Impact of Globalization on Production and Export of Turmeric in India – An Economic Analysis

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Abstract

India is a major supplier of turmeric to the world with more than 60 per cent share in turmeric trade. The production and export performance of turmeric in India have been examined using secondary data for the period from 1974-75 to 2007-08 and exponential form of growth function has been used for the analysis. The growth in production and export of turmeric has been reported significant, because of the high demand coupled with inflation. Instability index has been worked for the production and export for pre-liberalization and post-liberalization periods. Instability has been observed high for production, export and prices of domestic and international markets and domestic and international prices have shown high integration. For the assessment of direction of trade, the Markov chain model has been used. The data regarding country-wise export of turmeric has shown that the previous export share retention for Indian turmeric has been high in minor importing countries (pooled under others category) (87 %), followed by UAE (49 %), Iran (41 %) and UK (35 %). The countries such as USA and Japan have not been the stable importers of Indian turmeric. The plans for export may be oriented towards these two countries and also plans should be formulated for stabilizing the export of turmeric to other countries. The farmers should be provided training on production of a quality product.

Key words: Turmeric, Export of turmeric, Indian turmeric, Markov chain model

JEL Classification: Q13, Q17

Introduction

India is popularly known as the "Spice Bowl of the World" as a wide variety of spices with premium quality is grown in the country since ancient times. In Vedas, as early as 6000 BC, scruples evidences are available regarding various spices, their properties and utility. Among the commodities that were traded during that period, spices occupied a major portion due to their superior quality and diversity which attracted foreigners to India. Turmeric — the Golden Spice — is widely cultivated in different countries such as India, China, Myanmar, Nigeria, Bangladesh, Pakistan, Sri Lanka, Taiwan, Burma, Indonesia, etc. Among these countries,

India occupies the first position in area, viz. 1,75,300 ha and also in production, viz.7,94,400 tonnes during 2007-08. In India, turmeric is grown in its 18 states. The states like Andhra Pradesh, Tamil Nadu, Karnataka, Orissa and West Bengal are the major turmeric-producing states in India. The major countries that export turmeric are: India, China, Myanmar and Bangladesh. Indian turmeric fetches a premium price due to its superior quality in the international market. India has occupied around 60 per cent of the world trade in turmeric.

Raveendran and Aiyaswamy (1982) had analysed the growth in quantity exported and export prices of turmeric in India. They had observed a cyclic pattern of variation in prices with a length of three to seven

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years. They had also found a high correlation between export price and domestic price of turmeric. Mamatha (1995) has estimated the growth rates of production and export of selected spices including turmeric. She has observed a positive growth rate in respect of production and export of these spices. Kumar and Sankaran (1998) have analysed the instability in turmeric production in India and have concluded that decrease in area instability has been compensated by the marginal increase in the yield instability during 1980s. The resulting reduction in production instability indicated that the yield instability was the dominant factor compensating production instability. Nair (2002) has studied the impact of monsoons on the prices of the spices in two states — Andhra Pradesh and Karnataka, which are the leading suppliers of chilli, turmeric and ginger as raw materials for the processing industries.

India's share of 90 per cent of world trade in turmeric during the pre-liberalization period was drastically reduced to 60 per cent during 2007-08. During this era of globalization, it is imperative to re-assess the nations supplying potential, domestic and international demand scenarios and export potential. Keeping in view the above points, the present study has analyzed production, price behaviour and export potential of turmeric in India. The specific objectives of the study were: to estimate the growth and instability in area, production, productivity and export of turmeric in India, to study the extent of price integration of turmeric in domestic and international markets, and to analyze the direction of trade of turmeric in India.

Data and Methodology

The study was mainly based on the secondary data from various sources, which included *Annual Reports, Yearbooks, Statistical Data* publications of Spices Board, Indiastat.com, Ministry of Commerce and Industries and Arecanut and Spices Development Board. The study period was divided into two sub-periods, viz. pre-liberalization (1974-75 to 1990-91) and post-liberalization (1991-92 to 2008-09).

Compound Growth Rate

The annual compound growth rates for area, production, productivity and export of turmeric were computed separately for the two sub-periods and compared in the form of Equation (1):

$$Y_t = Y_o \left(1+r\right)^T e^u \qquad \ldots(1)$$

where,

Y_t =   Value at time 't',

Y_o =   Initial value,

r =   Growth rate,

T =   Time in years; 0, 1, 2 …….., n, and

u =   Random error-term.

Instability Index

The instability associated with turmeric area, production, yield, export quantity, value and unit value of export, domestic and international market prices was estimated using the Instability Index of the form:

Instability Index = STDEV of ln (Y_{t+1}/Y_t)

$$\ldots(2)$$

where,

STDEV = Standard deviation,

Y_t =   Crop area / production / yield / export quantity / export value / export unit value in the current year, and

Y_{t+1} =   Crop area / production / yield / export quantity / export value / export unit value in the next year.

This index is unit free and very robust and it measures deviations from the underlying trend (log linear in this case). When there are no deviations from the trend, the ratio Y_{t+1}/Y_t is constant, and thus standard deviation in it is zero. As the series fluctuates more, the ratio of Y_{t+1}/Y_t also fluctuates more, and standard deviation increases.

Direction of Trade

The structural change in exports was examined using the Markov chain approach. Central to Markov chain analysis was the estimation of the transitional probability matrix P. The element P_{ij} of this matrix indicates the probability that exports will switch from country i to country j with the passage of time. The diagonal P_{ij} measures the probability that the export share of a country will be retained. Hence, an examination of the diagonal element indicates the loyality of an importing country to a particular country's export.

In the context of the current application, there were five main turmeric importing countries. The average export to a particular country was considered to be a random variable which depended only on its past exports to that country and which could be denoted algebraically as Equation (3):

$$E_{jt} = \sum_{i=1}^{r} E_{it-1} \; P_{ij} + e_{jt} \qquad \qquad …(3)$$

where,

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

E_{it-1} = Exports to 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}, and

r = The number of importing countries.

The transitional probabilities P_{ij}, which can be arranged in a (c × r) matrix, have the following properties:

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

$$\sum_{i-1}^{n} P_{ij}=1, \text{ for all i}$$

Thus, the expected export shares of each country during period t were obtained by multiplying the exports to these countries in the previous period (t–1) with the transition probability matrix.

The transitional probability matrix is estimated in the linear programming (LP) frame work by a method referred to as minimization of Mean Absolute Deviation (MAD). The LP formulation is stated as

Min O' P* + Ie

Subject to

X P* + v = y

GP* = I

P* ≥ 0

where, P* is a vector of the probabilities P_{ij}, 0 is a vector of zero, I is an appropriately dimensioned vector of country, e is the vector of absolute errors (|U|), y is the vector of exports to each country, x is a block diagonal matrix of lagged values of y, and v is the vector of errors and G is a grouping matrix to add the row elements of P arranged in P* to unity.

Results and Discussion

Growth Analysis of Area, Production and Productivity of Indian Turmeric

A perusal of Table 1 reveals that in all the periods, the growth rates of production were higher than of productivity and area. In all the periods, turmeric had the productivity-led growth. The growths in area, production and productivity were found higher during pre-liberalization period than post-liberalization or overall period. The lower growth in area and productivity in post-liberalization period might be due to stability in area under turmeric, i.e. no scope to allocate more area under new planting. Growth recorded in all periods was significant at one per cent level, except in the productivity during the post-liberalization period, which was significant at 5 per cent level.

India virtually has a monopoly in supplying of turmeric to the world with a share of about 78 per cent in the total global output and 60 per cent in the global trade. Favourable weather conditions prevailing in the major turmeric growing areas in the country (Andhra Pradesh, Tamil Nadu, Orissa, Karnataka and West Bengal) and the important steps taken by the Spices Board, such as providing drying sheets to small and marginal growers of turmeric and other spices for drying

Table 1. Compound growth rates of area, production and productivity of Indian turmeric

Year	Area	Production	Productivity
1974-75 to 1990-91(Pre-liberalization period)	3.41*	7.97*	4.40*
1991-92 to 2007-08(Post-liberalization period)	1.88*	3.42*	1.50**
Overall1974-75 to 2007-08	2.74*	5.86*	3.04*

Note: *, ** denote significance at 1 per cent and 5 per cent levels, respectively.

Table 2. Compound growth rates of export quantity, total value and unit value of Indian turmeric

Year	Export quantity	Export value	Unit value
1974-75 to 1990-91 (Pre-liberalization period)	1.34	8.13*	6.70*
1991-92 to 2007-08 (Post-liberalization period)	5.74*	9.89*	3.92*
Overall (1974-75 to 2007-08)	5.26*	12.70*	7.08*

Note: * Significant at one per cent level

Table 3. Compound growth rates and correlation coefficients of domestic and international prices of turmeric

Year	Domestic market price	International market price	Correlation coefficient
1974-75 to 1990-91 (Pre-liberalization period)	10.47*	11.70*	0.96
1991-92 to 2007-08 (Post-liberalization period)	2.08	5.71*	0.64
Overall (1974-75 to 2007-08)	8.77*	9.18*	0.90

Note: *Significant at one per cent level

under hygienic conditions, providing subsidies for the small and marginal farmers for the construction of concrete drying yards and warehouses, organization of educational programmes for growers on improved technologies, have led to increased productivity of turmeric. Besides, release of high-yielding varieties over the years also has made a significant contribution.

Growth Analysis of Turmeric Export from India

The growth in turmeric export in both quantity and total value was found to be higher in the post-liberalization period than pre-liberalization or overall period (Table 2). It implies that a higher quantity of turmeric is being exported after export liberalization, which reduced the unit price of turmeric. The growth in unit value has been found to be higher in pre-liberalization than to post-liberalization period. The main hurdle to turmeric export was the quality; if quality was maintained; the growth rate would have increased by many fold. Turmeric being a multi-use product of natural origin, it is used in many fields such as culinary, medicine, cosmetics and textiles.

Though a lower growth in unit value was seen in post-liberalization period, the total export value of turmeric export had the growth rate of 9.89 per cent per annum which showed the rise in demand for turmeric. The growth rate of the total export value was higher due to higher growth of the export quantity of turmeric. The overall export quantity, export value and unit value of turmeric exported were significant at one per cent level over the study period.

About less than 10 per cent of the turmeric produced in the country is exported. The main hurdle to the export is the quality, because the processing is not done properly. For getting a good quality product, there is the need of adoption of improved technologies, such as stream boiling and mechanical drying instead of conventional cooking and sun drying. If proper processing and pre-limitation of pesticide residue is maintained, then there would be ample scope for increasing export in the years to come.

Growth Analysis and Correlation Coefficients of Domestic and International Prices of Turmeric

The growth rates and correlation coefficients of domestic and international prices of turmeric have been presented in Table 3. The results revealed that during pre-liberalization period the domestic market prices had a high growth rate of 10.47 per cent per annum, whereas the international prices had a growth rate of 11.70 per cent per annum. The coefficients of domestic and international prices were significant at one per cent level. However, during post-liberalization period, the growth rate in turmeric price was estimated to be 2.08 per cent per annum for domestic prices and 5.71 per cent per annum for international prices. These were lower compared to the post-liberalization period. This is due to higher quantity of export due to liberalization which brought down the unit price of turmeric exported. Correlation studies indicated that the domestic prices were positively associated with the international market prices (r = 0.96) during pre-liberalization period. During

the post-liberalization period also, the domestic prices had a positive correlation but with a lower degree with international prices (r = 0.67). There were many factors other than price, which affected the international and domestic prices during post-liberalization period.

Instability Analysis of Turmeric Production and Trade in India

The instability index was worked out for turmeric production and trade in India for the three periods to analyse the extent of instability. It was observed from Table 4. that the production was almost stable in all the periods compared to area and productivity. The fluctuations in yield of turmeric were mainly influenced by the rainfall and other climatic factors. The release of new varieties and innovative cultural practices developed in recent years were also responsible for the variations in productivity, which affected the levels of production in different years. The fluctuations in the export quantity of turmeric were very high during the pre-liberalization period (0.49), whereas during the post-liberalization period, there is less instability (0.15). This indicates that the export growth during post-liberalization did not fluctuate much due to less restrictions and growing demand of Indian turmeric.

The instability in total value of turmeric export is very high during pre-liberalization period (0.57)

compared to post-liberalization period (0.19). Compared to the quantity and value, the unit value showed a lower instability during the pre-liberalization period, but the unit value became stable during the post-liberalization period. Moreover, there are no stiff competitors in the international market for turmeric due to comparative advantage or agro-climatic advantage. Even though there was not much fluctuation in domestic prices of turmeric in all the periods, the extent of variation was relatively high (0.39) in post-liberalization period. This might be due to the changing demand for turmeric products in foreign countries. The instability in international price of overall period is very high (0.30) compared to pre-liberalization and post-liberalization periods. These result implied that there was a high instability in pre-liberalization than post-liberalization period.

Direction of Trade of Turmeric Export from India

The transitional probability, presented in Table 5, depicts a broad idea of change in the direction of trade of Indian turmeric. The five major countries which imported Indian turmeric were: UAE, USA, UK, Iran and Japan. The export to remaining countries was pooled under the category of other countries. It can be seen from Table 5 that USA was not a stable importer of Indian turmeric even though the quantity imported

Table 4. Instability in Indian turmeric production and trade

Particulars	Pre-liberalization period (1974-75 to 1990-91)	Post-liberalization period (1991-92 to 2007-08)	Overall period (1974-75 to 2007-08)
Area	0.09	0.12	0.10
Production	0.21	0.20	0.20
Yield	0.14	0.18	0.16
Export quantity	0.49	0.15	0.36
Export value	0.57	0.19	0.42
Unit value	0.33	0.18	0.27
Domestic price	0.39	0.34	0.34
International market	0.20	0.17	0.30

Table 5. Transitional probability matrix of Indian turmeric export: 1989-90 to 2007-08

Country	USA	UK	Iran	Japan	UAE	Others
USA	**0.00**	6.97	0.00	25.88	42.28	24.87
UK	0.00	**35.20**	32.77	6.43	25.60	0.00
Iran	0.00	0.00	**41.88**	8.20	0.00	49.92
Japan	83.89	0.00	0.00	**0.00**	16.11	0.00
UAE	2.22	8.15	13.43	12.03	**49.14**	15.03
Others	2.00	3.05	0.00	3.12	4.28	**87.55**

by USA was higher. The USA would lose its share of 42.28 per cent to the UAE, 25.88 per cent share to Japan and 24.87 per cent share to other countries, even though USA gained considerable share from Japan (83.89 %). In future, its share may be reduced from the total turmeric traded from India. The countries such as China give a stiff competition to India in turmeric trade. The UK was found to be one of the stable importers of Indian turmeric because it retained its original share of around 35.20 per cent over the period. It lost its major share of 32.77 per cent to Iran and 25.60 per cent to UAE.

Iran is another stable importer of Indian turmeric because it retained its original share of 41.88 per cent. It lost its major share to other countries to the extent of 49.92 per cent. It gained from the share of UK to the extent of 32.77 per cent and 13.43 per cent from UAE. Hence, in future Iran will be one of the most stable importer and its growth may be higher in turmeric import from India. Japan has not retained its original share and it lost a major share of 83.89 per cent of its original share to USA, followed by UAE (16.11 %). It gained 25.88 per cent from USA, followed by UAE (12.03%). Hence, Japan may not be regarded a stable importer of Indian turmeric in future. The reason may be that it imports turmeric from Burma and Thailand.

The UAE has retained 49.14 per cent of its original share and it is a stable importer of Indian turmeric. It lost its major share to other countries category (15.03%) and to some extent to Iran, Japan, UK and USA. But it gained high share of 42.28 per cent from USA, followed by UK (25.6 %) and Japan (16.1%). Being a major importer of Indian turmeric, if it loses its share, it will create a high instability in the export of turmeric from India in future. The countries pooled under the other category retained 87.55 per cent of its original share, which implied that even though they import in lower quantities, there is high stability, they have retained most of its original share. It gained 49.92 per cent of the Iran share, 24.87 per cent of USA share and 15.03 per cent of UAE share. Hence, compared to major importing countries at present, the countries pooled under 'others category' would import more turmeric from India in near future.

Thus, it is clear that the countries pooled under 'others category', UAE, Iran and UK would be the stable importers of the Indian turmeric in future and countries like USA and Japan are not the stable

importers. Hence, it would be necessary to give more stress on the USA and Japan. The plans for export should be oriented towards these two countries and also plans should be formulated for stabilizing the export to other countries. Mamatha (1995) has assessed the direction of trade of turmeric. The countries such as UAE (25 %), UK (65 %) and Singapore (15.71 %) were the stable importers of the Indian turmeric. The countries such as Japan, USA and Iran were found to be not stable importers of Indian turmeric. The results endorsed the present study, except in the case of Iran, which indicated retention of 41.88 per cent of its original share in the present study. Singapore was stable importer, in past studies which had retained 15.71 per cent. But, in the present study its share reduced drastically and hence it was clubbed under other countries category. The reason may be that Singapore imports turmeric from its neighboring countries such as Thailand and Burma where the cost was comparatively lower than of Indian turmeric.

The countries pooled under 'others category' had 87.55 per cent of the retention of its original share in the present study, which was 74 per cent in the earlier study, which implied that the retention of the countries pooled under 'other category' gained its original share over the period. The reasons may be that in many areas such as, food, textiles and cosmetics, turmeric is being replaced by synthetic chemicals, as a coloring agent. In medicine, turmeric is a naturally available medicine at a lower cost. As a result, the retention of its original share was increasing over the period. The other reasons are that the properties of turmeric are being explored continuously and its usage is increasing along with the demand for fast food shops in the major importing countries.

Projections of Indian Turmeric Export to Major Importing Countries

The projection of the Indian turmeric export to different countries was computed using the transitional probability matrix and the results of actual and projected exports of Indian turmeric have been presented in Table 6. The market share projections of turmeric exports to different countries have been computed up to 2020.

Even though the total quantity increased, the percentage share of actual and estimated export of turmeric to USA declined between 1999-00 and 2007-08. However, the projected value suggests that the

Table 6. Actual and projected exports of Indian turmeric to major importing countries

(in tonnes)

Year	USA		UK		Iran		Japan		UAE		Others	
	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated
1999-00	2427	2783	1676	2074	2077	2086	1878	2355	8162	6455	21555	21543
	(6.43)	(7.46)	(4.44)	(5.56)	(5.50)	(5.59)	(4.97)	(6.31)	(21.61)	(17.31)	(57.06)	(57.76)
2000-01	2584	2188	1837	2081	2971	2515	3027	2560	6044	6691	28165	21741
	(5.79)	(5.79)	(4.12)	(5.51)	(6.66)	(6.66)	(6.78)	(6.78)	(13.54)	(17.71)	(63.11)	(57.55)
2001-02	2739	3236	1842	2177	2724	2658	2559	2636	5272	6226	22641	27694
	(7.25)	(7.25)	(4.88)	(4.88)	(7.21)	(5.96)	(6.78)	(5.91)	(13.95)	(13.95)	(59.93)	(62.06)
2002-03	3914	2717	2006	1959	949	2453	2614	2391	4724	5602	18196	22657
	(12.08)	(7.19	(6.19)	(5.19)	(2.93)	(6.49)	(8.07)	(6.33)	(14.58)	(14.83)	(56.16)	(59.97)
2003-04	3880	2662	2060	1918	488	1689	2694	2355	7239	5689	20683	18089
	(10.47)	(8.21)	(5.56)	(5.92)	(1.32)	(5.21)	(7.27)	(7.27)	(19.54)	(17.56)	(55.83)	(55.83)
2004-05	2508	2835	2576	2216	800	1851	2686	2693	5215	7044	29312	20406
	(5.82)	(7.65)	(5.98)	(5.98)	(1.86)	(5.00)	(6.23)	(7.27)	(12.10)	(19.02)	(68.02)	(55.09)
2005-06	2635	2955	2772	2399	1447	1879	2608	2422	7361	5970	29582	27472
	(5.68)	(6.86)	(5.97)	(5.57)	(3.12)	(4.36)	(5.62)	(5.62)	(15.86)	(13.85)	(63.75)	(63.74)
2006-07	2461	2943	2896	2660	6095	2503	2632	2787	7824	7127	29593	28385
	(4.78)	(6.34)	(5.62)	(5.73)	(11.83)	(5.39)	(5.11)	(6.01)	(15.19)	(15.36)	(57.46)	(61.17)
2007-08	2649	2973	2461	2730	3709	4552	2797	3187	5151	7317	32485	30741
	(5.38)	(5.77)	(5.00)	(5.30)	(7.53)	(8.84)	(5.68)	(6.19)	(10.46)	(14.21)	(65.96)	(59.69)
2008-09		3110		2460		3110		2780		6122		31726
		(6.31)		(4.99)		(6.31)		(5.64)		(12.42)		(64.34)
2009-10		3103		2548		2931		2944		6759		31024
		(6.29)		(5.17)		(5.94)		(5.97)		(13.71)		(62.92)
2010-11		3240		2609		2970		2988		7088		30414
		(6.57)		(5.29)		(6.02)		(6.06)		(14.37)		(61.68)
2015-16		3373		2690		3242		3131		7579		29294
		(6.84)		(5.46)		(6.57)		(6.35)		(15.37)		(59.41)
2020-21		3391		2695		3278		3146		7624		29175
		(6.88)		(5.47)		(6.65)		(6.38)		(15.46)		(59.17)

Note: Figures within the parentheses indicate percentage to total.

percentage of quantity would slightly increase from 5.77 per cent in 2007-08 to 6.88 per cent by 2020-21 AD. In the case of UK, the actual export had increased from 1999-00 to 2007-08 and the estimated value showed that the share of UK was increased for the same period and the projected market share is expected to increase marginally during 2007-08 to 2020-21 from 5.30 per cent to 5.47 per cent. In the case of Iran, the actual and estimated export had increased from 1999-00 to 2007-08. The projected market share was expected to decrease marginally from 8.84 per cent to 6.65 per cent during 2007-08 to 2020-21. In the case of Japan, the actual and the estimated value export had increased marginally between 1999-00 and 2020-21. The actual export share of turmeric to UAE had decreased drastically from 21.61 per cent in 1999-00 to 10.46 per cent in 2007-08. However, the estimated value decreased to the extent of 17.31 per cent in 1999-00 to

14.21 per cent in 2007-08. The projected market share is expected to increase from 14.21 per cent to 15.46 per cent during 2007-08 to 2020-21. The actual export share to the countries pooled under 'others' showed an increase during 1999-00 to 2007-2008 from 57.06 to 65.96 per cent respectively. The projected market share was expected to increase from 57.76 per cent to 59.69 per cent from the year 1999-00 to 2007-08, but the share is expected to reduce to less extent from 2007-08 to 2020-21.

Keeping in view of the foregoing discussions, more stress has to be given on the countries such as UK, Iran, UAE and other countries category for maintaining present status of export and the government has to give more importance to the countries such as USA and Japan to maintain the market share in the future. The countries such as Bangladesh and Srilanka are gaining the status of major importers of Indian turmeric.

The policies have to be drawn based on the problems faced by the importing countries, so that the export of turmeric would increase in future and India may earn more foreign exchange through turmeric export.

Conclusions and Policy Implications

The analysis of the rate of growth in export and direction of trade in turmeric in India has revealed that the growth of turmeric export is satisfactory but the direction of trade gives a warning. The liberalization and globalization had a well-defined impact on the turmeric export and this gives a positive signal. The study has suggested that more importance should be given to the R&D on quality of turmeric. Looking into the importance of international demand, export earnings and domestic needs, government should increase and stabilize its outlay of funds for research on turmeric under the spice development programs. The government should be more conscious regarding the policies pertaining to the above aspects and also WTO implications to protect our farmers and to maintain our monopoly in international markets. Appropriate export promotion strategies and policies have to be evolved to maintain the market share of Indian turmeric.

The policy implications emerging out of the study are outlined below:

- High priority has to be assigned to increase the production and productivity of turmeric.

- To maintain quality of turmeric, trainings should be organized for the farmers on the way to produce good quality turmeric. The facilities such as stream boilers and mechanical driers need to be provided by the government and spice industries to marginal and small farmers.

- The result of Markov chain analysis has indicated that India is likely to loose its export markets in some of the countries like USA and Japan. Our exports are likely to be concentrated in minor importing countries, Iran, UAE, and UK in the future. A high dependence on one or two export markets will increase the trade risk in the long-run. Therefore, more importance has to be given to the minor importing countries such Bangladesh, Sri Lanka, etc. and appropriate export promotion strategies have to be evolved to diversify the geographical concentration. Appropriate steps and policies have to be evolved to maintain the market share of Indian turmeric.

- There is a need to disseminate information on international markets, price behaviour and other trade matters to Indian farmers and institutions to reap the benefits. This calls for strengthening of information technology and providing forecasts in products and prices.

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