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Export Performance of Pepper from India

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A B S T R A C T

Historically, the black pepper has been a highly tradable commodity in India. The domestic price, production and profitability are highly influenced by its international prices. The notable objective of the present study was to disclose the growth and instability under area, production, yield and export volume and value of pepper in India. Composition and direction of trade of pepper from India during study period was analyzed using Markov Chain to find out the stable and reliable markets for Indian pepper. Projection of export quantity of pepper from India up to 2022 was calculated by using the transitional probability of retention values. Multiple linear regression was carried out to find out the factors influencing export of pepper from India by using production, international price, and domestic price as independent variables. Garret Ranking was employed to identify the major constraints in export of spices from India. Growth in area and production of pepper in India was found to be negative and growth in yield found to be positive in India. Instability in yield was found to be high in India. Pepper exports from India with respect to quantity was negative growth and in value of pepper exports from India was found to be positive growth. There was high variability in quantity and value of exports of pepper from India. U.S.A, U.K, Vietnam, Netherlands and Germany were found to be stable importers of Indian pepper from India. Export projections indicate that export of pepper would increase by 2022. The influence of export price and production on the changes in export of pepper was found to be positive, but the influence of domestic price was found to be negative. Difficulty to meet international standards, fluctuating prices of produce in the international market, Lower productivity of export variety were the major problems faced by exporters.

Key words: Export, International trade, Price, Growth, Instability

The changing economic order has opened up new vistas of growth in the context of globalisation and liberalisation of world trade in the sphere of agriculture (Gayathri and Saravanan 2014). Spices have been a main source livelihood for millions of people and more than three million farmers are directly or indirectly engaged in spices cultivation, processing, grading, marketing and other activities (Hari 2017).Indian spices command a formidable position in world spice trade. India is the world's largest producer, consumer and exporter of spices (IBEF Report 2019). A total of 1.1 million tons of spices and spice products were exported by India during 2018-19 which was valued at ₹ 19,505.81 crore which registered an increase of 7 increase in volume in comparison to 2017-18.Spices are cultivated in an area of 3.21 million hectares in India. Indian spices are well known in the world for their aroma, taste and texture. Out of 109 varieties listed by the International Organization for Standardization (ISO), India produces about 75 varieties.

Historically, the black pepper has been a highly tradable commodity in India. The domestic price, production and profitability are highly influenced by its international prices (Hema *et al.* 2007). The export quality standards need to be guaranteed by the Indian Spice Industry for the items which are exported to other countries. High level of pesticide residue makes the spices unfit for export to consumer

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markets, which affects the livelihood of the farmers (Chawla 2016). During 2014-15, the Indian spice industry exported 893920 tons of spices and spice products which was valued at US $ 2432.85 million. The Indian spice exports mainly comprise of whole spices, organic spices, spice mixes, spice blends, freeze dried, curry powders, curry mixtures, oleoresins, extracts, essential oils and other value added spices.

MATERIALS AND METHODS

Period of study and sources of data

The growth and instability in pepper area, production, exportand factors influencing export of pepper from India have been examined using secondary data for the period of 19 years, from 1999-00 to 2017-18. The direction and composition of trade of pepper from India had been examined using secondary data for the period of 12 years, from 2005-06 to 2017-18. The necessary data were obtained from the Spice Board, indiastat.com, FAO.com etc. This study is confined to two major pepper producing states in India viz., Karnataka and Kerala. To identify the constraints in export of spices from India primary data was collected from 30 randomly selected respondent by using personnel interview method and using pre- tested schedule.

Compound growth rate model

The growth in quantity of export of coffee was analyzed using the compound growth rate (CAGR). CAGR was computed using log-linear model.

$$\ln y_t = \alpha t + \beta t + u_t$$

Where,

y_t= Quantity (tons) of coffee in year t.

t= Time element which takes the value 1, 2……..n for various years.

αt= Intercept

βt= Regression coefficient

Annual compound growth rate (r) = [(Antilog βt)] × 100

Instability analysis

The formula suggested by Cuddy and Della was used to compute the index of instability. Instability index was used to study the stability of exports over the years.

$$\text{Index Instability} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (X)} \times 100 \times 1\text{-}R^2$$

Markov Chain Analysis

The trade directions of Indian selected spices exports were analyzed using the first order Markov Chain Approach. Central to Markov Chain Analysis is the estimation of the 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.

Annual export data for period 2005-06 to 2017-18 was used to analyze the direction of trade and changing pattern of major Indian spices export. In this context, five major importing countries of selected spices i.e. were Vietnam, Malaysia, United States of America, United Kingdom, United Arab Emirates, Saudi Arabia, Bangladesh, Iran, Nepal, and along with others countries were considered. The average exports to a particular country was considered to be a random variable which depends only on the five years past exports to that country, which can be denoted algebraically as:

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

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

$P_{i\ j}$= The probability that exports 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.

$$\sum_{i=1}^{n} P_{Ij} = 1 \text{ and } 0 \le P_{I\,j} \le 1$$

Thus, the expected export share of each country during period 't' is 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 2005-06 to 2017-18.

Thus, the Transitional Probability Matrix (T) is estimated using linear programming (LP) framework by a method referred to as minimization of Mean Absolute Deviation (MAD).

$$\text{Min, } OP^* + I\,e$$

Subject to

$$X\,P^* + V = Y$$
$$GP^* = 1$$
$$P^* \ge 0$$

Where

P^* is a vector of the probabilities $P_{I\,j}$

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.

Using the estimated transitional probabilities, the exports of selected spices to various destinations was predicted by multiplying the same with the respective shares of base year. The export shares of Indian selected spices to different countries was predicted for the years 2018 to 2022 by using 2 step, 3 step, 4 step and 5 step transitional probabilities.

Regression analysis

Multiple linear regression was employed to identify the factors influencing the export of major spices. The model used was of the type:

$$Y = a + biXi + e \quad \ldots\ldots\ldots\ldots (1)$$

Where,
Y= Export (Tonnes)
a= Constant or intercept
bi= Regression coefficients
X_1= Price in domestic market (₹/Kg)
X_2= Export price of the spice (₹/Kg)
X_3= Production (Tonnes)
e = Disturbance term

To identify the factors influencing the export of major spices, multiple linear regression was made use of by placing export quantity as dependent variable (Y) and price in domestic market (X_1), export price of the spice (X_2) and production (X_3) as independent variables (Xi) in the above model.

Garrett's Ranking Technique

The Garrett's ranking technique was used to analyze the constraints perceived by the exporters at the time of export of spices. In the Garrett's scoring technique, the respondent exporters were asked to rank the factors or problems and these ranks were converted into per cent position by using the formula:

$$\text{Percent position} = \frac{100 \times (Rij - 0.5)}{Nj}$$

Where,
R_{ij} = Ranking given to the i^{th} attribute by the j^{th} individual
N_j = Number of attributes ranked by the j^{th} individual.

By referring to the Garrett's Table, the per cent positions estimated were converted into scores. Thus, for each factor, the scores of the various respondents were added and the mean values were estimated. The mean values thus obtained for each of the attributes were arranged in descending order. The attributes with the highest mean value was considered as the most important one and the others followed in that order. (Garrett and Woodworth 1969).

RESULTS AND DISCUSSION

Growth and instability in area, production and productivity of pepper in major states of India

The growth and instability in area, production and productivity of pepper in major states of India is depicted in (Table 1). The results indicated that the area and productivity under pepper had been showing a significant annual growth rate of -3.82 and 3.28 per cent over the study period. Negative growth in India was due to major state Kerala was affected by adverse harsh sun light this hot weather since 2011-12 to 2016-17 this led to yellowing of vines and immature fruit drying which was contradicting to the observations was made by Krishnadas (2010) during the period from 1979-80 to 2006-07. The major pepper growing states were Karnataka and Kerala. Karnataka showed significant positive growth in area, production and productivity which was contradicting to the observations was made by Jayesh (2001). Pepper area (14.64%) and production (19.55%) were found to stable in India. Productivity of pepper in India was found unstable due to decreased area and production in major state Kerala. Among major states, Karnataka was found to very unstable in production (50.68%) and productivity (54.74%) due to better output in Karnataka had grown as intercrop in coffee, and congenial weather conditions in area like Chikkmagaluru and Sakaleshpur areas.

Table 1 Growth and instability in area, production and productivity of pepper in major states of India (1999-00 to 2017-18)

Pepper (Per cent per annum)

Major states		Area	Production	Productivity
Karnataka	CAGR	9.15*	15.48*	6.84*
	Instability	16.13	50.68	54.74
Kerala	CAGR	-6.13*	-5.49*	1.33*
	Instability	17.93	26.02	42.02
India	CAGR	-3.82*	-0.28	3.28*
	Instability	14.64	19.55	26.33

*Significance at 1 per cent level

**Significance at 5 per cent level

Growth and instability in export of major spices from India

From the (Table 2), it is evident that the value of pepper export showed 10.13 per cent per annum. This might be due to competing countries like Vietnam were practicing monocropping this led to achieve the good output. In India majority of the pepper was under intercrop and adverse weather conditions in Kerala led to crop loss. The appreciation of rupee and other negative global economic factors also had a role. The observations of the investigation were in line with the findings of Krishnadas (2010). The quantity of black pepper exported had shown instability of 30.30 per cent while export earnings had shown instability of 35.48 per cent. The major competitor for Indian pepper export was Vietnam, the higher output and cautious pricing by Vietnam had pushed up the pepper prices in the international markets.

Table 2 Growth and instability in export of major spices from India (1999-00 to 2017-18)

(Per cent per annum)

Spices		Export quantity	Export value
Pepper	CAGR	-1.30	10.13*
	Instability	30.30	35.48
Total spices	CAGR	9.76*	16.82*
	Instability	8.65	19.81

*Significance at 1 per cent level

**Significance at 5 per cent level

Transitional probability matrix of pepper exports to major importing countries

United States of America was the most stable market among the major importers of black pepper from India as reflected by retention of 42.10 per cent shares during the study period. Thus, United States of America was most stable and loyal market for black pepper from India. This was similar to the study made by Krishnadas (2010) during the period from 1979-80 to 2006-07. In case of United States of America, there was higher preference for good quality pepper. This was reflected by the share of United States of America in import of Indian black pepper (Jayesh 2001). U.K, Germany, Netherlands, Vietnam and others retained export share of 28.00 per cent, 12.70 per cent, 13.00 per cent, 19.50 per cent and 26.60 per cent respectively. United States of America lost its share of 57.90 per cent to United Kingdom, Germany, Netherlands, Vietnam and others. While it gained significant shares from United Kingdom, Germany, Vietnam and others. United Kingdom was also one of the reliable market for Indian pepper export by retained share of 28.00 per cent. While United Kingdom lost 72.00 per cent of its major share to United States of America, Germany and others. Germany lost its share of 88.30 per cent to United Kingdom, United States of America, Vietnam and others. While it gained shares from U.S.A, U.K, Netherlands and others. Other countries lost 74.40 per cent of their major shares to United States of America United Kingdom, Germany, Netherlands and Vietnam. While they gained shares from United States of America, United Kingdom and Germany.

Table 3 Transitional probability matrix of pepper exports to major importing countries (2005-06 to 2017-18)

Countries	U.S.A	U.K	Germany	Netherlands	Vietnam	Others
U.S.A	0.421	0.119	0.075	0.042	0.001	0.342
U.K	0.350	0.280	0.230	0.000	0.000	0.140
Germany	0.017	0.360	0.127	0.000	0.049	0.432
Netherlands	0.000	0.159	0.148	0.130	0.563	0.000
Vietnam	0.470	0.326	0.000	0.000	0.195	0.000
Others	0.013	0.044	0.047	0.591	0.039	0.266

Table 4 Projections of pepper exports to major importing countries

	Pepper											
Countries	U.S.A		U.K		Germany		Netherlands		Vietnam		Others	
Year	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2018	6376.17	7516.96 (44.64)	2250.05	1421.64 (8.44)	916.57	817.56 (4.85)	484.20	403.90 (2.40)	1019.94	707.24 (4.20)	5793.07	5972.70 (35.47)
2019		7855.27 (46.65)		1450.08 (8.61)		899.26 (5.34)		443.40 (2.63)		609.43 (3.62)		5582.55 (33.15)
2020		7802.11 (46.33)		1447.34 (8.59)		912.24 (5.42)		457.66 (2.72)		597.57 (3.55)		5623.09 (33.39)
2021		7810.95 (46.38)		1441.23 (8.56)		912.26 (5.42)		457.81 (2.72)		604.81 (3.59)		5612.93 (33.33)
2022		7812.17 (46.39)		1444.22 (8.58)		912.48 (5.42)		458.07 (2.72)		605.92 (3.60)		5607.14 (33.30)

Figures in the parenthesis indicate export share in per cent

Projections of pepper exports to major importing countries

The export projections of pepper to major importing countries were computed up to 2022 using the transitional probability of retention values and presented in the (Table 4). The projected market share of U.S.A was expected to increase marginally from 44.64 per cent to 46.39 percent during 2017-18 to 2022-23. U.K, Germany and Netherlands were also shown similar increasing trend in import of pepper from India. Only Vietnam and other countries was shown decreasing trend in projection of pepper imports from India. Vietnam is major producer and exporter of pepper in the world and Vietnam had adopted improved technologies in

cultivation of pepper and it led to good production. Hence, the projection for Vietnam for import of pepper from India shown decreasing trend.

Factors influencing export of pepper

The factors influencing the export of pepper is represented in (Table 5). The coefficient of multiple determination indicated that 48 per cent of the variations in export of pepper were explained by the variables included in the function. Variables like production, domestic price and export price influenced the pepper export significantly. Export of pepper depended upon the level of production given the domestic price and export. On the contrary domestic price had got negative effect though their magnitudes were less. The export of pepper was influenced by production during study period. The high price in India was the main reason for poor pepper exports. Similar findings were reported by Krishnadas (2010).

Table 5 Factors influencing export of pepper during1999-00 to 2017-18

Explanatory Variable	b	P	t	R^2	F
		Pepper			
Intercept	19.16	0.00*	5.30	0.48*	5.24
X_1: Domestic price in Cochin market (₹/Kg)	-0.07	0.80	-0.25		
X_2: Export price (₹/Kg)	0.063	0.85	0.18		
X_3: Production (Tonnes)	0.49	0.06	2.50		

*Significance at 1 per cent level

**Significance at 5 per cent level

Constraints in export of major spices from India

The constraints in export of major spices from India is represented in (Table 6). The exporters operating in the study area faced several constraints in the export of spices. Study revealed that difficulty to meet international market standards was the foremost constraint with the mean score of (56.81%), considerable change in quality standards from importing countries from time-to-time and high set of quality parameters by importing countries become major constraint. Fluctuating prices of produce in the international market (55.32%), major competing countries like Vietnam, China, Nigeria, and Romania for some commodities like pepper, ginger, coriander and chilli were giving tough competition in international market.

Lower productivity of export variety (53.46%), to meet the international quality standards like pesticides residual contents were using less chemical fertilizers it led to low productivity. Lack of knowledge about cleaning, grading and packaging (51.75%), according to importing country quality standard the moister content and other colour related to commodity knowledge was less among the exporters. Non-availability of updated export market information (50.67%), non-availability of guidance from export organizations (49.36%), lack of knowledge about export procedures (47.27%), lengthy procedures and formalities for export (37.56%), all these obstacles were faced by exporters due to varying rules and regulations in international trade. Lack of infrastructure facilities like cold storage and drier facilities (45.37%), non-availability of quality testing laboratories (44.58%), lack of transportation facilities (40.58%) and non-availability of skilled labour (32.34%), these constraints were faced many of exporters in Gujarat and Rajasthan due to they had less access to Spice Parks and other quality testing laboratories. Hence, these were the major export constraints faced by exporters in the study area.

Table 6 Constraints in export of major spices from India (n=30)

Constraints	Garrett mean score	Rank
Difficulty to meet international market standards	56.81	I
Fluctuating prices of produce in the international market	55.32	II
Lower productivity of export variety	53.46	III
Lack of knowledge about cleaning, grading and packaging	51.75	IV
Non-availability of updated export market information	50.67	V
Non-availability of guidance from export organisations	49.36	VI
Lack of knowledge about export procedures	47.27	VII
Lack of infrastructure facilities like cold storage and drier facilities	45.37	VIII
Non-availability of quality testing laboratories	44.58	IX
Lack of transportation facilities	40.58	X
Lengthy procedures and formalities for export	37.56	XI
Non-availability of skilled labour	32.34	XII

The Indian spice industry has evolved and matured as technology–led, quality conscious, customer centric and market driven industry. The results indicated that the area and productivity under pepper had been showing a significant annual growth rate of -3.82 and 3.28 per cent over the study period. The value of pepper export showed 10.13 per cent per annum. This might be due to competing countries like Vietnam were practicing monocropping this

led to achieve the good output. The quantity of black pepper exported had shown instability of 30.30 per cent while export earnings had shown instability of 35.48 per cent. United States of America was the most stable market among the major importers of black pepper from India as reflected by retention of 42.10 per cent shares during the study period. The projected market share of U.S.A was expected to increase marginally from 44.64 per cent to 46.39 percent during 2017-18 to 2022-23. The coefficient of multiple determination indicated that 48 per cent of the variations in export of pepper were explained by the variables included in the function. Variables like production, domestic price and export price influenced the pepper export significantly. Among the various constraints in export of major spices, difficulty to meet international market standards was the foremost constraint with the mean score of (56.81%), considerable change in quality standards from importing countries from time-to-time and high set of quality parameters by importing countries become major constraint. Fluctuating prices of produce in the international market (55.32%), major competing countries like Vietnam, China, Nigeria, and Romania for some commodities like pepper, ginger, coriander and chilli were giving tough competition in international market. To sustain production of pepper in our country and to compete in international market, there is a need to improve its production by developing improved production technologies like instead of intercrop, pepper should grow as single crop. Hence production would go up. The other competing countries are influencing more on instability in export of spices from India on both volume and value terms in global market. Appropriate measures should be taken to stabilize the export earnings.

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