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RESEARCH PAPER

Direction of trade of Indian arabica coffee

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Abstract : Coffee (Coffea) is one of the most valuable commercial crops and the second most traded agricultural commodity on a global scale. Around 100.55 lakh MT of coffee will be consumed worldwide in 2019–20. South America, Asia, Africa, and Central America were identified as major coffee-growing regions, comprising of countries Brazil, Vietnam, Colombia, Indonesia, Honduras, Ethiopia, India, Uganda, Peru, and Mexico. While Brazil and Vietnam contribute 50 per cent of the world's coffee, India stands at 7th position in terms of production and exporting 2,61,374 GBE (Green Bean Equivalent - Quantity In MT) of coffee to the world, worth of Rs. 4131.82 crores during 2019-20 and contributes 2.5 per cent to the nation's primary sector export earnings. Markov Chain analysis helps to understand the export pattern of Indian arabica coffee. Italy, Belgium, Germany, U.S.A, Switzerland, United Kingdom, France, Australia, Russian Federation and some other countries are the major importers of Indian arabica coffee. The only consistent importer of Indian arabica coffee was Italy. Despite having many major importers, India was unable to maintain a consistent share of the global market. Because of increased competition, arabica coffee's export share has been declining. One of the major reasons for this decline was tough competition from Brazil, Vietnam, Colombia, Indonesia, Honduras, and Ethiopia. This shows that there is a need to frame policies in favor of increased coffee marketing to gain the competitive advantage in the global coffee market.

Key Words : Arabica coffee, Exports, Global coffee market, Destinations

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INTRODUCTION

Coffee (*Coffea*) is one of the most valuable commercial crops and the second largest agricultural commodity traded internationally. During 2019-20, the world consumes around 100.55 lakh MT of coffee. In 2018-19, the overall global production of coffee was 170.93 million bags (102.56 lakh MT) (International Coffee Organization, Historical data). According to the International Coffee Organization, 100 million people are working in the coffee industry, 20-25 million of whom are small growers. Four regions were listed as major coffee growing countries: South America, Asia, Africa and Central America.Brazil, Vietnam, Colombia, Indonesia, Honduras, Ethiopia, India, Uganda, Peru and Mexico are listed as the top 10 coffee growing countries in these regions (International Coffee Organization Report,2018).

The largest coffee growers in the world are Brazil and Vietnam, accounting for around half of the global production. The Indian exports during 2019-20 was 2,61,374 GBE (Green Bean Equivalent - Quantity In

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MT). Export earnings 2019-20 was Rs. 4131.82 crores and contributes 2.5 per cent to the nation's primary sector export earnings. In recent times, export share of arabica coffee has been in decreasing trend due to the increased competition. So, this paper aimed to understand the export pattern of Indian arabica coffee using Markov chain analysis.

MATERIAL AND METHODS

Annual export data for period 2015 to2021 were used to analyze the direction of trade and changing pattern of Indian arabica coffee export. The export destination countries of Indian arabica coffee were categorized into 10 countries *viz.,* Italy, Belgium, Germany, U.S.A, Switzerland, United Kingdom, France, Australia, Russian Federation and the remaining countries were categorized under others. The data were converted into a linear programming (LP) problem by a method referred to as minimization of mean absolute deviation (MAD) and solving the LP problem the the transition probability matrix was arrived at using LINGO (version 10) package. Estimation of the exports was done for the study period using Markov chain analysis.

The dynamic nature of trade patterns that was the gains and losses in export of Indian arabica coffee in major importing countries was examined using the Markov chain model. It involved developing a transitional probability matrix 'P' whose elements Pij indicate the probability of exports switching from country 'i' to country 'j' over time. The diagonal element Pij 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 ten importing countries. For Indian arabica coffee the assumption was that the average export of arabica coffee 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 :

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

whereas,

Σ_{jt} : Exports from India during the year t to j^{th} region.

E_{it}-1: Export to i^{th} region during the year t-1.

P_{ij}: The probability that exports will shift from i^{th} region to j^{th} region.

E_{jt} : Error term which is statistically independent of Eit-1.

n : The number of importing regions and

t : The number of years considered for the analysis.

The transitional probabilities Pji which could be arranged in a (c x n) matrix have the following properties:

$$\sum_{i=1}^{n} P_{ij}=1$$

where $0 \leq Pij \leq 1$

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 2013- 14 to 2017-18.

Thus transitional probability matrix (T) was estimated using linear programming (LP) framework by a method referred to as minimization of mean absolute deviation (MAD).

Min **OP* + i e**

Subject to:

X P* + V= Y,

GP*= 1, P* >0

where,

P*=Vector of the probabilities

Pij,O=Vector of zeros,

i= Appropriately dimensional vectors of areas,

e= Vector of absolute errors,

Y= Proportion of exports to each country,

X= Block diagonal matrix of lagged values ofY,

V= Vector of errors,

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

Prediction of quantity of cashew kernels export was made by using the transitional probability matrix:

Bt= B0 * T,

Bt+i= Bt+i-1 * T

where,

B0= Quantity exported in base years,

Bt+i= Quantity exported in next year (prediction),

T= Transitional probability matrix.

RESULTS AND DISCUSSION

India ranks seventh next to Brazil, Vietnam, Colombia, Indonesia, Honduras, Ethiopia in the export of arabica coffee. Indian arabica coffee are known for their taste and aroma. This analysis was carried out to understand the export pattern of Indian arabica coffee

Table 1 : Transitional probability matrix for importing countries of Indian Arabica coffee (2015 to 2021)

	Italy	Belgium	Germany	U.S.A.	Switzerland	United Kingdom	France	Australia	Russian federation
Italy	0.45216	0.02122	0.15277	0.20191	0.06336	0.04772	0.00000	0.06086	0.00000
Belgium	0.28488	0.00000	0.68316	0.00000	0.00000	0.01956	0.00000	0.01240	0.00000
Germany	0.00000	0.22705	0.20326	0.51348	0.02982	0.00000	0.02639	0.00000	0.00000
U.S.A.	0.00000	0.75171	0.00000	0.00000	0.00000	0.00000	0.04095	0.00000	0.20735
Switzerland	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
United Kingdom	0.00000	0.62129	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25231
France	0.00000	0.00000	0.00000	0.60217	0.00000	0.39783	0.00000	0.00000	0.00000
Australia	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Russian federation	0.00000	0.50457	0.00000	0.00000	0.00000	0.00000	0.05813	0.00000	0.02029
Others	0.00000	0.43967	0.00000	0.15978	0.11912	0.07866	0.13517	0.00000	0.00000

for the seven years (2015 to 2021). The largest importing countries were Italy, Belgium, Germany, U.S.A, Switzerland, United Kingdom, France, Australia, Russian Federation and the remaining countries were categorized under others. The results of the export trend are given in the Table 1.

A review of Table 1 reveals that Italy was one of the largest and consistent importers of arabica coffee and retained 45.21 per cent of its previous share. It gained a share of about 100 per cent from Switzerland and 28.48 percent from Belgium. It also lost a share of 20.19, 15.27, 6.3, 6.0, 4.7 per cent to the USA, Germany, Switzerland, Australia and 4.71 per cent to United Kingdom.

Germany also retained 20.32 per cent of its previous share. It also gained about 68.31 per cent from Belgium and 15.27 per cent Italy. It also lost 51.34 per cent to the USA, 22.70 per cent to Belgium, 2.98 per cent to Switzerland and 2.63 per cent to France.

Russia retained about 2.02 per cent of its previous share and gained 25.23 per cent from United Kingdoms and 20.73 per cent from the USA. It also lost 50.45, 5.81 and 41.70 per cent to Belgium, France and other countries, respectively.

No other major importing country held the importing share constantly. Other countries pool retained share of 6.76 per cent as it gained 41.70 and 12.64 per cent from Russia and the UK, respectively. In the same period, it also lost 43.96 per cent to Belgium, 15.97 per cent to Germany, 13.51 per cent to France, 11.91 per cent to Switzerland and 7.86 per cent to the UK.

Belgium gained 75.17, 62.12, 50.45, 22.70, 2.12, 43.96 43.96 per cent from the USA, UK, Russia, Germany, Italy and other countries, respectively. It also lost 43.96 per cent to Belgium, 15.97 per cent to the USA, 13.51 per cent to France, 11.91 per cent to Switzerland and 7.86 per cent to the United Kingdom.

The USA gained 60.21 per cent from France, 51.34 per cent from Germany, 20.19 per cent from Italy and 15.97 per cent from other countries. It also 75.17, 20.73 and 4.09 per cent to Belgium, Russia and France, respectively.

Switzerland gained 6.33 per cent from Italy, 2.98 per cent from Germany and 11.91 per cent from other countries. It lost 100 per cent of its share to Italy. The United Kingdom gained 39.78 per cent from France, 4.71 per cent from Italy, 1.95 per cent from Belgium and 7.86 per cent from other countries. It also lost 62.12, 25.23 and 12.64 per cent to Belgium, Australia and other countries, respectively.

France gained 5.81, 4.09, 2.63, 13.51 per cent from Russia, the USA, Germany and other countries, respectively. It also lost to 60.21 and 39.78 per cent to the USA and the UK, respectively.

Australia gained 6.08 and 1.23 per cent from Italy and Belgium, respectively and lost 100 per cent of its share to other countries during the study period.

Conclusion:

Italy was the only stable importer of Indian arabica coffee. Though there were many major importers India could not hold the consistent share in global market. Tough competition from Brazil, Vietnam, Colombia, Indonesia, Honduras and Ethiopia was one of the major reasons for this downfall. Therefore, there is a need to frame policies in favor of increased coffee marketing to gain the competitive advantage in the global coffee market.

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