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Production, export dynamics and future prospects of fresh mango of India

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ABSTRACT

Mango (Mangiferaindica) is one of potential fruit crops in the tropics, adopted to a wide range of soil and relatively easy to cultivate anywhere in the country in several seasons. It plays a key role to make India top runner in global mango production.Data for a period of 2006-07 to 2015-16 has been analyzedwith respect to area, production, productivity, quantity, and value of export of Indian mangoes. The Markov chain modeland transitional probability matrices was used for forecasting the major global market and nature of export of Indian mango.Results revealed that compound growth rate of area were non-significant whereas compound growth rate (CGR)of production, productivity and value of export were positively significant at 1 per cent level of probability while, the quantity of export was negatively significant at 1 per cent level of probability. The study also revealed that CGR of value of export was 10.81 per cent per annum and quantity of export had shown a decreasing trend with CGR value (-) 7.56 per cent per annum. The countries like the UAE is one of the major market for Indian mango which imported 38.33 per cent quantity and it was greater than half of the value of fresh mango exported from India.Bangladesh is one of the most stable markets of Indian mango as reflected by 82.32 per cent probability of retention in terms of quantity export;the UAE remained at top in total value exported as reflected 75 per cent retention probability.As per these facts, India has a good and significant potential for increasing production, productivity and export of mango crop. Therefore, India mustpay more attention for increasing production with superior quality, supported by favourable export promotion policies. Besides, attempts have to be taken to create new market and expand the trade area to other global major existing markets.

***Keywords*:** Compound growth rate, mango, Markov chain, production, projection, retention

After the implementation of the liberalized economy, the nation has observed the remarkable change in the production sector. Agriculture is also one of them, where the land use pattern is shifting from traditional food grains to high value nutritional based horticultural crops. This phenomenon has a great momentum due to less remunerative prices of stable food grains mainly rice and wheat, in the middle and lower *Indo Gangetic* belts region of the nation. On the other hand, the wide range of natural endowment existing in India is very much favorable for growing a large array of horticultural crops throughout the country. In the horticulture industry, the fruit production and area devotion under mango stand at the top position and it covers 21.83 per cent of total fruits crops area and holds the second rank in total fruits production 35.53 per cent Singh *et al*. (2018).

Today, India has become the world's largest producer of mango with 92.8 thousand million tons of production with coverage of 6.5 thousand hectares acreage. Traditionally, it has the potentiality to earn foreign exchange, while at the same time acting as a source of food security and household income for farmers. In spite of this, the production to export ratio for Indian mango is less than one per cent, which is comparatively very low and has a downward trend as compared to last year. The major export destinations of Indian mango are the USE (60%), the UK (16%), Saudi Arabia (4%) and Kuwait (3%) Sharma and Mathur (2016).Considering the these fact in mind, the present study aims to examine the trend of growth rate of Indian fresh mango in respect of area, production, productivity and export dynamics in terms of quantity and value. Besides future prospect, structural stability, nature and routeof trade had been exercised.

MATERIALS AND METHODS

This study is absolutely based on a time series data on area, production, productivity and export of fresh mango in terms of quantity and value from India. Data obtained from various publications issued by of Agricultural and Processed Food Products Export Development Authority (APEDA)for a period of 2006-07 to 2015-16. The compound growth rate was carried out to determine the growth trend in area, production, productivity, export (quantity and value) by using an exponential form of equation and in modeling time trend. The exponential trend or log-linear as employed by Ahmed *et al*. (2015) was used.

The exponential trend equation for area, production, productivity and quantity and value of export was specified as follows;

$$Y_t = e\beta_o + \beta_i t_i + u_t \quad \ldots \quad (1)$$

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By taking the natural logarithm of both sides, the linear form of the equation was obtained making it amenable to OLS as;

$$\text{Lin } Y_t = \beta_o + \beta_i t_i + u_t \quad \ldots (2)$$

Where:

Y_t = area, production, productivity and quantity and value of export in the year t,

β_o = intercept of the trend equation,

β_i = trend coefficient,

u_t = disturbance term/stochastic term or error term for the year t

From the equation-2, the compound growth rate was computed as follows.

$$r = (e\beta_i - 1)*100 \quad \ldots (3)$$

Where:

r = compound growth rate,

β_i = estimated coefficient from equation -2,

e = euler's exponential constant (=2.71828)

Markov chain analysis

In the present study, the dynamics of trade patterns (gain and loss) and direction Indian mango export was examined using the stationary form of the first order Markov chain model. In this model, involved developing a Transitional Probability Matrix (TPM) explains the shift of exports from one country to another. The diagonal elements 'P' of transitional probability matrix indicate the retention probability and off-diagonal elements represent switching-over probability. The general mathematical form of first order Markov model is (Sharma, 2017)

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

Where :

E_{jt} = Exports from India to the j^{th} country in the year t,

E_{jt-1} = Exports of i^{th}country during the year t-1,

P_{ij} = Probability that exports will shift from i^{th} country to j^{th} country,

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

n = number of importing countries.

The transitional probabilities P_{ij}, which can be arranged in a (Column x Row) matrix, have the following properties.

$$\sum_{i=1}^{n} P_{ij} = 1 \text{ where } 0 \le P_{ij} \le 1$$

Thus, the expected export share of each country during the period 't' is obtained by multiplying the exports to these countries in the previous period (t-1) with the transitional probability matrix (T). It was estimated for the period 2006-07 to 2015-16 by using 'Linear Programming Technique' (LPT) framework referred to as Minimization of Mean Absolute Deviation (MAD).

Min, OP* +I e

Subject to,

XP* + V = Y

GP* = 1

P* e $\geq$ 0

Where,

P* = Vector of the probabilities P_{ij}

O = Vector of zeros

I = Dimensional vectors of areas

e = Vector of absolute errors

Y = Proportion of exports to each country

X = Block diagonal matrix of lagged values of Y

V = Vector of errors

G = Grouping matrix to add the row elements of P arranged in P* to unity

Predictions of the quantity of fresh mango export were made by using the Transitional Probability Matrix.

$$\mathbf{B_t = B_0 * T}$$

$$\mathbf{B_{t+i} = B_{t+i-1} * T}$$

Where,

B_t = Quantity exported in current year,

B_0 = Quantity exported in base year,

B_{t+i} = Quantity exported in next year (prediction),

T = Transitional probability matrix.

RESULTS AND DISCUSSION

The compound growth rates for area, production, productivity and export of mango were analyzed for a period of ten years (2006-07 to 2015-16) and have been presented in the table 1. The results revealed that compound growth rate in area was positive and non-significant whereas compound growth in production, productivity and value of export were positive and significant at 1 per cent level of probability while the quantity of export was negatively significant at 1 per cent.The compound growth rate regarding quantity and value of export, where the growth of value of export was increasing at 10.81 per cent per annum and quantity of export had shown a decreasing trend of 7.56 per cent. This finding is similar to the study of Kusuma and Basavaraja (2014) where the productivity (-0.72% per annum) of mango was negative and could be due to poor management practices adopted by the producers. The quantity of mango export has increasing at 5.56 per cent per annum during the period 2001-02 to 2010-11.

Table 1: Compound growth rates of area, production, productivity and export of fresh mangoes in India (2006-07 to 2015-16)

Particulars	CGR(% Per annum)
Area	0.47^{NS}
Production	4.70*
Productivity	14.83*
Quantity of Export	-7.56*
Value of Export	10.81*

Note: Figures in parentheses indicate in per cent. denotes significant at 1% (P<0.01) level of probability, NS denotes Non Significant, CGR (Compound Growth Rate)*

The compound growth rate of mango production is positive and statistically significant at 1 percent level of probability while the total quantity of mango export is found negative, which implies that the 7.56 per cent export quantity decrease. Even though, growth in value of export has found to be extremely high indicating good potential and more profit for Indian mangoes. The export of mango from India has declined in the countries like the UAE, Bangladesh, the UK, and the Netherlands. While increased in the export of mango from India observed in Kuwait and Saudi Arabia during last six years. The increase in price of exported mango have beenrecorded relatively more in the UAE, the UK, and the Netherlands while it was not increased substantially in Kuwait and Saudi Arabia. The lower prices arereceived in Bangladesh.These results are in line with findings of Bhosale *et al.* (2016).

India's export was spread to around 54 different countries in the world over a last decade. The area under mango cultivation has been increased from 21.54 lakh hectares in 2006-07 to 22.00 lakh hectares in 2015-16 with a compound growth rate of 0.47 per cent per annum. The production has increased from 137.34 lakh metric tons in 2006-07 to 195.17 lakh metric tons with a compound grow rate of 4.70 per cent per annum and productivity increased 6.38 to 8.87 tons per hectare. While, quantity of fresh mango exported from India has been extremely decreased from 79060.8 metric tons to 36329 metric tons which is slightly lower than half of (45.95%) total quantity export over 2006-07 with a decline of compound growth rate of 7. 56 per cent per annum. The share of export out of the total quantity of mango production is very less; this is ranging from only 0.19 percent to 0.66 percent, though India is the top runner in production and significant area devoted under mango cultivation. In spite of these, quantity of fresh mango exported by India is not satisfactory to total fresh mango exported that was less than one per cent during the period of study. These results lines are converse to the findings of Kusama and Basavaraja (2014) where the study found that the quantity of mangoes exported from India was increasing from 44429.32 metric tons to 59220.77 metric tons with a compound growth rate of 5.65 per cent per annum and share of export ranged between 0.30 to 0.70 per cent of total production.

The major export destinations (importing countries) of Indian mangoes were the UAE, Bangladesh, the Netherlands, the UK, Saudi Arabia, Kuwait and others have been presented in table 2. Export of mango to other countries recorded a statistically significant and positive growth rate of 15.55 (P<0.05) per cent and 21.52 (P<0.01) per cent in terms of quantum and value of export. A negative growth rate is recorded in quantity of fresh mangoes export to countries like Bangladesh (-43.59% per annum), the UK (-8.55% per annum) the UAE (-7.83% per annum), the Netherlands (-7.80% per annum) while, a positive compound growth rate were found in countries like Kuwait and Saudi Arabia, but not statistically significant. In total value of mango export revealed that the more than half of (50.08%) total, export alone to the UAE followed by the UK, Bangladesh, Saudi Arabia, Kuwait and the Netherlands. The compound growth rate of export for all countries were found positive except to country like Bangladesh that was extreme decline in value of export which was (-38.66% per annum) and it is highly statistical significant. The countries like Saudi Arabia (17.22% per annum) and Kuwait (16.67% per annum), were revealed that highly positive and statistically significant (P<0.01). The single finding with respect to value of mango export is not uniform with findings of Kusama and Basavaraja (2014) which estimated positive compound growth rate for Bangladesh.

The trade direction, prediction of trade and stability of global mango market has been explored by Markov chain model using both together data of volume and value of export from the current last decade for (2006-07 to 2015-16). The Transitional Probability Matrix presented in table 3 provides a broad indication of changes in the direction of export of fresh mango from India. The major importing countries in terms of quantity were the UAE, Bangladesh, the Netherland, the UK, Kuwait, Saudi Arabia, and all other importing countries were clustered 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, because 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 apparent from table 3 that Bangladesh was the most stable market among the major importers of Indian mango as reflected by the probability of retention at 82.32 per cent followed by the UAE (63.45%) and the Netherland (14.46%).The

Table 2: Destination wise growth rates in export of fresh mangoes from India (2006-07 to 2015-16)

Destinations	Growth rate per annum (%)		Share in total quantity export	Share in total value export
	Quantity	Value	Quantity (%)	Value (%)
U.A.E	-7.83^{NS}	7.98^{NS}	38.33	50.08
UK	-8.55^{NS}	5.52^{NS}	4.02	9.60
Saudi Arabia	4.58^{NS}	17.22*	2.95	4.55
Bangladesh	-43.59*	-38.66*	33.78	9.41
Netherlands	-7.80^{NS}	5.33^{NS}	7.72	2.75
Kuwait	7.17^{NS}	16.67*	2.02	3.12
Others	15.55**	21.52*	13.20	23.24
Total	**-7.56***	**10.81***	**100.00**	**100.00**

Note: Figures in parentheses indicate exports share in per cent. denotes significantat 1% (P<0.01) level of probability, ** denotes significant at 5% (P<0.05) level of probability*

Table 3: Transitional probability matrix for quantity of fresh mangoes export from India (2006-07 to 2015-16)

	U.A.E	U.K	Saudi Arabia	Bangladesh	Netherlands	Others
U.A.E	**0.6345**	0.1201	0.0258	0.0019	0.0215	0.1963
U.K	0.0000	**0.0000**	0.3059	0.0000	0.0000	0.6941
Saudi Arabia	1.0000	0.0000	**0.0000**	0.0000	0.0000	0.0000
Bangladesh	0.1226	0.0083	0.0120	**0.8232**	0.0339	0.0000
Netherlands	0.8554	0.0000	0.0000	0.0000	**0.1446**	0.0000
Others	0.4932	0.0000	0.0463	0.0000	0.2935	**0.1671**

Table 4: Transitional probability Matrix for value of fresh mangoes export from India (2006-07 to 2015-16)

	U.A.E	U.K.	Saudi Arabia	Bangladesh	Kuwait	Others
U.A.E	**0.74570**	0.00484	0.06273	0.00000	0.03438	0.15234
U.K.	0.00000	**0.00000**	0.00000	0.61285	0.00000	0.38715
Saudi Arabia	1.00000	0.00000	**0.00000**	0.00000	0.00000	0.00000
Bangladesh	0.19559	0.40902	0.02693	**0.36166**	0.00680	0.00000
Kuwait	0.00000	1.00000	0.00000	0.00000	**0.00000**	0.00000
Others	0.61061	0.04862	0.05918	0.00000	0.04908	**0.23250**

most unstable markets among the importing countries were the UK and Saudi Arabia with the zero per cent retention.

Transitional Probability Matrix in terms of value export from the table 4 revealed that the UAE was most stable market as reflected by the probability of retention at 75 per cent followed by Bangladesh (36.20%). The most unstable markets among the value of fresh mango exporting countries were the UK, Saudi Arabia, and Kuwait with the zero per cent retention. The market share projections of Indian fresh mango exports to major importing countries like Bangladesh were computed up to 2019-2020 using the transitional probability matrix. Table 5 presents the actual and predicted quantity of Indian mango exports to major importers from 2006-07 to 2015-16 and projections up to 2015-16. The actual share of Bangladesh had shown a fluctuation. Overall, it had increased from 2.38 to 4.12 per cent. Parallel picture was obtained in prediction of export share too, where the increases was ranging from 2.01 per cent to 3.50 per cent.

The prediction for 2015-16 to 2019-20 suggested a decrease from 1093.25 tons to 710.54 tons (Table 5). With regard to actual share of the U.A.E in fresh mango, export had shown fluctuation over the study period (2006-07 to 2015-16) taken as a whole, it had increased from 27.88 to 54.98 per cent. Similar representation was in prediction of export share too, where the increase was from 31.39 per cent to 68.43 per cent. The estimation of fresh mango export from India in terms of quantity for the period of 2015-16 to 2019-20 suggested an increase from 20960.85 to 21347.29 tons. The actual quantity of fresh mango of the Netherlands market share showed an increasing trend from 1.67 per cent to 3.38 per cent and

Table 5: Actual and predicted quantity of fresh mangoes export from India to selected countries (Quantity in tons)

Year	U.A.E		U.K.		Saudi Arabia		Bangladesh		Netherlands		Others	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2006-07	22045.50	24819.54	42887.50	2662.32	8055.70	13841.38	1883.20	1592.57	1323.60	1569.40	2865.30	34575.60
	(27.88)	(31.39)	(54.25)	(3.37)	(10.19)	(17.51)	(2.38)	(2.01)	(1.67)	(1.99)	(3.62)	(43.73)
2007-08	22469.60	24976.31	17063.60	2718.97	7550.90	5977.23	2575.40	2163.19	1489.00	1724.78	3202.20	16790.22
	(41.34)	(45.95)	(31.40)	(5.00)	(13.89)	(11.00)	(4.74)	(3.98)	(2.74)	(3.17)	(5.89)	(30.89)
2008-09	24570.90	24184.41	45104.50	2970.85	4765.00	14746.09	2527.40	2127.72	546.10	2508.57	6189.40	37165.66
	(29.35)	(28.89)	(53.89)	(3.55)	(5.69)	(17.62)	(3.02)	(2.54)	(0.65)	(3.00)	(7.39)	(44.40)
2009-10	25608.20	25895.28	33549.90	3098.96	4058.20	11195.07	2958.70	2484.75	3147.10	2613.24	5138.60	29173.40
	(34.39)	(34.78)	(45.06)	(4.16)	(5.45)	(15.03)	(3.97)	(3.34)	(4.23)	(3.51)	(6.90)	(39.18)
2010-11	25474.50	21836.10	23049.70	3080.94	1991.30	7926.34	2721.90	2289.56	1582.40	2054.69	4043.60	21675.77
	(43.28)	(37.10)	(39.16)	(5.23)	(3.38)	(13.47)	(4.62)	(3.89)	(2.69)	(3.49)	(6.87)	(36.82)
2011-12	22013.90	22703.47	27599.50	2663.90	3925.70	9269.99	2532.40	2126.92	2388.60	2365.71	4981.10	24311.20
	(34.70)	(35.79)	(43.50)	(4.20)	(6.19)	(14.61)	(3.99)	(3.35)	(3.77)	(3.73)	(7.85)	(38.32)
2012-13	37598.60	30945.78	4650.20	4541.36	2237.60	2714.08	3304.50	2792.43	1665.40	2958.62	6128.70	11632.74
	(67.64)	(55.67)	(8.37)	(8.17)	(4.03)	(4.88)	(5.94)	(5.02)	(3.00)	(5.32)	(11.03)	(20.93)
2013-14	23046.70	22116.28	2899.90	2794.93	1106.40	1943.39	3381.10	2827.55	1721.90	3536.09	9123.90	8061.66
	(55.83)	(53.58)	(7.02)	(6.77)	(2.68)	(4.71)	(8.19)	(6.85)	(4.17)	(8.57)	(22.10)	(19.53)
2014-15	3381.10	22938.32	2475.30	408.66	3574.90	2285.52	329.80	277.98	2171.50	9515.03	31065.70	7572.79
	(7.86)	(53.35)	(5.76)	(0.95)	(8.31)	(5.32)	(0.77)	(0.65)	(5.05)	(22.13)	(72.25)	(17.61)
2015-16	19973.60	24861.03	46.30	2410.37	8273.00	784.41	1496.28	1270.08	1399.00	2190.26	5139.90	4811.94
	(54.98)	(68.43)	(0.13)	(6.63)	(22.77)	(2.16)	(4.12)	(3.50)	(3.85)	(6.03)	(14.15)	(13.25)
2016-17		20960.85		2995.27		1615.52		1093.25		2305.66		7357.53
2017-18		20649.73		2525.56		1809.62		940.20		2979.73		7423.24
2018-19		21236.66		2486.94		1659.14		813.61		3084.63		7047.11
2019-20		21347.29		2556.36		1643.52		710.54		2997.71		7072.67

Note: Figures in parentheses indicate quantity exports share in percent

Table 6: Actual and Predicted quantity of fresh mangoes export from India to selected countries (value in Lakhs)

Year	UAE		UK		Saudi Arabia		Bangladesh		Kuwait		Others	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2006-07	6581.00	9981.58	1141.30	706.26	422.30	520.80	3994.80	852.17	422.30	309.26	1632.30	1823.93
	(46.36)	(70.32)	(8.04)	(4.98)	(2.98)	(3.67)	(28.14)	(6.00)	(2.98)	(2.18)	(11.50)	(12.85)
2007-08	6320.90	7667.68	1981.70	625.90	459.80	531.86	1595.50	1380.77	306.20	322.44	2077.80	2213.25
	(49.61)	(60.18)	(15.55)	(4.91)	(3.61)	(4.17)	(12.52)	(10.84)	(2.40)	(2.53)	(16.31)	(17.37)
2008-09	7818.30	11804.92	1403.70	743.99	398.80	676.71	4085.70	1004.49	398.80	417.10	2966.00	2424.10
	(45.80)	(69.15)	(8.22)	(4.36)	(2.34)	(3.96)	(23.93)	(5.88)	(2.34)	(2.44)	(17.37)	(14.20)
2009-10	10383.00	12988.53	1746.90	1255.00	1345.40	851.05	3295.80	1557.16	520.10	501.74	2762.70	2900.41
	(51.78)	(64.77)	(8.71)	(6.26)	(6.71)	(4.24)	(16.43)	(7.76)	(2.59)	(2.50)	(13.78)	(14.46)
2010-11	10318.30	10799.17	1455.40	783.30	618.30	772.90	1859.40	1115.56	390.90	449.35	1841.50	2563.52
	(62.60)	(65.51)	(8.83)	(4.75)	(3.75)	(4.69)	(11.28)	(6.77)	(2.37)	(2.73)	(11.17)	(15.55)
2011-12	10736.70	14020.71	1641.60	1207.61	1169.70	872.36	4058.90	1429.09	539.70	515.90	2827.70	2928.64
	(51.19)	(66.85)	(7.83)	(5.76)	(5.58)	(4.16)	(19.35)	(6.81)	(2.57)	(2.46)	(13.48)	(13.96)
2012-13	16286.60	15642.11	3250.10	1654.71	1200.40	1294.93	776.30	2425.96	886.90	767.96	4071.40	4686.02
	(61.52)	(59.09)	(12.28)	(6.25)	(4.53)	(4.89)	(2.93)	(9.16)	(3.35)	(2.90)	(15.38)	(17.70)
2013-14	17231.10	16132.48	4545.00	1615.36	1219.00	1369.00	411.00	3226.26	823.60	812.44	4313.30	5387.47
	(60.37)	(56.52)	(15.92)	(5.66)	(4.27)	(4.80)	(1.44)	(11.30)	(2.89)	(2.85)	(15.11)	(18.88)
2014-15	4545.00	17552.39	606.40	2912.33	1428.60	1623.27	473.40	888.30	1238.20	1243.96	21962.10	6033.46
	(15.02)	(58.02)	(2.00)	(9.63)	(4.72)	(5.37)	(1.56)	(2.94)	(4.09)	(4.11)	(72.59)	(19.94)
2015-16	19199.40	18513.55	3205.70	2383.97	1675.20	1623.77	7.01	2570.46	1298.30	981.93	6324.50	5636.43
	(60.55)	(58.38)	(10.11)	(7.52)	(5.28)	(5.12)	(0.02)	(8.11)	(4.09)	(3.10)	(19.94)	(17.77)
2016-17		20135.35		2009.79		1538.65		2048.27		924.23		5053.83
2017-18		20450.15		1896.80		1603.61		1788.16		950.81		5020.58
2018-19		20417.20		1949.86		1623.14		1742.41		960.45		5017.06
2019-20		20348.54		1967.15		1621.39		1782.00		959.27		5031.76

Note: Figures in parenth indicate quantity exports share in percent

the predicted quantity of export share has increased from 2305.66 tons in 2016-17 to 2997.71 tons (1.99 to 6.03%).

The actual protuberance of the UK market shares of imports from India showed a decreasing trend from 54.25 per cent to 0.13 per cent. The predicted export share increased from 3.37 per cent to 6.63 per cent during the study and the estimation for 2019-20 suggested a decrease from 2995.27 tons in 2016-17 to 2556.36 tons. The actual projection of Saudi Arabia market shares of imports from India showed an increasing trend from 10.19 per cent to 22.77 per cent while, predicted export share declined greater quantity from 17.51 per cent to 2.16 per cent. The estimation for 2019-20 suggested a slight increase from 1615.52 tons in 2016-17 to 1643.52 tons. The actual and predicted proportion of exports to other countries showed an increasing trend *i.e.,* increased from 3.62 per cent to 14.15 per cent. The prediction export share showed a decreasing trend from 43.73 per cent to 13.25 per cent. The estimation for 2019-20 suggested a decrease from 7357.53 to 7072.67 tons.

From the table 6 presents the actual and predicted value export to major global markets. The actual proportion of the UAE market share of value imports from India showed an increasing trend from 46.36 to 60.55 per cent. The predicted export share also increased from 70.32 to 58.38 per cent, which suggested a decrease from 20135.35 lakhs in 2016-17 to 20348.54 lakhs during last decade (2006-07 to 2015-16). The actual proportion of Bangladesh market share of value imports from India showed a decreasing trend from 28.14 to 0.02 per cent. The predicted export share also increased from 6.00 to 8.11 per cent during the study and the estimation for 2019-20 suggested a decrease from 2048.27 lakhs in 2016-17 to 1782 lakhs.

The actual proportion of the UK market share of value imports from India shows increasing trend from 8.04 to 10.11 per cent. The predicted export value share also increased from 4.98 to 7.52 per cent. The estimation for the year 2019-20 suggested a decrease from 2009.79 lakhs in 2016-17 to 1967.15 lakhs. There was an increasing trend from 2.98 to 5.28 per cent of actual proportion of Saudi Arabia market share of value imports. The predicted export value share increased from 3.67 to 5.12per cent. As per estimation of 2019-20, it suggested an increase from 1538.65 lakhs in 2016-17 to 1621.39 lakhs. From the Kuwait market, the actual proportion share of value imports from India shows increasing trend, which was measured 2.98 to 4.09 per cent. The predicted export value share also increased from 2.13 to 3.10 per cent. The 2019-20 estimation suggested that there was an increase from 924.23 lakhs in 2016-17 to 959.27 lakhs. The actual and predicted proportion of exports share of India's mango exports to all over the world showed an increasing trend *i.e.,* from 11.50 to 19.94 per cent. The prediction export share also showed an increasing trend from 12.85 to 17.77 per cent. The annual estimation of 2019-20 suggested slight decrease from 5053.83 to 5031.76 lakhs.

The study found that the total area under mango cultivation of the country has increased with relatively slow and positive significant growth rate for the periods 2006-07 to 2015-16. Although India is the largest producer of mango in the world but the share of export isvery less out of the total quantity of mango produced. It ranges 0.19 to 0.66 per cent during the period 2006-07 to 2015-16. The six major Indian mango export destinations (importing countries) were the UAE (38.33%), Bangladesh (33.78%), the Netherlands (7.72%), the UK (4.02%), Saudi Arabia (2.92%) and Kuwait (2.02%). Bangladesh is one of the most stable favorite export destination or market since it has retained its original share of 82.32 percentover the period (2006-07 to 2015-16). The UAE is a second most stable market as it is able toretain their probability of retention at 63.45 percent. The increase in the price of exported mangos is relatively more in the UAE, the UK, and the Netherlands while it has not up to the mark in Kuwait and Saudi Arabia. The Markov-Chain Analysis for mango indicates high dependence on a few export markets *viz.*, Middle-east countries (U.A.E, Saudi Arabia, Kuwait) which would increase the trade risk in the long run. Therefore, India should pay more attention to adoption of favourable export promotion strategies need to evolve to diversify the trade area to other countries and to find new markets besides expanding the existing market in major importing countries.

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