26		0.02		5.81	
1988-89	59.03	35.58	17.97	12.52	6.19	6.49	5.37	8.95	0.02	21.06	11.43	15.40
1989-90	57.90	35.27	21.59	12.94	5.29	5.89	3.68	9.04	1.38	21.13	10.17	15.74
1990-91	49.45	30.57	29.93	15.62	5.45	6.57	4.09	11.12	0.49	18.92	10.59	17.21
1991-92	54.56	34.59	23.38	13.30	2.54	4.79	2.48	9.27	4.33	21.11	12.71	16.94
1992-93	48.64	32.78	17.05	12.30	6.62	7.58	4.42	9.82	10.86	21.74	12.41	15.78
1993-94	44.64	30.26	18.70	13.74	7.42	8.08	4.52	10.86	7.32	20.04	17.40	17.01
1994-95	39.39	30.01	19.53	12.86	4.15	7.51	4.80	10.96	19.32	21.78	12.81	16.88
1995-96	48.95	31.77	20.80	13.52	6.41	7.56	5.70	10.46	6.48	20.52	11.66	16.17
1996-97	37.74	29.23	18.68	12.89	5.92	8.36	4.59	11.18	19.70	21.64	13.37	16.69
1997-98	28.46	24.96	18.56	14.73	5.76	8.89	4.81	12.86	17.94	19.34	24.47	19.23
1998-99	19.72	23.18	22.75	14.17	5.23	9.58	3.66	13.45	33.38	21.29	15.26	18.34
1999-00	28.95	26.86	15.53	12.73	4.11	8.87	6.64	12.14	27.81	21.78	16.96	17.63
2000-01	18.49	28.37	5.69	8.11	2.54	9.11	2.27	10.70	57.76	27.58	13.25	16.13
2001-02	28.90	31.25	6.64	8.24	2.22	8.07	3.10	9.78	47.45	27.04	11.70	15.62
2002-03	37.35	33.32	5.55	8.65	2.15	7.07	3.27	9.06	35.64	25.86	16.05	16.02
2003-04	36.54	33.94	6.67	8.03	0.76	6.60	2.62	8.78	41.30	27.05	12.10	15.60
2004-05	20.64	30.66	4.59	6.50	0.54	8.43	2.61	9.79	64.90	29.71	6.71	14.91
2005-06	40.52	37.60	2.39	5.32	0.16	6.13	1.28	7.08	50.04	30.19	5.61	13.67
2006-07	31.05	34.78	1.86	5.15	0.60	7.61	2.65	8.17	60.40	30.78	3.43	13.52
2007-08	48.01	38.16	3.18	6.54	0.98	6.33	5.50	7.34	36.46	28.09	5.86	13.55
2008-09	31.13	34.18	2.71	5.80	0.69	7.63	3.20	8.50	57.14	29.93	5.13	13.96
2009-10	36.37	34.73	4.47	6.75	1.14	7.33	4.20	8.49	47.65	28.55	6.16	14.15
2010-11	44.79	37.47	2.78	6.32	1.01	6.57	4.79	7.49	40.53	28.50	6.10	13.64
2011-12	36.99	34.84	4.01	6.80	1.23	7.29	4.26	8.44	46.37	28.37	7.14	14.25
2012-13	70.48	43.77	3.12	7.38	1.55	4.20	6.19	5.45	8.72	25.76	9.94	13.43
2013-14	57.37	36.15	4.29	9.71	11.45	9.75	8.42	8.44	7.22	22.92	11.26	13.03
2014-15	67.98	42.76	5.05	8.35	1.83	3.29	0.77	5.47	5.76	24.85	18.61	15.27
2015-16	54.98	35.97	3.85	11.40	2.06	4.72	4.12	8.37	0.13	20.69	34.86	18.85
2016-17	54.07	35.59	4.50	11.35	2.08	5.18	5.71	8.65	2.18	20.89	31.47	18.35
2017-18		28.75		12.23		9.03		11.49		21.44		17.02

Goodness of fit $\chi^2_{cal} = 39.17$ χ^2_{tab} at 145 degree of freedom = 174.101 Obs. – Observed and Est. – Estimated

maintaining its status as major importers of Indian mango. However, a sharp decline of UAE export share during trans-WTO phase was seen due to diversification of trade. The lost share of UAE was mostly absorbed by Bangladesh during trans- WTO phase but at present, again UAE maintained its status of being the major importer with 54.07 per cent share during 2016-17. The expected shares of UAE, estimate based on Markov model for different years was almost nearer to the observed values for most of the years indicating the validity of the fitted model. Regarding the quantum of exports of fresh mango from Table 4, the actual value increased from

13970 MT to 28751 MT. The estimate for 2022-23 is likely to decline by 10303 MT.

Regarding Saudi Arabia (Table 3) the actual and predicted export share showed a decreasing trend from 14.60 per cent to 11.35 per cent and 7.50 to 2.08 per cent respectively from 1987-88 to 2016-17. The actual quantum of exports (Table 4) shown an erratic trend during study period but predicted value was increasing. The estimation for 2022-23 is likely to increase from 6034 MT (2016-17) to 8293 MT (2022-23). The similar findings for Saudi Arabia and UAE were observed by Kusuma and Basavaraja

(2014) and Tirlapur *et al.* (2014) for mango export from India.

The actual proportion of Kuwait market share of imports from India showed a declining trend from 7.50 to 2.08 per cent. The predicted export share is also decreasing from 6.49 per cent to 5.18 per cent over the study (Table 3). The actual quantum of exports also followed a similar trend while predicted quantum of exports showed the rising trends. The estimation for 2022-23 suggested an increase from 2757 MT in 2016-17 to 8129 MT (Table

4). With regard to UK, the actual market share of India's fresh mango exports increased from 3.26 per cent to 5.71 per cent whereas the predicted share more or less remained the same from 8.95 to 8.65 per cent from 1987-88 to 2016-17 (Table 3). But regarding the export quantum, both actual and predicted exports observed an increase. The estimation is also likely to decrease from 4599 MT to 8289 MT during the study period (Table 4).

The quantum of mango export was very fluctuating in nature especially for country like Bangladesh.

Table 4: Actual and predicted quantity of mango export from India to its major trading partners (Qty. in metric tonnes)

Year	U.A.E.		Saudi Arabia		Kuwait		U. K.		Bangladesh		Other	
	A	P	A	P	A	P	A	P	A	P	A	P
1987-88	13970	8174	2964	2097	1522	1214	661	1392	5	4733	1180	2692
1988-89	9939	5990	3025	2109	1042	1093	904	1506	3	3546	1925	2593
1989-90	11521	7018	4296	2576	1052	1171	732	1798	276	4205	2023	3132
1990-91	9582	5923	5798	3026	1056	1273	793	2154	95	3666	2052	3334
1991-92	12594	7983	5396	3070	587	1105	571	2140	1000	4874	2934	3910
1992-93	12570	8472	4408	3178	1712	1959	1142	2538	2806	5620	3208	4079
1993-94	10173	6895	4261	3132	1692	1842	1030	2475	1668	4567	3965	3877
1994-95	10004	7622	4961	3267	1054	1907	1218	2784	4907	5531	3255	4288
1995-96	10899	7075	4631	3010	1427	1683	1269	2329	1443	4568	2597	3601
1996-97	9349	7240	4627	3194	1467	2071	1137	2770	4880	5360	3311	4135
1997-98	12201	10700	7957	6314	2470	3810	2060	5512	7692	8290	10488	8242
1998-99	8903	10463	10268	6395	2362	4324	1653	6070	15069	9610	6887	8278
1999-00	10021	9296	5375	4404	1421	3068	2297	4201	9624	7536	5871	6103
2000-01	6859	10525	2112	3008	941	3379	843	3969	21427	10232	4916	5983
2001-02	12810	13851	2943	3654	985	3576	1373	4335	21034	11987	5184	6923
2002-03	14034	12521	2085	3251	807	2657	1228	3406	13393	9718	6029	6021
2003-04	21056	19556	3846	4624	438	3805	1512	5061	23797	15585	6972	8989
2004-05	10339	15351	2301	3254	268	4221	1309	4904	32503	14878	3360	7468
2005-06	26534	24620	1564	3484	105	4014	840	4639	32771	19774	3677	8955
2006-07	22046	24695	1324	3653	428	5402	1883	5800	42888	21853	2437	9598
2007-08	22470	17856	1489	3059	461	2964	2575	3434	17064	13145	2742	6340
2008-09	24571	26980	2141	4578	546	6024	2527	6706	45105	23628	4048	11019
2009-10	25608	24451	3147	4750	804	5159	2959	5974	33550	20100	4335	9965
2010-11	25475	21311	1582	3596	577	3735	2722	4262	23050	16210	3467	7757
2011-12	22014	20736	2389	4044	731	4338	2532	5026	27600	16887	4250	8483
2012-13	37599	23352	1665	3937	828	2241	3305	2910	4650	13745	5300	7163
2013-14	23047	14521	1722	3902	4601	3919	3381	3390	2900	9207	4523	5235
2014-15	29232	18388	2172	3591	787	1416	330	2353	2475	10684	8003	6566
2015-16	19974	13067	1399	4140	748	1716	1496	3041	46	7518	12666	6848
2016-17	28751	18923	2394	6034	1104	2757	3034	4599	1158	11106	16735	9757
2017-18		15290		6509		4807		6114		11405		9052
2018-19		13235		7110		6251		7002		10703		8874
2019-20		11873		7630		7166		7596		10089		8821
2021-22		10942		8017		7749		8006		9640		8820
2022-23		10303		8293		8129		8289		9323		8836

Note: A- Actual exports. P- Predicted exports.

The actual proportion of exports share of India's mango exports to Bangladesh (Table 3) showed an increasing trend of 0.02 to 2.18 per cent and the prediction from 21.06 per cent to 20.89 per cent. But it was observed from Table 4 that the actual quantity of exports increased from 4.7 MT to 1158 MT and the prediction also increased from 4733 MT to 11106 MT during 1987-88 to 2016-17. But the estimation was likely to decrease from 11106 MT in 2016-17 to 9323 MT in 2022-23.

Considering the other imports, both the actual and predicted exports shares increased during the study period. The actual share increased from 5.81 per cent to 31.47 per cent and the predicted export share of India's export share to others also increased from 15.40 per cent to 18.35 per cent (Table 3). The quantum of export witnessed a similar picture. The prediction for 2022-23 was expected to decrease slightly from 9757 MT in 2016-17 to 8836 MT (Table 4).

There are some differences in observed and expected exports shares in few years in countries like Bangladesh and 'other countries' which are mainly due to limitation of the model that the present estimates depend only on the previous year's observation (Murthy and Subrahmanyam, 1999).

Export market projections for quantity of mango pulp export

As it could be seen from Table 5, the calculated chi-square (χ^2) of 19.29 was less than the table value at 174 degrees of freedom (205.77) indicating identical distribution of the actual and estimated values. Thereby, the actual shares of exports are consistent with the predicted export shares. This validates the use of Markov chain approach for forecasting the future export volume of all the major importing countries from India. It is clear that the actual share of Saudi Arabia in mango pulp export has shown less fluctuation over the study period (1987-88 to 2016-17) but on the whole, it has increased from 19.00 to 23.95 per cent. Similar trend was in prediction of export share too, where the increase was from 20.06 to 21.51 per cent. The estimation for the year 2022-23 showed that there would be slight decline in quantum of exports in the upcoming five years. Regarding the quantum of exports (Table 6) of mango pulp, the actual value increased from 4547

MT to 32483. The estimate for 2022-23 is likely to decline by 20143 MT.

Regarding UK, the actual and predicted export share showed a decreasing trend from 17.43 to 8.19 per cent and 12.52 to 11.34 per cent, respectively from 1987-88 to 2016-17 (Table 5). From Table 6, it can be observed that the actual and predicted quantum of exports showed an increasing trend during study period. The estimation for 2021-22 also is likely to increase from 15376 MT (2016-17) to 19240 MT (2021-22).

With regard to UAE, the actual market share of India's fresh mango exports decreased from 13.90 to 6.17 per cent whereas the predicted share decreased from 13.03 to 10.55 per cent from 1987-88 to 2016-17 (Table 5). But regarding the export quantum, both actual and predicted exports observed an increase. The projection is also likely to increase from 141313 MT to 19177 MT from year 2016-17 to 2021-22 as seen in Table 6.

Table 5 showed that the actual proportion of Netherland market share of imports from India showed a rising trend from 5.24 to 10.14 per cent. The predicted export share more or less remained same over the study. The actual and predicted quantum of exports followed the rising trend. The estimation for 2021-22 suggested a increase from 13285 MT in 2016-17 to 19007 MT (Table 6).

The actual and predicted proportion of exports to YAR more or less remained the same for the whole study period. The actual quantity of exports (Table 6) increased from 2946 to 16708 MT and the prediction also increased from 3111 to 20168 MT during 1987-88 to 2016-17. But the estimation is likely to decrease from 20168 MT in 2016-17 to 19418 MT in 2021-22.

The actual proportion of exports share of India's mango exports to USA showed a decreasing trend of 4.44 per cent to 3.86 per cent and also the prediction from 9.81 per cent to 9.17 per cent. But the actual quantity of exports increased from 1063.7 MT to 5233.2 MT and the prediction also increased from 2488 MT to 12436 MT during 1987-88 to 2016-17. The estimation is also likely to increase from 12436 MT in 2016-17 to 18342 MT in 2021-22. Considering the other imports, both the actual and predicted exports shares increased during the study period. The actual share rose from 27.68 to 35.37 per cent

Table 5: Observed and estimated shares (%) of mango pulp exports from India

Country	Saudi Arabia		U.K.		U.A.E.		Netherlands		YAR		U.S.A.		Other	
	Year	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	
1987-88	19.00		17.43		13.90		5.24		12.31		4.44		27.68	
1988-89	20.99	20.06	13.09	12.52	11.49	13.03	5.85	9.97	11.96	13.85	5.00	9.81	31.61	20.76
1989-90	19.57	19.09	14.54	12.69	11.31	13.41	6.08	10.49	14.71	13.77	5.24	10.53	28.56	20.01
1990-91	21.80	18.74	16.48	13.02	9.78	13.22	5.81	10.56	16.66	13.55	5.26	10.99	24.20	19.92
1991-92	16.94	18.61	12.26	12.21	10.50	13.01	7.10	10.93	17.36	14.42	6.01	10.93	29.83	19.90
1992-93	15.55	20.28	12.57	12.18	12.09	13.62	8.43	10.23	8.46	13.93	4.90	9.51	37.99	20.26
1993-94	15.95	21.34	13.84	12.17	10.76	13.51	3.74	8.83	8.09	13.80	5.15	8.96	42.47	21.39
1994-95	16.16	20.51	11.53	12.65	13.19	13.51	8.21	10.08	3.91	14.06	7.87	9.35	39.11	19.85
1995-96	22.12	20.81	13.09	13.32	16.29	13.99	5.13	9.56	2.79	13.30	6.59	8.88	34.00	20.14
1996-97	29.34	21.48	12.64	13.70	13.30	12.43	4.68	9.05	2.24	13.44	8.08	8.82	29.72	21.08
1997-98	17.33	20.68	11.15	12.56	17.06	14.31	8.06	10.17	3.11	13.61	4.97	8.73	38.32	19.94
1998-99	17.99	20.03	14.97	13.55	17.87	15.14	5.70	10.06	2.33	12.99	6.77	9.27	34.37	18.95
1999-00	23.87	20.63	9.21	12.72	13.39	12.34	8.39	10.18	5.84	14.23	7.21	9.25	32.10	20.65
2000-01	25.97	20.21	11.60	13.46	15.52	13.10	6.71	10.18	5.10	13.62	7.41	9.42	27.70	20.02
2001-02	23.98	21.70	10.02	12.03	8.47	11.40	7.37	9.26	8.54	14.39	5.37	8.92	36.26	22.29
2002-03	29.00	21.76	7.92	11.98	8.57	10.50	5.24	9.00	11.78	14.69	5.36	8.90	32.15	23.16
2003-04	35.21	23.08	3.04	11.26	7.72	8.78	8.07	8.88	10.74	15.21	3.20	7.91	32.01	24.89
2004-05	32.55	21.90	3.03	11.10	9.19	9.41	7.55	9.51	15.29	15.30	2.65	8.56	29.74	24.22
2005-06	33.45	22.63	3.42	11.20	9.88	9.57	6.90	9.02	12.34	15.03	2.18	7.97	31.82	24.57
2006-07	31.04	21.61	3.47	11.16	9.06	9.63	12.30	10.38	12.57	15.17	2.34	8.72	29.21	23.33
2007-08	27.70	21.52	4.35	11.05	9.06	10.13	11.36	10.24	12.93	15.14	2.41	8.78	32.19	23.14
2008-09	30.96	21.58	4.74	11.72	12.66	10.72	11.16	10.30	9.00	14.61	2.51	8.42	28.98	22.65
2009-10	34.09	22.17	5.71	11.65	9.16	9.79	8.63	9.46	11.68	14.67	2.40	8.40	28.33	23.85
2010-11	28.05	22.11	7.21	11.62	8.63	10.54	10.70	9.69	8.44	14.58	3.19	8.48	33.78	22.97
2011-12	30.36	22.17	3.74	11.02	7.51	9.37	11.09	9.80	12.15	15.26	2.69	8.50	32.47	23.88
2012-13	29.39	21.91	2.16	10.60	7.94	9.26	7.60	9.48	17.05	15.67	2.56	8.64	33.29	24.45
2013-14	25.39	21.59	1.90	9.93	5.20	8.99	8.14	9.64	21.26	16.12	2.06	9.07	36.05	24.66
2014-15	30.47	22.09	3.15	10.71	6.34	8.97	7.76	9.32	16.91	15.59	2.72	8.70	32.64	24.62
2015-16	32.64	23.42	3.78	11.18	6.59	8.91	9.32	8.79	8.38	15.17	3.50	7.77	35.81	24.76
2016-17	23.95	21.51	8.19	11.34	6.17	10.55	10.14	9.80	12.32	14.87	3.86	9.17	35.37	22.76
2017-18		18.00		13.00		12.27		11.69		14.56		11.50		18.98

Goodness of fit $\chi^2_{cal} = 19.29$ χ^2_{tab} at 174 degree of freedom = 205.779 Obs. - Observed and Est.- Estimated

and the predicted export share of India's export share to others also increased from 20.76 per cent to 22.76 per cent. The quantum of export witnessed a similar picture. The prediction for 2021-22 is expected to decline substantially from 30870 MT in 2016-17 to 202910 MT.

As discussed earlier, there are some differences in observed and expected exports shares in few years in countries which are mainly due to limitation of the model that the present estimates depend only on the previous year's observation (Murthy and Subrahmanyam, 1999).

The analyses of Transitional Probability Matrix of fresh mango and mango pulp exports from India revealed that the country's export share to UAE showed erratic trend *i.e.* it was 68.81 per cent during

1987-88 and decreased to 54.07 per cent by 2016-17 in case of mango. Similar trend was also noticed in mango pulp, its share declined from 13.90 to 6.17 per cent (from 1987-88 to 2016-17) although quantity of export was increasing (Table 3 & 4). This was due to the fact that though UAE is the potential growing market for India's fresh mango, and mango pulp did not remain loyal importer, may be due to stiff competition by other countries like Thailand. Indian mango exports to Hong-Kong also faced similar problems by Pakistan and Sri Lanka as indicated by Mamale (2001) in his study of export potential of mangoes from northern Karnataka. The predictions in Table 4 and Table 6 revealed that UAE will be the largest importer of Indian mango and Saudi Arabia will be the largest importer of mango pulp from

Table 6: Actual and Predicted quantity of mango pulp export from India to its major trading partners (Qty. in metric tonnes)

Country	Saudi Arabia		U.K.		U.A.E.		Netherlands		YAR		U.S.A.		Other	
	Year	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.	Est.	Obs.
1987-88	4547	4534	4171	3167	3327	3514	1255	2505	2946	3111	1064	2488	6627	4618
1988-89	6348	6066	3959	3787	3476	3942	1768	3014	3616	4188	1513	2966	9561	6278
1989-90	5581	5447	4146	3620	3227	3827	1735	2993	4196	3928	1495	3005	8146	5707
1990-91	5725	4922	4328	3418	2568	3472	1525	2773	4375	3557	1382	2885	6355	5232
1991-92	5704	6265	4127	4109	3535	4379	2392	3680	5846	4854	2022	3680	10044	6701
1992-93	5777	7530	4669	4523	4489	5057	3132	3801	3143	5173	1821	3533	14108	7523
1993-94	6193	8287	5377	4726	4179	5248	1452	3429	3141	5358	1999	3481	16495	8307
1994-95	7778	9869	5548	6085	6348	6498	3951	4850	1883	6764	3788	4500	18820	9549
1995-96	10940	10294	6474	6590	8058	6918	2538	4731	1378	6577	3259	4390	16815	9962
1996-97	16002	11714	6893	7470	7253	6777	2552	4935	1219	7331	4407	4811	16209	11496
1997-98	10653	12711	6856	7724	10489	8799	4957	6250	1913	8366	3053	5367	23557	12260
1998-99	9544	10627	7943	7188	9482	8032	3023	5338	1234	6892	3589	4917	18233	10055
1999-00	21119	18248	8146	11256	11844	10915	7422	9008	5164	12589	6376	8187	28400	18267
2000-01	19353	15059	8644	10031	11567	9761	4998	7585	3797	10147	5519	7017	20643	14921
2001-02	22766	20607	9512	11426	8045	10828	6997	8793	8111	13660	5096	8470	34428	21169
2002-03	34072	25564	9302	14073	10067	12342	6155	10579	13837	17264	6295	10463	37773	27213
2003-04	31521	20660	2718	10077	6913	7860	7228	7945	9616	13611	2867	7079	28653	22281
2004-05	31205	20995	2901	10644	8809	9016	7240	9116	14654	14667	2541	8206	28507	23212
2005-06	45033	30461	4603	15080	13297	12883	9292	12146	16616	20238	2934	10732	42839	33072
2006-07	48421	33705	5411	17414	14135	15014	19191	16191	19612	23659	3651	13598	45558	36397
2007-08	46435	36061	7283	18525	15178	16980	19044	17164	21679	25368	4044	14719	53948	38792
2008-09	53564	37329	8204	20277	21896	18550	19311	17829	15563	25278	4343	14565	50134	39186
2009-10	63480	41282	10626	21694	17054	18227	16073	17613	21753	27324	4467	15645	52745	44411
2010-11	47744	37642	12280	19779	14685	17949	18221	16492	14360	24814	5432	14436	57499	39107
2011-12	45686	33364	5625	16587	11297	14107	16689	14755	18290	22960	4042	12789	48871	35936
2012-13	43448	32385	3199	15664	11737	13689	11236	14008	25203	23165	3784	12767	49209	36138
2013-14	44390	37759	3324	17362	9097	15714	14229	16849	37175	28188	3605	15863	63041	43127
2014-15	47178	34194	4883	16582	9822	13892	12019	14434	26180	24133	4205	13468	50534	38118
2015-16	42055	30179	4870	14401	8497	11487	12005	11325	10794	19552	4504	10010	46142	31910
2016-17	32483	29174	11107	15376	8367	14313	13749	13285	16708	20168	5233	12436	47974	30870
2017-18		24406		17630		16645		15855		19750		15594		25742
2018-19		22178		18511		18012		17440		19552		17055		22875
2019-20		21029		18932		18681		18315		19469		17780		21418
2020-21		20443		19138		19012		18772		19433		18152		20677
2021-22		20143		19240		19177		19007		19418		18342		20300

Note: Obs. – Observed and Est. – Estimated.

2017-18 up to 2021-12. The share of Saudi Arabia, Kuwait and UK in fresh mango and in mango pulp share of UK, UAE, Netherland and USA predicted to rise from existing level. It appears that India needs to strive to improve its export shares to these three major importers by improving upon the quality of mango exports and also by improving the yield levels (Kusuma and Basavaraja, 2014). Besides, in order to avoid dependency on a few markets, there is a need to identify the consumer’s preferences of the new markets where India’s export shares are likely to increase.

Destination pattern of fresh mango and mango pulp exports

Indian fresh mango is the most sought fresh agricultural commodity in overseas markets. The results revealed that (Table 7) during pre-WTO period, UAE (52.4 %) and Saudi Arabia (20.4% share), were India’s major trading partners in terms of export volume. In fact, UAE single-handedly accounted for 49.8 per cent of total export value of Indian mango, followed by Saudi Arabia (20.1 %), Kuwait (7.7 %), UK (6.5%) and Bangladesh (2.5%).

Table 7: Destination pattern of Indian mango exports during pre-WTO phase

Export share (%)	U.A.E.		Saudi Arabia		Kuwait		U.K.		Bangladesh		Other countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
1987-88	68.8	58.1	14.6	16.9	7.5	11.4	3.3	6.6	0.0	0.0	5.8	6.9
1988-89	59.0	52.9	18.0	19.5	6.2	8.2	5.4	7.9	0.0	0.0	11.4	11.5
1989-90	57.9	51.0	21.6	21.9	5.3	7.4	3.7	6.8	1.4	0.8	10.2	12.2
1990-91	49.5	43.2	29.9	25.2	5.5	9.1	4.1	8.5	0.5	0.1	10.6	13.8
1991-92	54.6	51.9	23.4	23.9	2.5	2.7	2.5	4.8	4.3	2.2	12.7	14.6
1992-93	48.6	48.6	17.1	16.3	6.6	9.3	4.4	6.3	10.9	5.5	12.4	14.0
1993-94	44.6	46.1	18.7	19.3	7.4	9.7	4.5	6.1	7.3	2.6	17.4	16.1
1994-95	39.4	46.9	19.5	20.8	4.1	4.4	4.8	4.8	19.3	8.6	12.8	14.6
1995-96	48.9	49.7	20.8	17.0	6.4	7.3	5.7	6.8	6.5	2.8	11.7	16.4
Average	52.4	49.8	20.4	20.1	5.7	7.7	4.3	6.5	5.6	2.5	11.7	13.3

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of exports.

Table 8: Destination pattern of Indian mango exports during trans-WTO phase

Export share (%)	U.A.E.		Saudi Arabia		Kuwait		U.K.		Bangladesh		Other Countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
1996-97	37.7	44.3	18.7	15.6	5.9	7.7	4.6	6.9	19.7	7.1	13.4	18.5
1997-98	28.5	38.3	18.6	14.1	5.8	6.9	4.8	7.5	17.9	7.9	24.5	25.4
1998-99	19.7	27.5	22.7	24.3	5.2	6.7	3.7	7.5	33.4	11.8	15.3	22.2
1999-00	29.0	35.7	15.5	12.3	4.1	5.3	6.6	10.6	27.8	13.3	17.0	22.8
2000-01	18.5	27.3	5.7	6.9	2.5	4.4	2.3	5.0	57.8	33.9	13.3	22.6
2001-02	28.9	34.9	6.6	8.2	2.2	3.8	3.1	5.6	47.5	29.8	11.7	17.7
2002-03	37.3	44.2	5.5	8.1	2.1	4.5	3.3	6.3	35.6	16.6	16.0	20.3
2003-04	36.5	45.2	6.7	8.5	0.8	1.6	2.6	6.7	41.3	20.9	12.1	17.0
2004-05	20.6	33.4	4.6	8.6	0.5	1.7	2.6	8.6	64.9	34.2	6.7	13.5
Average	28.5	36.7	11.6	11.8	3.2	4.7	3.7	7.2	38.4	19.5	14.4	20.0

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of exports.

Despite visible expansion in India's mango exports in the WTO transition phase, the share of UAE heavily decreased to around half (28.5% in export volume and 36.7 % in export value) of its pre-WTO imports as it could be seen in Table 8. The strict enforcement of quality standards along with competition from other exporters resulted in significant reduction of Indian mango exports to these countries in both quantity and value terms. With the alarming qualitative restrictions of the traditional importing countries, India's exports started reaching new destinations like Bangladesh with 38.4 per cent (highest) volume share and 19.5 per cent value share and other countries with 14.4 per cent and 20.0 per cent share in volume and value, respectively (Table 8). During transition phase in mango export, share of UAE declined heavily and is more diverted to the markets like Bangladesh, UK and other countries.

In the post-WTO period, UAE again became the

largest importer in terms of volume and value, followed by Bangladesh (Table 9). Even with Bangladesh, though the share of export volume shrunk to 30.2 per cent, the share of export volume improved to about 25 per cent, when compared to that of 5.6 per cent in the pre-WTO period. At the same time, the traditional market like Saudi Arabia was found to be unreliable for Indian mango exports in terms of both quantity and value. On the other hand, export volume and value shares of UK remained more or less the same in all the three periods. The share of Kuwait in terms of export volume and export value declined throughout the study period. Thakor (2019) also reported that around 15 per cent of mango exports in terms of value went to United Arab Emirates, while around 12 per cent shipped to the Saudi Arabia followed by Kuwait and UK during 2017.

Mango is consumed as fresh as well as in processed forms. In India, less than 5 per cent of the produced

Table 9: Destination pattern of Indian mango exports during post-WTO phase

Export shares (%)	U.A.E.		Saudi Arabia		Kuwait		U.K.		Bangladesh		Other Countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
2005-06	40.5	58.5	2.4	3.5	0.2	0.9	1.3	4.3	50.0	22.2	5.6	10.6
2006-07	31.0	48.8	1.9	3.1	0.6	1.8	2.7	8.5	60.4	29.6	3.4	8.2
2007-08	48.0	52.2	3.2	3.8	1.0	2.5	5.5	16.4	36.5	13.2	5.9	11.9
2008-09	31.1	46.8	2.7	5.0	0.7	2.4	3.2	8.4	57.1	24.5	5.1	12.9
2009-10	36.4	52.8	4.5	6.8	1.1	2.6	4.2	8.9	47.7	16.8	6.2	12.1
2010-11	44.8	63.4	2.8	3.8	1.0	2.4	4.8	8.9	40.5	11.4	6.1	10.0
2011-12	37.0	52.9	4.0	5.8	1.2	2.7	4.3	8.1	46.4	20.0	7.1	10.6
2012-13	70.5	63.0	3.1	4.6	1.6	3.2	6.2	12.6	8.7	3.0	9.9	13.6
2013-14	57.4	61.1	4.3	4.3	11.5	2.9	8.4	16.1	7.2	1.5	11.3	14.1
2014-15	68.0	71.1	5.1	4.7	1.8	4.1	0.8	2.0	5.8	1.6	18.6	16.6
2015-16	55.0	60.5	3.9	5.3	2.1	4.1	4.1	10.1	0.1	0.0	34.9	19.9
2016-17	54.1	55.6	4.5	5.5	2.1	4.3	5.7	11.1	2.2	0.6	31.5	22.8
Average	47.8	57.2	3.5	4.7	2.1	2.8	4.3	9.6	30.2	12.0	12.1	13.6

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of export.

Table 10: Destination pattern of Indian mango pulp exports during pre-WTO phase

Export Shares (%)	Saudi Arabia		U.K.		U.A.E.		Netherland		YAR		U.S.A.		Other Countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
1986-87	19.0	17.6	17.4	15.9	13.9	13.6	5.2	5.3	12.3	8.1	4.4	6.8	27.7	32.6
1987-88	21.0	20.3	13.1	12.2	11.5	9.8	5.8	6.9	12.0	11.4	5.0	7.9	31.6	31.5
1988-89	19.6	17.8	14.5	13.9	11.3	10.5	6.1	6.8	14.7	10.5	5.2	8.2	28.6	32.3
1989-90	21.8	19.4	16.5	16.5	9.8	9.3	5.8	5.9	16.7	11.7	5.3	7.8	24.2	29.4
1990-91	16.9	15.5	12.3	12.4	10.5	10.4	7.1	7.9	17.4	10.3	6.0	9.2	29.8	34.4
1991-92	15.6	13.4	12.6	12.0	12.1	10.7	8.4	9.1	8.5	4.7	4.9	7.4	38.0	42.7
1992-93	15.9	14.7	13.8	13.2	10.8	10.4	3.7	4.1	8.1	5.1	5.1	6.7	42.5	45.8
1993-94	16.2	13.6	11.5	12.9	13.2	11.3	8.2	8.7	3.9	2.6	7.9	8.4	39.1	42.5
1994-95	22.1	18.2	13.1	15.4	16.3	14.3	5.1	5.4	2.8	1.7	6.6	7.8	34.0	37.1
Average	18.7	16.7	13.9	13.8	12.1	11.1	6.2	6.7	10.7	7.3	5.6	7.8	32.8	36.5

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of exports.

mangoes are processed and mango pulp is the main export product both in terms of volume and value. The demand for mango in the world market is increasing day by day. It is reported that the markets for mangoes have increased in temperate countries because of social change and promotion of fruit trade in developing countries Kumaresh and Seker (2013).

Export of mango pulp is more widely distributed when compared with fresh mango export. During pre-WTO phase, Saudi Arabia was the highest importer of mango pulp in terms of volume (18.7%) and value (16.7%), followed by UK, UAE, YAR and Netherland. On the other hand the share of other countries was 32.8 per cent in volume and 36.5 per cent in value of export (Table 10).

Demand for mango pulp widely changed during

trans-WTO phase when compared with pre-WTO period. During trans-WTO, the share of Saudi Arabia and Netherland share increased and together they contributed about 30 per cent in total import in both volume and value term. On the other hand, countries like United Kingdom and Yaman Arab Republic showed a declining trend in percentage share. Per cent share of UAE, USA and other countries more or less remained same during trans-WTO phase (Table 11).

After WTO, the share of YAR, Saudi Arabia and Netherland increased and was the highest in both volume and value among all the three periods. On the other hand UK, UAE and USA share declined in this period. During all the three periods, the share of other countries remained the same and also it could be seen from Table 12 that other countries alone contributes about 30 per cent in total import

Table 11: Destination pattern of Indian mango pulp exports during trans-WTO phase

Export Shares (%)	Saudi Arabia		U.K.		U.A.E.		Netherland		YAR		U.S.A.		Other Countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
1996-97	29.3	24.4	12.6	13.4	13.3	12.0	4.7	6.9	2.2	1.5	8.1	9.7	29.7	32.2
1997-98	17.3	14.6	11.2	15.4	17.1	15.1	8.1	8.2	3.1	2.4	5.0	6.4	38.3	37.8
1998-99	18.0	14.4	15.0	19.4	17.9	16.3	5.7	6.7	2.3	1.4	6.8	7.7	34.4	34.1
1999-00	23.9	17.8	9.2	12.8	13.4	11.7	8.4	10.7	5.8	4.2	7.2	9.6	32.1	33.2
2000-01	26.0	27.0	11.6	10.5	15.5	13.6	6.7	7.7	5.1	4.8	7.4	7.4	27.7	29.0
2001-02	24.0	19.7	10.0	10.9	8.5	8.7	7.4	8.9	8.5	5.6	5.4	8.0	36.3	38.2
2002-03	29.0	27.9	7.9	2.6	8.6	9.7	5.2	7.8	11.8	7.3	5.4	7.9	32.1	36.8
2003-04	35.2	30.1	3.0	5.2	7.7	7.1	8.1	11.4	10.7	7.3	3.2	4.7	32.0	34.2
2004-05	32.6	29.5	3.0	4.9	9.2	8.4	7.6	11.0	15.3	10.0	2.7	3.5	29.7	32.7
Average	26.1	22.8	9.3	10.6	12.3	11.4	6.9	8.8	7.2	4.9	5.7	7.2	32.5	34.3

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of exports.

Table 12: Destination pattern of Indian mango pulp exports during post-WTO phase

Export shares (%)	Saudi Arabia		U.K.		U.A.E.		Netherland		YAR		U.S.A.		Other Countries	
	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.	Vol.	Val.
2005-06	33.5	27.8	3.4	5.5	9.9	8.6	6.9	10.7	12.3	8.6	2.2	3.2	31.8	35.7
2006-07	31.0	26.4	3.5	5.6	9.1	7.8	12.3	16.5	12.6	8.4	2.3	3.0	29.2	32.3
2007-08	27.7	22.8	4.3	7.2	9.1	7.7	11.4	14.9	12.9	8.3	2.4	3.6	32.2	35.6
2008-09	31.0	26.4	4.7	6.2	12.7	11.1	11.2	14.0	9.0	7.0	2.5	3.0	29.0	32.3
2009-10	34.1	29.8	5.7	6.4	9.2	8.2	8.6	12.1	11.7	9.2	2.4	3.8	28.3	30.5
2010-11	28.0	25.8	7.2	7.1	8.6	7.5	10.7	13.5	8.4	7.5	3.2	3.5	33.8	35.1
2011-12	30.4	25.3	3.7	4.6	7.5	6.6	11.1	14.9	12.2	8.2	2.7	4.0	32.5	36.4
2012-13	29.4	21.7	2.2	3.4	7.9	7.2	7.6	10.5	17.1	13.5	2.6	4.4	33.3	39.3
2013-14	25.4	28.0	1.9	3.1	5.2	5.9	8.1	12.8	21.3	14.7	2.1	3.5	36.1	31.9
2014-15	30.5	26.7	3.2	4.3	6.3	6.1	7.8	10.5	16.9	13.1	2.7	4.0	32.6	35.3
2015-16	32.6	27.9	3.8	4.7	6.6	5.9	9.3	10.9	8.4	6.9	3.5	5.0	35.8	38.7
2016-17	24.0	21.2	8.2	8.1	6.2	5.9	10.1	11.1	12.3	9.8	3.9	5.3	35.4	38.5
Average	29.8	25.8	4.3	5.5	8.2	7.4	9.6	12.7	12.9	9.6	2.7	3.9	32.5	35.1

Note: 'Vol.' refers to volume of exports and 'Val.' refers to value of exports.

during all three periods in terms of both volume and value.

CONCLUSION AND POLICY IMPLICATIONS

UAE and Kuwait were the most stable markets for Indian fresh mango export while most of the export markets are moderately stable; however, UAE was one of the most stable countries among major importers of Indian mango pulp. The UK was major loser among countries and lost about 76.67 per cent and retained the rest. The major gainer among importers of Indian mango pulp has been YAR gained from Saudi Arabia, UAE, Netherland, USA and from other countries. It was predicted that quantum of mango export for countries like Saudi

Arabia, Kuwait and UK are expected to increase while quantity exported to UAE, Bangladesh and other countries are expected to decline from the year 2016-17. On the other hand, for mango pulp, forecasting revealed that in terms of quantity of pulps export to UK, UAE, Netherland and USA would rise and quantity exported to Saudi Arabia, YAR and other countries would decline. UAE and Kuwait for fresh mango and Saudi Arabia, UAE and Netherland for mango pulp were important markets, need more concentration on export promotion to tap the potential. The existing processing units should be strengthened by providing access to information on modern technology, packaging, markets, food laws and hygiene requirements of different markets. Keeping in view the role of export in raising the

producers' income, there is also a need to give free export consultation to these enterprises.

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