

Direction of trade analysis of Indian grapes

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ABSTRACT

The study was conducted to analyse the changing direction of trade of Indian grapes. Markov chain analysis was employed to analyse the secondary data collected from APEDA and NHB for direction of trade for the period 2000-01 to 2010-11. The other countries category, Bangladesh, UK and Netherlands were the most stable markets for Indian fresh grapes and Germany was the most unstable market tending to lose its entire share to other countries. Analysis of the losses and gains in market share indicated, Bangladesh as the major net gainer. The results of the Markov chain analysis revealed that, Bangladesh, UK, Netherlands, Saudi Arabia, UAE and other countries were important markets for fresh grapes. India can concentrate on export promotion in these countries to tap the import potential for Indian grapes and international trade fairs, exhibitions etc., which may be organized to gain knowledge about the quality preference and thereby planned measures could be initiated to promote the required quality of grapes of the needy country.

KEY WORDS : Markov chain analysis, Stable market, Net gainer

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The growing importance of horticulture in strengthening the Indian economy has been realized of late. The contribution of agriculture towards national income was about 14.2 per cent as on 2009-10. Horticulture from an area of just 8.5 per cent of the gross cropped area of the country is estimated to have contributed over 24.5 per cent to the agriculture GDP of India. It is potential source of employment especially for the youth and women in the rural area where 72.2 per cent of the Indian population resides. The income generation through effective horticulture farming is higher as compared to agriculture farming. Horticultural farming has also increased the sustainability of the small land holding, helping the small

and medium farmers who form the majority of farmers in India, to increase their per capita income. This in turn has increased the disposal income of the rural population and helped the overall economic development of the country. The process of globalization initiated in the early nineties has resulted in free flow of goods including agriculture goods across international borders. The Indian farmer is being exposed to numerous challenges because of the growing phenomenon. However, if the challenges are overcome which opens up a great opportunity for horticulture exports from India since the country grows a variety of fruits of excellent quality. The Indian peasants need support from all the concerned stake holders to harness the growing opportunities for horticulture exports to different global markets.

Grape occupies the 9th position among all fruits production in the country accounting only 1.6 per cent of total fruit production. It is next only to apple, pineapple and sapota in terms of production. The current area and production under grapes in India is estimated at 1.11 lakh ha with an annual production of 12.35 lakh tonnes. While 78 per cent of grapes produced is used for table purpose, nearly 20 per cent is dried for raisin production and 2 per cent is

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used for manufacturing of juice and wine. Grapes exports from India started during 1970 with an export of only 3 tonnes to Asian countries. Remunerative prices offered by these countries led to an increase in grapes export, while import market for Indian grapes widened to European countries during 1990-91.

Total export of grapes during 2010-11 was 99,270 tonnes worth 411.98 crores, which amounted for 80 per cent of the total production of grapes as against 24 per cent of all fruits grown in India. The major importers of Indian grapes are Netherlands, Bangladesh, UK, UAE, Russia, Saudi Arabia, Belgium, Thailand, Sweden, Norway, Oman, Bahrain, Sri Lanka, Mauritius, USA, Singapore and Hong Kong etc. Indian fresh grapes are highly competitive in the international market because of cultivation of Thompson Seedless a highly preferred variety with higher productivity and also lower cost of production (being a very labour intensive crop and the labour input being comparatively cheaper than other major grape producing countries). Also, grapes cultivation being largely in the hands of progressive and well-to-do farmers with better managerial abilities has made Indian grapes highly competitive. Hence, the present study was undertaken with the objectives of assessing direction of trade in grapes.

METHODOLOGY

Secondary data for the study were collected from various published sources. Data on destination wise exports were obtained from “APEDA. Annual export data for period 2000-01 to 2010-11 were used to analyze the direction of trade and changing pattern of Indian grapes export. The major Indian grapes importing countries considered were UK, Bangladesh, Netherlands, Germany, Sri Lanka, Saudi Arabia, and UAE. Estimation of the exports was done for the study period using Markov chain analysis.

Markov chain analysis is employed to analyze the structural change in any system whose progress through time can be measured in terms of single outcome variable. In the present study, the dynamic nature of trade patterns that is the gains and losses in export of Indian grapes in major importing countries was examined using the Markov chain model. Markov chain analysis involves developing a transitional probability matrix ‘P’, whose elements, P_{ij} indicate the probability of exports switching from country ‘i’ to country ‘j’ over time. The diagonal element P_{ij} where $I=j$, 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.

In the context of current application, structural change was treated as a random process with seven importing countries for grapes, the assumption was that the average export of grapes from India amongst importing

countries in any period depends only on the export in the previous period and this dependence was same among all the periods.

This was algebraically expressed as:

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

where,

- E_{jt} = exports from India to the j^{th} country in the year t
- E_{it-1} = exports of i^{th} country during the year t-1
- P_{ij} = the probability that exports will shift from i^{th} country to j^{th} country
- e_{jt} = the error term which is statistically independent of E_{it-1}
- n = the number of importing countries.

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

$$\text{And } 0 \leq P_{ij} \leq 1 \quad \dots\dots(2)$$

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 2000-01 to 2010-11.

Thus, transitional probability matrix (T) was estimated using linear programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD).

$$\text{Min. OP}^* + Ie \quad \dots\dots(3)$$

Subject to,

$$\begin{aligned} X P^* + V &= Y \\ GP^* &= 1 \\ P^* &\geq 0. \end{aligned}$$

where,

- P^* is a vector of the probabilities P_{ij}
- O is the vector of zeros.
- I is an appropriately dimensional vectors of areas.
- 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.
- G is a grouping matrix to add the row elements of P arranged in P^* to unity.

Prediction of quantity of fresh grapes export was made by using the Transitional Probability Matrix:

$$B_t = B_0 * T \quad \dots\dots(4)$$

$$B_{t+1} = B_{t+1} * T$$

where,

B_0 = Quantity exported in base years.

B_t = Quantity exported in next year (prediction).
 T = Transitional probability matrix.

ANALYSIS AND DISCUSSION

The transitional probability matrix presented in Table 1 provides a broad indication of changes in the direction of export of fresh grapes from India for the study period (2000-01 to 2010-11). The major Indian fresh grapes importing countries were Bangladesh, Germany, Netherlands, UK, UAE, Saudi Arabia and all other importing countries were grouped under the category of the other countries. The transitional probability matrix was obtained for the study period by using the actual proportion of exports to different importing countries. This matrix explained the changing direction of Indian fresh grapes trade among importing countries which was necessary for taking the proper decision in view of their expected changes.

Bangladesh was one of the most stable markets among the major importers of Indian grapes as reflected by the probability of retention at 0.68440, *i.e.*, the probability that Bangladesh retained its export share over the study period was 68 per cent. Thus, Bangladesh was the most reliable and loyal market for Indian grapes. Fresh grapes export to Bangladesh was retained to the tune of 68 per cent of its previous year's share in the current period; of the remaining 32 per cent of Bangladesh market share, 20 per cent was directed to Netherland, 5.8 per cent to Saudi Arabia, 5.10 per cent to UAE and 0.11 per cent to Germany.

United Kingdom (UK) had the probability of retention of 0.50058, which retained its export share of 50 per cent. This implied that it had lost half of its share to other importing countries; of the remaining 50 per cent of UK market share, 45.07 per cent was directed to UAE and 4.86 per cent to Germany. Netherlands had moderate probability retention of 0.45505, which retained its export share of 45.50 per cent. This implied that it had lost most of its share to other importing countries; of the remaining 54.50 per cent of Netherlands market share, 32.81 per cent was lost to UAE, 18.41 per cent to other countries and 3.27 per cent was to Germany.

The remaining countries such as Saudi Arabia and UAE had the retention of 42.74 per cent and 30.74 per cent of its

original share. This implied that they were also the stable importers of Indian grapes, whereas those countries, which imported grapes in less quantity from India, were pooled under the 'other' countries showing high stability, which retained 80.37 per cent of its original share. The entire share of Germany grapes market was directed to Bangladesh of 65.19 per cent and 34.81 per cent to Netherlands. Totally, 100 per cent of Germany's share of grapes imports from Indian was lost to Bangladesh and Netherlands. However, Germany gained 4.86 per cent of UK market share, 3.27 per cent of Netherlands market share, 4.65 per cent of others countries and less 1 per cent from UAE and Bangladesh.

The major gainer among importers of Indian grapes over a period of time has been Bangladesh, which having a transfer probability of 0.65192 from Germany and 0.32810 from Netherlands. The probability that Bangladesh would gain in the export share of Indian grapes over the study period at the cost of Germany and Netherlands were 0.65192 and 0.32810, respectively. Therefore, Bangladesh loses about 31.56 per cent of its total imports. Netherlands could retain its original share of 45.50 per cent and gained 34.80 per cent from Germany, 20.50 per cent from Bangladesh, 20.36 per cent from UAE and 14.98 per cent from other countries. Whereas it lost its share to the tune of 32.80 per cent to Bangladesh and 18.41 per cent to other countries and 3.27 per cent to Germany.

United Kingdom sustained its original share of 50.05 per cent and gained 42.73 per cent from UAE. Whereas it lost 45.08 per cent to UAE and 4.87 per cent to Germany. Therefore, UK lost about 49.95 per cent and retained the rest. UAE had retained its original share of 30.75 per cent and gained 45.08 per cent from UK and 5.10 per cent from Bangladesh. Whereas it lost 42.73 per cent, 20.37 per cent, 5.72 per cent and 0.43 per cent to UK, Netherlands, other countries and Germany, respectively. Saudi Arabia sustained its original share of 42.74 per cent and gained 5.83 per cent from Bangladesh. Whereas it lost 57.26 per cent to only other countries group. Therefore, Saudi Arabia lost totally about 57.26 per cent and retained the rest. Other countries retained its original share of 80.37 per cent and gained 57.26 per cent from other countries, 18.41 per cent from Netherlands and 5.73 per cent from Saudi Arabia. Whereas

Table 1: Transitional probability matrix for fresh grapes export from India (2000-01 to 2010-11)

Destination	Bangladesh	Germany	Netherlands	UK	UAE	Saudi Arabia	Others
Bangladesh	0.68440	0.00117	0.20506	0.00000	0.05103	0.05833	0.00000
Germany	0.65192	0.00000	0.34808	0.00000	0.00000	0.00000	0.00000
Netherland	0.32810	0.03273	0.45505	0.00000	0.00000	0.00000	0.18412
UK	0.00000	0.04865	0.00000	0.50058	0.45076	0.00000	0.00000
UAE	0.00000	0.00432	0.20369	0.42729	0.30746	0.00000	0.05725
Saudi Arabia	0.00000	0.00000	0.00000	0.00000	0.00000	0.42743	0.57257
Others	0.00000	0.04651	0.14981	0.00000	0.00000	0.00000	0.80368

Table 2: Actual and predicted quantity of fresh grapes export from India to selected countries (Qty in tonnes)

Years	Bangladesh		Germany		Netherlands		UK		UAE		Saudi Arabia		Others	
	A	P	A	P	A	P	A	P	A	P	A	P	A	P
2000-01	550.30 (2.67)		1328.00 (6.43)		1705.50 (8.26)		8567.10 (41.50)		4992.90 (24.18)		477.40 (2.31)		3024.78 (14.65)	
2001-02	248.20 (1.70)	1801.94 (8.73)	280.30 (1.92)	535.50 (3.08)	1347.10 (9.23)	2821.33 (13.67)	5042.40 (34.57)	6421.98 (31.11)	4829.70 (33.11)	5424.943 (26.28)	620.80 (4.26)	236.15 (1.14)	2213.61 (15.21)	3304.14 (16.00)
2002-03	526.70 (2.06)	794.58 (5.45)	724.90 (2.84)	413.73 (2.84)	3546.80 (14.25)	2077.58 (14.24)	8887.80 (34.76)	4587.83 (31.45)	6617.10 (25.88)	3770.539 (25.85)	489.70 (1.92)	279.82 (1.92)	4673.01 (18.28)	2663.01 (18.26)
2003-04	2125.50 (7.94)	2029.56 (7.94)	1381.00 (8.89)	798.38 (3.12)	4260.10 (15.91)	4068.00 (15.91)	6618.60 (24.71)	7276.52 (28.46)	4685.30 (17.49)	6067.675 (23.73)	249.90 (0.93)	240.03 (0.94)	6463.39 (24.13)	5087.84 (19.90)
2004-05	14724.00 (37.43)	4404.65 (16.45)	1151.00 (2.93)	784.77 (2.93)	7529.30 (19.14)	5125.85 (19.14)	5889.00 (14.97)	5315.15 (19.84)	5476.00 (13.92)	4532.433 (16.92)	163.00 (0.41)	230.79 (0.86)	4408.00 (11.20)	6390.15 (23.86)
2005-06	13933.00 (25.97)	13297.77 (33.80)	2992.00 (5.79)	778.86 (1.98)	12133.00 (23.49)	8621.85 (21.92)	11319.00 (21.91)	5287.79 (13.44)	7046.00 (13.64)	5089.548 (12.94)	345.00 (0.67)	928.52 (2.36)	3884.00 (7.52)	5335.65 (13.56)
2006-07	25716.00 (29.94)	15467.15 (29.94)	6137.00 (7.14)	1175.21 (2.28)	15021.00 (22.14)	11436.80 (22.14)	13638.00 (15.88)	8676.81 (16.80)	8140.00 (9.48)	7979.549 (15.45)	1115.00 (1.30)	960.17 (1.86)	12130.00 (14.12)	5956.31 (11.53)
2007-08	37995.00 (39.18)	27841.70 (32.41)	2162.00 (2.23)	1915.54 (2.23)	24379.00 (25.14)	19540.38 (22.75)	11640.00 (12.00)	10305.12 (12.00)	9686.00 (9.99)	9962.504 (11.60)	2403.00 (2.48)	1976.59 (2.30)	8699.00 (8.97)	14355.16 (16.71)
2008-09	54509.00 (43.74)	35412.08 (36.52)	1304.00 (1.05)	1855.22 (1.91)	24341.00 (19.53)	22913.78 (23.63)	12758.00 (10.24)	9965.54 (10.28)	13064.00 (10.48)	10163.79 (10.48)	3489.00 (2.80)	3243.35 (3.34)	15161.00 (12.17)	13410.24 (13.83)
2009-10	45656.00 (34.83)	46142.51 (37.02)	2356.00 (1.80)	2242.87 (1.80)	25074.00 (22.15)	27640.42 (22.18)	14360.00 (10.95)	11968.59 (9.60)	13205.00 (10.07)	12549.03 (10.07)	5099.00 (3.89)	4670.80 (3.75)	21341.00 (16.28)	19411.79 (15.58)
2010-11	38563.00 (38.84)	42322.19 (32.28)	741.00 (0.75)	2753.37 (2.10)	17700.00 (17.83)	29299.49 (22.35)	7749.00 (7.81)	12830.77 (9.79)	10384.00 (10.46)	12862.75 (9.81)	4058.00 (4.09)	4842.56 (3.69)	20083.00 (20.23)	26179.87 (19.97)
2011-12		32683.07 (32.92)		1980.46 (1.99)		21344.00 (21.50)		8316.02 (8.38)		8653.453 (8.72)		3983.88 (4.01)		22317.12 (22.48)
2012-13		30662.45 (30.89)		2216.85 (2.23)		22210.10 (22.37)		7860.41 (7.92)		8076.93 (8.14)		3609.22 (3.64)		24642.05 (24.82)
2013-14		29717.79 (29.93)		2326.30 (2.34)		22503.02 (22.67)		7386.00 (7.44)		7591.19 (7.55)		3331.22 (3.36)		26422.48 (26.61)
2014-15		29238.73 (29.45)		2392.41 (2.41)		22648.49 (22.81)		6940.96 (6.99)		7179.79 (7.23)		3157.29 (3.18)		27720.32 (27.92)

Note: A-Actual exports in tones, P- Predicted exports in tones, Figures in parenthesis indicate exports share in per cent

it lost 14.98 per cent and 4.65 per cent to Netherlands and Germany, respectively. Therefore, the total loss of other countries was 19.63 per cent. This was indicative that both European and Gulf countries were the most potential markets of Indian fresh grapes and India needs to hold its share intact for the recent competition from other countries. These results are in conformity with the study conducted by Desai (2002) and Patil (2006).

The market share projections of Indian fresh grapes exports to the major importing countries were computed up to 2014-2015 using the transitional probability matrix. Table 2 presents the actual and estimated values of Indian grapes exports to major importers from 2000-01 to 2010-11 and also projections up to 2014-15. The actual share of Bangladesh in fresh grapes export had shown fluctuation over the study period (2000-01 to 2010-11) but on the whole it had increased from 2.67 per cent to 38.84 per cent. Similar picture was in prediction of export share too, where the increase was from 8.73 per cent to 32.28 per cent. The estimation for 2014-15 suggested a slight decline from 32.28 per cent to 29.45 per cent. Regarding the quantum of exports of grape, the actual value increased from 550.30 tonnes to 38563.00. The estimate for 2014-15 was likely decline by 29238.73 tonnes.

Regarding Germany, the actual and predicted export share showed a decreasing trend from 6.43 per cent to 0.75 per cent and 3.08 to 2.10 per cent, respectively from 2000-01 to 2010-11. The actual quantum of exports showed an erratic trend during the study period but predicted value was increasing. The estimation for 2014-15 also was likely to decrease from 2753.37 tonnes (2010-11) to 2392.41 tonnes (2014-15). The actual proportion of Netherlands market share of imports from India showed a rising trend from 8.26 per cent to 17.83 per cent. The predicted export share also increased from 13.67 per cent to 22.35 per cent over the study. The actual and predicted quantum of exports also followed a similar trend. The estimation for 2014-15 suggested a decrease from 29299.49 tonnes in 2010-11 to 22648.49 tonnes. Regarding the UK, the actual and predicted quantum and also the proportion of exports showed an erratic trend. But on the whole the actual proportion of India's exports to UK decreased from 41.50 per cent to 7.81 per cent. The predicted proportion showed a decline from 31.11 to 9.79 per cent. With regard to quantum of exports, the actual values decreased from 8567.10 tonnes to 7749.00 tonnes and predicted value increased from 6421.98 tonnes to 12830.77 tonnes in 2010-11. But, predicted value for future was found to be decreasing and will reach 6940.96 tonnes in 2014-15. With regard to UAE, the actual market share of India's fresh grape exports decreased from 24.18 per cent to 10.46 per cent whereas the predicted share decreased from 26.28 per cent to 9.81 per cent from 2000-01 to 2010-11. But

regarding the export quantum, both actual and predicted exports observed an increase. The estimation was also likely to decrease from 12862.75 tonnes to 7179.79 tonnes during the study period.

The actual proportion of exports share of India's grapes exports to Saudi Arabia showed an increasing trend of 2.31 per cent to 4.09 per cent and also the prediction from 1.14 per cent 3.69 per cent. But the actual quantity of exports increased from 477.40 tonnes to 4058.00 tonnes and the prediction also increased from 236.15 tonnes to 4842.56 tonnes during 2000-01 to 2010-11. The estimation was also likely decreased from 4842.56 tonnes in 2010-11 to 3157.29 tonnes in 2014-15. Considering the other imports, both the actual and predicted exports shares increased during the study period. The actual share increased from 14.65 per cent to 20.23 per cent and the predicted export share of India's export share to others also increased from 16.00 per cent to 19.97 per cent. The quantum of export witnessed a similar picture. The prediction for 2014-15 was expected to increase slightly from 26179.87 in 2010-11 to 27720.32 tonnes. It appears that India needs to strive to improve its export shares to these three major importers by improving upon the quality of grapes exports and also by improving the yield levels. 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.

Conclusion:

The results of the Markov chain analysis revealed that Bangladesh, UK, Netherlands, Saudi Arabia, UAE and other countries were important markets for fresh grapes. India can concentrate on export promotion in these countries to tap the import potential for Indian grapes and international trade fairs, exhibitions etc., may be organized to gain knowledge about the quality preference and thereby planned measures could be initiated to promote the required quality of grapes of the needy country.

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