

Growth in Production and Export Performance of Indian Coffee in International Market

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ABSTRACT

The second most traded commodity after oil in the world is coffee. It is an interesting fact that the coffee drink is preferred by the people of developed countries and crop is grown in developing countries. Therefore, it is the developing countries who are the major producers and exporters of coffee to the world. Brazil is the largest producer and exporter of coffee in the world and India is the seventh largest producer and eighth largest exporter of coffee. The study attempts to analyze the trends, growth and instability in the area, production and productivity of coffee in major coffee producing countries and India. The production and yield of coffee had increased in all the major coffee producing countries from pre-liberalization to post liberalization period. The area had decreased in Brazil and Colombia but in other countries including India the area had increased in both the periods. The stability of the area, production and productivity remains unstable (>20%) over the years in the countries including India however the instability started to decline (15-20%) in the post-liberalization period. The export competitiveness of Indian coffee in the international market has been analyzed using the Trade Intensity Index. The results showed that India had competitive advantage in exporting coffee to Italy, Belgium and Russia which are the major importers of coffee in the world.

Keywords : Area, Export, Instability index, Liberalization, Production & productivity of coffee, Trade intensity index

Coffee is brewed drink prepared from roasted coffee beans, which are the seeds of berries from the coffee plant. The plant is native to subtropical Africa and some islands of southern Asia. Coffee is produced in about 70 countries most of them belonging to the developing world from Africa, Latin America and Asia. In contrast, coffee is mostly consumed in developed world in America and Europe, thus making it the world's highest traded commodity after petroleum. The countries that produce the most (75%) coffee are Brazil (63.4 million kg), Vietnam (29 million kg), Colombia (14.3 million kg), Indonesia (12 million kg), Ethiopia (7.3 million kg) and Honduras (6.1 million kg). India is the seventh largest coffee producing country (5.7 million kg) that accounts for three per cent of global coffee output

(International Coffee Organization (ICO), 2019). According to the International Coffee Organization report 2019, a total of 10,176 million kg of coffee were produced worldwide in 2020. Brazil is the largest producer and exporter of coffee in the world. The productivity does not stand the same as Vietnam's productivity is higher compared to Brazil. The productivity of Vietnam in the year 2019 was 2.71 t/ha in the year 2019 followed by Brazil (1.65 t/ha), Colombia (1.04 t/ha), Ethiopia (0.64 t/ha) and Indonesia (0.61 t/ha) (Assefa *et al.*, 2021). In India, Arabica and Robusta are both produced, but Robusta dominates production at 70 per cent, with Arabica making up the remaining 30 per cent. Mohan *et al.* in 2012 estimated that area under coffee showed an increasing trend in India from 1990 to 2010. The area

under coffee during the year 2020 was 422924 ha, production was 3,34,000 million tonnes and productivity of 0.79 tonnes per ha (Coffee Board of India, 2021).

Coffee market had undergone a series of changes since the establishment of International Coffee Organization, 1962. From 1962 to 1988 coffee was traded under a system of quotas. From 1989 the coffee market has been liberalized. Internationally, coffee trade takes place at two major exchanges *viz.*, Inter-Continental Exchange-ICE (previously known as NYBOT - New York Board of Trade) in respect of Arabica and London International Financial Futures & Options Exchange (LIFFE) in respect of Robusta. Bill *et al.*, in 2021 mentioned that liberalization was one of the reasons for increase in world coffee production and supply of better quality coffee for consumption.

The deregulation of coffee market or liberalization of coffee market increased the prices paid to the producers and at the same time increased the price volatility. Since then the coffee production has started to concentrate in fewer origins and new markets have emerged on the demand side. India is the eighth largest exporter of coffee by volume. According to Food and Agriculture Organization (FAO) statistics, 2021 almost one-third of the country's total coffee exports constitute instant coffee. Indian coffee exports display seasonality with exports peaking from March to June. The country exports over 70 per cent of its production, in 2021-22, the total exports recorded 42 per cent rise to US\$ 1.04 billion from 2020-21. In March 2022, exports of coffee were valued at US\$ 114.7 million, a 22 per cent growth from February 2022. However over the years with the liberalization of coffee market the production and export performances of coffee producers has taken major shifts and turns to compete in the international market. The labor availability in coffee estates of India is facing the problem of migration due to price volatility as income generation became unstable (Sagar *et al.*, 2021). With this background the study focuses on production and export aspects of Indian coffee in the international market. To analyze the trends and patterns the study

tries to assess the change in area and production of coffee before and after the coffee market liberalization as well as study the major export destinations of Indian coffee in the international market.

MATERIAL AND METHODS

The present study focuses on secondary data of area, production and productivity of coffee of major coffee producing countries (Brazil, Vietnam, Columbia, Indonesia and Honduras) and India. The data was collected from FAOSTAT for a period of 1961 to 2020. The data has been divided into two periods (pre-liberalization (1961-1989) and post-liberalization (1990-2020) to know the changes in area and production due to liberalization of coffee market. As well as to calculate the export performance of Indian coffee secondary data from Trade Map was collected for 2002 to 2021 years. The following analyses carried in the study are:

Trend Lines of Area, Production and Productivity of Coffee : The trend lines are fitted across the countries from a period of 1961 to 2020 for area, production and productivity. This helps to observe the fluctuations across the periods with a view of coffee market liberalization.

Compound Annual Growth Rates of Area, Production and Productivity of Coffee Across Five Countries And India : The compound growth rate is estimated from the following form

$$Y = ab^t e \quad \dots\dots (1)$$

where,

'Y' is the dependent variable (area, production and productivity).

'a' is the intercept term.

'b' is the regression coefficient that measures the relative change in Y for a given absolute change in independent variable t.

't' is the dependent variable.

'e' is the error term.

Eq (1) is converted to linear form by taking log on both sides of the equation and it forms the following

form,

$$\ln Y = \ln a + t \ln b \quad \dots\dots\dots(2)$$

The per cent compound growth rate takes the form

$$\text{CAGR (g)} = [\text{antilog } b - 1] \times 100 \quad \dots\dots\dots (3)$$

Instability analysis : The study uses Cuddy-Della Valle Index (CDVI) to measure the instability in harvested area, production and productivity of coffee. This index is preferred over the normal coefficient of variation (CV) as it attempts to de-trend the CV by using co-efficient of determination and showing the exact direction of instability (Cuddy and Valle, 1978).

CDVI is obtained for the CV and the following form of CV is

$$\text{CV} = \frac{\text{standard deviation}}{\text{mean}} \times 100 \dots\dots\dots (4)$$

CDVI is estimated as follows

$$\text{CDVI} = \text{CV} \times \sqrt{1-R^2} \quad \dots\dots\dots (5)$$

where,

CV is the coefficient of variation in percentage

R² is the coefficient of determination from the regression adjusted for its degrees of freedom. If the index values below 15 per cent then it is categorized as low instability, if the value lies between 15 to 20 per cent then it is categorized as medium instability and more than 20 per cent is categorized as high instability.

Export performance of Indian coffee : To analyze the export performance, trade intensity index was calculated to indicate whether a country exports more, as a percentage, to a partner than the world does on an average. The trade intensity index is obtained by the following formula :

$$\text{TII} = 100 \times \frac{(X_{ijk} / X_{ik})}{(X_{wjk} / X_{wk})} \quad \dots\dots\dots (6)$$

where,

‘X_{ijk}’ = value of exports of product ‘k’ from origin country ‘i’ to destination ‘j’

‘X_{ik}’ = total exports from ‘i’ of product ‘k’

‘w’ = indicates the world as origin

Value greater than 100 indicates a relationship more intense than the world average for the partner.

RESULTS AND DISCUSSION

Trend Lines of Area, Production and Productivity of Coffee : The trend lines were fitted for area, production and productivity of coffee in Brazil, Vietnam, Columbia, Indonesia, Honduras and India from the year 1961 to 2020. To depict whether changes exist between pre and post coffee market liberalization a line has been marked at 1989 in the graphs.

Fig. 1, indicates that area under coffee in Brazil has been decreasing from the pre-liberalization period due to frost combined with drought over the decades. Area under Colombia increased in the pre-liberalization due to stable market prices and in the post-liberalization period area had decreased due to price volatility in post-liberalization period. Other countries like Indonesia, Vietnam, Honduras and India have shown an increasing trend in the area to the post-liberalization of coffee market which shows the liberalization had a positive impact in these countries.

Fig. 2, showed that production in the pre-liberalization period was increasing at a lesser rate and in post-independent period the increasing trend was higher in Brazil, Vietnam, Indonesia, Honduras and India. Production increased due to removal of quota restrictions that were imposed on the exports prior to liberalization and planting of high yielding varieties that increased production.

Fig. 3, depicts that productivity remained almost constant in the pre-liberalization period of these countries. But after coffee liberalization in 1989 the productivity increased due to increase in competition to produce high quality coffee seeds and improved

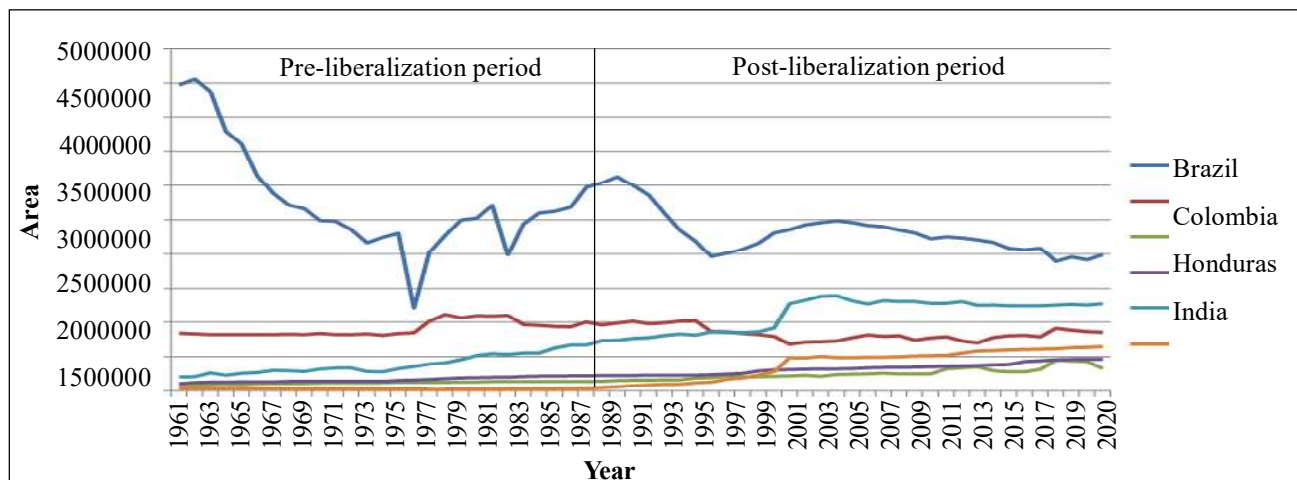


Fig. 1 : Area of green coffee in the five major coffee-producing countries in the world vis-a-vis India

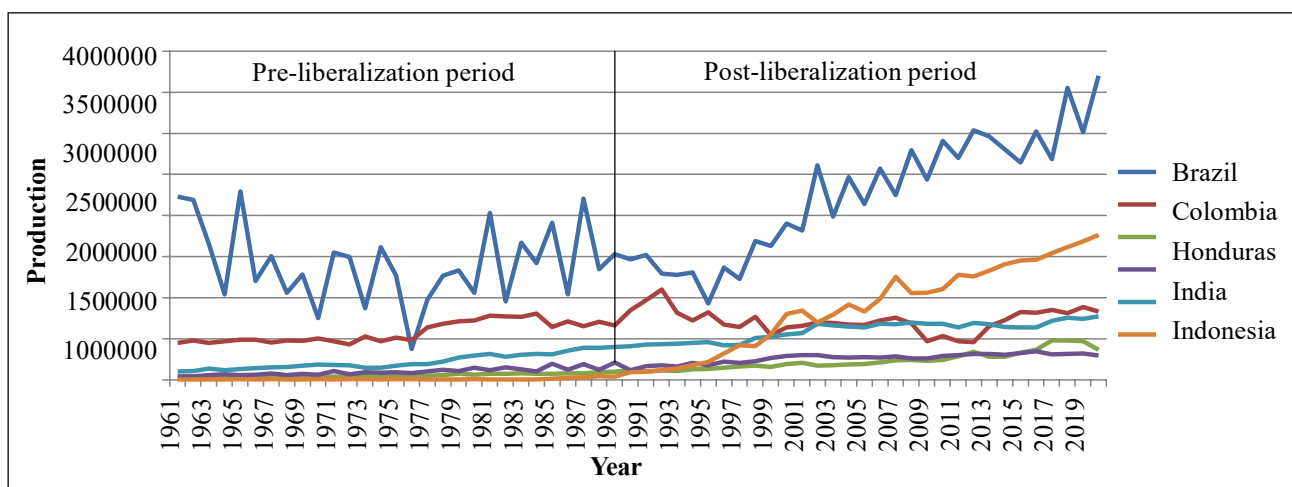


Fig. 2 : Production of green coffee in the five major coffee-producing countries in the world vis-a-vis India

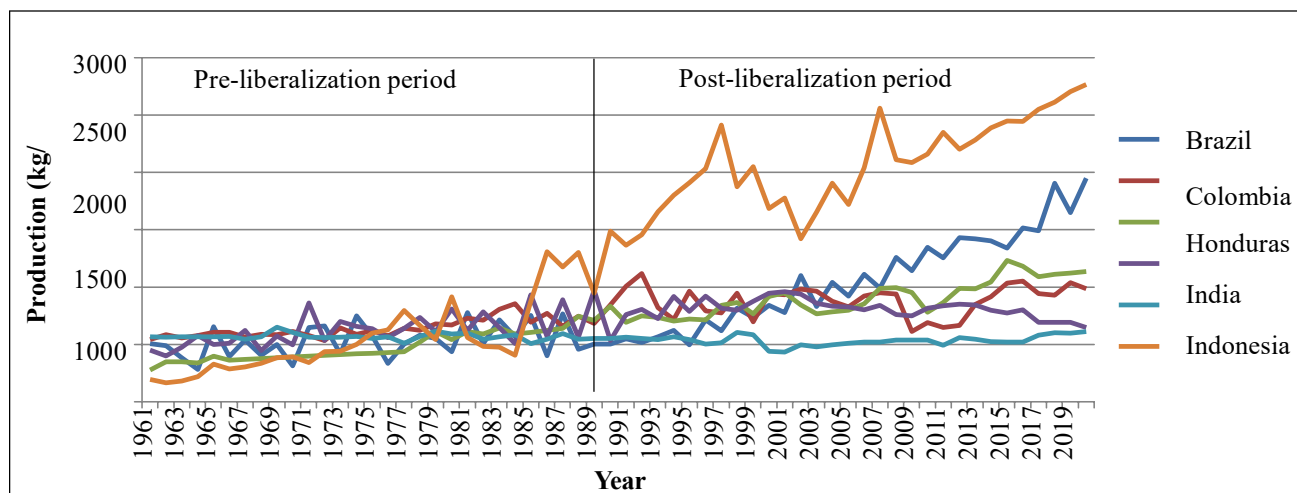


Fig. 3 : Productivity of green coffee in the five major coffee-producing countries in the world vis-a-vis India

cultivation practices over the years. The increase in productivity of Brazil was due to increased area under production. The yield of coffee in Vietnam was highest in the post-liberalization period compared to the previous period (pre-liberalization) as well as other countries because of high-intensity Robusta cultivation, planting improved tree varieties and intensive usage of fertilizers. Overall the fluctuations in productivity between the years in the countries was due to climatic factors that changed the flowering and fruit setting patten over the years as coffee being a highly climate sensitive crop.

Compound Annual Growth Rates of Area, Production and Productivity of Coffee Across Five Countries and India : Table 1 shows pre and post liberalization compound growth rates of area, production and productivity of coffee in five major coffee producing countries.

Brazil showed a negative significant growth rate in the area during the pre and post liberalization period. The production and productivity showed positive growth rate in both the periods but the significant growth rate was noticed in the post-liberalization period. In Columbia growth rate of area, production and productivity showed positive significant growth rate in the pre-liberalization period, whereas in the post-liberalization period negative growth rate of area and production. Overall the area under coffee in Columbia has an insignificant positive growth rate with positive significant growth rates in production and productivity. In Honduras, area, production and productivity show positive significant growth in all the periods. Indonesia shows positive significant growth rate in area and production in all the periods. The productivity in the country shows an insignificant positive growth rate. In the pre-liberalization period area under coffee in Vietnam showed negative growth rate and in post-liberalization period area showed positive significant growth rate. The production and productivity of Vietnam shows positive significant growth rate in all the periods. The area, production and productivity in India show a significant positive growth rate in all the periods.

TABLE 1
Compound growth rate of area, production and productivity of green coffee in the five major coffee-producing countries in the world vis-a-vis India (Per cent)

Countries	Pre-liberalization (1961-1989)			Post-liberalization (1990-2020)			All period (1961-2020)		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Brazil	-5.71 x 10 ⁶ **	1.88 x 10 ⁻⁶ NS	0.02 NS	-2.22 x 10 ⁻⁵ ***	1.14 x 10 ⁻⁵ ***	0.02 ***	-6.42 x 10 ⁻⁶ ***	5.67 x 10 ⁻⁶ ***	0.01 ***
Columbia	5.75 x 10 ⁻⁵ ***	5.59 x 10 ⁻⁵ ***	0.08 ***	-4.01 x 10 ⁻⁵ **	-1.08 x 10 ⁻⁵ NS	0.005 NS	8.56 x 10 ⁻⁶ NS	1.49 x 10 ⁻⁵ **	0.01 **
Honduras	5.02 x 10 ⁻⁴ ***	3.79 x 10 ⁻⁴ ***	0.06 ***	1.02 x 10 ⁻⁴ ***	7.67 x 10 ⁻⁵ ***	0.05 ***	5.03 x 10 ⁻⁵ ***	4.05 x 10 ⁻⁵ ***	0.02 ***
Indonesia	4.87 x 10 ⁻⁵ ***	8.71 x 10 ⁻⁵ ***	-0.04 NS	3.08 x 10 ⁻⁵ ***	7.12 x 10 ⁻⁵ ***	0.04 NS	9.17 x 10 ⁻⁶ ***	1.99 x 10 ⁻⁵ ***	0.01 NS
Vietnam	-8.9 x 10 ⁻⁵ NS	5.17 x 10 ⁻⁴ ***	0.02 ***	4.18 x 10 ⁻⁵ ***	1.71 x 10 ⁻⁵ ***	0.02 ***	1.62 x 10 ⁻⁵ ***	7.83 x 10 ⁻⁶ ***	0.004 ***
India	2.10 x 10 ⁻⁴ ***	1.65 x 10 ⁻⁴ ***	0.04 ***	1.16 x 10 ⁻⁴ ***	1.38 x 10 ⁻⁴ ***	-0.02 NS	4.83 x 10 ⁻⁵ ***	4.65 x 10 ⁻⁵ ***	0.01 **

Note: **, *** indicates p-value significance at 5% and 1% level of significance and NS indicates non-significance.

TABLE 2
Instability index of area, production and productivity of green coffee in the five major coffee-producing countries in the world vis-a-vis India (Per cent)

Countries	Pre-liberalization (1961-1989)			Post-liberalization (1990-2020)			All period (1961-2020)		
	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
Brazil	24.63	33.99	25.31	9.47	12.51	10.50	22.74	35.80	40.92
Columbia	8.37	12.36	8	10.64	19.92	14.98	12.49	22.57	20.72
Honduras	3.38	10.31	8.52	14.20	18.22	9.32	43.56	68.45	31.07
Indonesia	13.02	13.45	5.07	13.22	8.42	8.10	48.97	45.45	7.38
Vietnam	45.33	80.27	32.32	18.39	9.23	11.17	100	107.50	57.95
India	6.35	22.05	19.04	4.45	10.86	11.36	35.12	44.74	20.39

Instability Analysis : the instability index for the area, production and productivity of coffee is presented in Table 2. Brazil's instability index for area decreased from pre (24.63%) to post liberalization period (9.47%), production instability decreased from 33.99 per cent to 12.51 per cent and productivity instability also decreased from 25.31 per cent to 10.50 per cent. The decrease in the instability was due to replanting high-yielding and disease resistant varieties in Brazil. In case of Columbia the instability index lies below 15 per cent in area and production except in case of productivity the instability index was more in post-liberalization period (19.92%) than pre-liberalization period (12.36%). The instability of productivity increased due to long-term climate changes and rust disease invasions in the post-liberalization periods of Colombia. In Honduras and Indonesia the instability between the periods did not vary too much. In Vietnam the instability in area, production and productivity decreased from pre liberalization period (45.33%, 80.27% & 32.32%) to post liberalization period (18.39%, 9.32% & 11.17%). This huge difference in instability was due to drastic steps taken by the Vietnam Government like increase area under coffee cultivation with high yielding varieties and conversion of Arabica area to Robusta coffee areas to take advantage of liberalization. India's instability index for area decreased from pre (6.35%) to post-liberalization period (4.45%), production instability decreased from 22.05 per cent to 10.86 per cent and productivity decreased from 19.04 per cent to 10.86 per cent which means that coffee market in India were trying to attain stability.

Classification of Countries Based in Instability Index Values : In table 3 the countries were classified into low, medium and high instable countries. In the pre-liberalization period Brazil and Vietnam showed high instability in area, production and productivity, whereas Columbia, Honduras and Indonesia show less instability in area, production and productivity. The coffee harvested area in India were less unstable in the pre-liberalization period with high instability in production and medium instability in productivity. In the post-liberalization period Brazil turned out to be less unstable towards changes in area, production and productivity. Vietnam also stabilized in production and productivity but the area still remains under medium instability. Columbia and Honduras had some fluctuations in stability with regard to production but area and productivity remain under low instability category. India's area, production and productivity reach low instability category in post-liberalization period. By taking the overall instability performance from the period of 1961 to 2020 the major coffee producing countries and India still lie in the high instability zone due to climatic changes as coffee is climate sensitive crop, international negotiations and price volatility over the years. To reach the overall instability it might take few more years as we notice in the post-liberalization period countries are trying to achieve stability in area and production.

Export Performance of Indian Coffee : The results in the Table 4 show that trade intensity was highest with Italy followed by Russia, Belgium and Germany. There has been a constant trade intensity of India with

TABLE 3
Classification of countries based on instability in coffee production

Periods	Particulars	Low (<15%)	Medium (15-20%)	High (>20%)
Pre-liberalization (1961-1989)	Area	Columbia, Honduras, Indonesia, India	-	Brazil, Vietnam
	Production	Columbia, Honduras, Indonesia	-	Brazil, Vietnam, India
	Productivity	Columbia, Honduras, Indonesia	India	Brazil, Vietnam
Post-liberalization (1990-2020)	Area	Brazil, Columbia, Honduras, Indonesia, India	Vietnam	-
	Production	Brazil, Indonesia, Vietnam, India	Columbia, Honduras	-
	Productivity	Brazil, Columbia, Honduras, Indonesia, Vietnam, India	-	-
All period (1961-2020)	Area	Columbia	-	Brazil, Honduras, Indonesia, Vietnam, India
	Production		-	Brazil, Columbia, Honduras, Indonesia, Vietnam, India
	Productivity	Indonesia	-	Brazil, Columbia, Honduras, Vietnam, India

TABLE 4
Trade intensity index of coffee from India to top coffee importers in the world from 2002-2021
(Per cent)

Year	United States of America	Germany	Italy	Belgium	France	Japan	Russia
2002	13.58	94.59	311.90	171.80	29.60	33.81	872.30
2003	6.46	79.77	372.60	201.98	36.60	30.75	697.96
2004	15.82	75.25	396.17	147.78	27.69	70.82	700.41
2005	6.73	59.08	460.69	110.19	31.43	40.49	806.58
2006	10.65	84.52	462.76	163.25	32.25	40.92	509.90
2007	12.41	44.95	459.74	148.05	34.96	20.45	372.20
2008	10.00	67.21	452.30	108.76	30.86	17.75	343.63
2009	14.91	45.22	414.24	113.43	21.61	16.55	547.56
2010	18.05	70.71	517.88	133.12	20.20	8.83	388.74
2011	10.45	103.96	419.02	186.68	20.10	9.16	381.58
2012	18.79	67.54	468.87	198.83	20.64	22.51	398.67
2013	25.24	82.76	472.01	179.63	20.04	18.71	214.72
2014	23.36	91.10	446.82	177.36	17.16	17.07	243.50
2015	19.93	79.59	453.94	170.40	20.09	10.95	326.09
2016	26.09	86.89	439.66	222.81	15.98	8.16	328.67
2017	28.25	97.18	391.88	179.80	13.12	6.50	298.47
2018	36.43	76.20	381.15	196.44	12.63	8.54	243.84
2019	30.33	105.06	389.81	190.88	13.17	7.40	295.10
2020	31.40	101.54	386.47	234.18	7.73	9.99	191.91
2021	33.36	81.37	350.90	268.58	5.94	14.85	249.57

respect to Italy, Belgium and Russia whereas with Germany the intensity had been fluctuating over the years. Therefore the major importers of Indian coffee among the major coffee importers in the world are Italy, Belgium and Russia. Italy seems to be the major exporter because of the special characteristic of Robusta coffee flavor. The Robusta coffee exported from Kerala is exposed to the salty sea air during the monsoon season which gives it a specific taste to Italian blends.

The study analyzed the trend, compound growth rates, instability in area, production and productivity of coffee in five major coffee producing countries and India and trade performance among top coffee importers in world. The area under coffee reduced over the years but production and productivity showed increasing trend over the years. Area and production in Columbia showed increasing trend in pre-liberalization period but in the post-liberalization period they show a decreasing trend. Area and production increased in Vietnam, Honduras and Indonesia over the years especially in the post-liberalization period. Area and production of coffee in India had increased over the years but in the post-liberalization period the growth rate was less compared to pre-liberalization period. If the same trend continues in India, then sooner the area and production would reduce therefore government must intervene in the matters to increase production by planting high-yielding and disease resistant varieties, giving incentives to remove old plants and plant the new ones. Special focus must be taken towards adoptive measures for resisting climate changes as coffee is a climate sensitive crop. With respect to export performance of Italy, Belgium and Russia are the major export destinations of Indian coffee. To hold the major share in the international market the export promotion activities with respect to Indian coffee must be focused.

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