Beans to Billions: Analysing the Production and Export Dynamics of Coffee as Catalysts for India's $5 Trillion Economy Ambitions

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Abstract

This research paper probes into the intricate dynamics of coffee production and export in India and their role as catalysts for the Nation's $5 trillion Economy ambitions. The study primarily focuses on key coffee-producing states, with Karnataka emerging as a powerhouse in both Arabica and Robusta cultivation. The methodology involves a meticulous analysis of time series data covering three decades, employing statistical techniques such as regression analysis and Compound Annual Growth Rate (CAGR). Regression analyses highlighted the robust correlation between coffee area and production, providing insights into the industry's growth. Decade-wise assessments reveal varying growth rates and export data sheds light on market trends. While some markets show consistent growth, challenges in key destinations necessitate strategic interventions. State-wise analyses highlight Karnataka's pivotal role. Overall, the study offers a comprehensive overview of India's coffee industry, crucial for policymakers and stakeholders navigating the journey from "Beans to Billions."

Keywords: Indian Coffee scenario, Coffee Growth dynamics and Export performance of Coffee

Introduction

In the global arena of coffee production, India has asserted its prominence, securing a notable position among the foremost coffee-producing nations by the year 2023 (*Anonymous-2023*). Driven by economic ambitions, nations frequently diversify into various industries to propel growth and prosperity(*Das et.al 2021*). This research paper intricately examines the dynamics of India's coffee production and export, delving into their catalytic role in the nation's pursuit of a $5 trillion economy. This exploration places a particular emphasis on the key coffee-producing states, with Karnataka emerging as a formidable force cultivating both Arabica and Robusta varieties. Employing a robust methodology, the study draws on time series data spanning three decades and employs statistical techniques such as regression analysis and Compound Annual Growth Rate (CAGR) to unravel the evolving trends and patterns shaping India's coffee sector. The research brings to light Karnataka's pivotal position in India's coffee industry, revealing substantial cultivation areas and impressive production outputs. Regression analyses underscore the strong relationships between variables, accentuating the industry's significance in the broader economic landscape. Decade-wise assessments expose varying growth rates, with the initial decade witnessing rapid expansion. Tables depicting export data underscore both opportunities and challenges, underscoring the imperative need for strategic adjustments to align with India's ambitious $5 trillion economic target. State-wise analyses accentuate Karnataka's dominance, making substantial contributions to India's coffee industry. The dynamics of exports emphasize the necessity for strategic interventions to capitalize on opportunities and effectively address challenges. In its journey from "Beans to Billions," India's coffee industry stands poised to make a substantial contribution towards the nation's overarching goal of achieving a $5 trillion economy. The potential for transformative impact lies in strategic adjustments and targeted initiatives that can propel the industry forward on the global stage, aligning its growth trajectory with the broader economic ambitions of the nation.

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Methodology:

The methodology for this research paper involves the collection and analysis of time series data related to India's coffee area, production, and export quantities from 1992-93 to 2021-22. The primary sources for this data include the National Horticultural Board, COFFEE Board Report-2023, and Agriculture Statistical at Glance-2023. To examine the export dynamics, data on export quantity and value of coffee from India to the top 20 countries worldwide is gathered specifically for the period 2014-15 to 2021-22, with the COFFEE Board Report-2023 serving as the primary data source. To achieve the research objectives, a comprehensive methodological approach is employed. Descriptive statistics are utilized to provide a detailed summary of the key features and trends in the data. Time series regression analysis is conducted to model the relationships between different variables over the specified period, offering insights into the factors influencing coffee area, production, and export dynamics. Additionally, the Compound Annual Growth Rate (CAGR) is computed to quantify the annual growth rate and assess the overall performance of the variables under consideration. This combination of statistical methods ensures a robust and multifaceted analysis of the temporal trends and patterns in India's coffee sector, contributing to a comprehensive understanding of its dynamics over the three decades.

Results and Discussion

The table1 presents a comprehensive overview of coffee production in key Indian states, emphasizing the cultivation of Arabica and Robusta varieties during 2022-2023. Karnataka emerges as a coffee production powerhouse, boasting substantial areas dedicated to both Arabica (98,496 hectares) and Robusta (129,115 hectares), resulting in a combined total area of 227,611 hectares. The state's production output reflects this dominance, with 254,575 metric tons, showcasing Karnataka's pivotal role in India's coffee industry. Kerala and Tamil Nadu follow, contributing significantly to the nation's coffee production. Kerala exhibits a noteworthy focus on Robusta cultivation, evident in its 81,021 hectares, surpassing Arabica cultivation. However, Tamil Nadu strikes a balance with 27,900 hectares dedicated to Arabica and 6,004 hectares to Robusta, showcasing diversity in coffee cultivation. The results also supported by (Prabha et al 2021). Andhra Pradesh and Odisha demonstrate varying degrees of coffee cultivation intensity. While Andhra Pradesh predominantly focuses on Arabica across 76,708 hectares, Odisha's relatively smaller cultivation area (4,183 hectares) is solely dedicated to Arabica. Assam, with a modest total cultivation area of 214 hectares, features a mix of Arabica and Robusta. Notably, the state achieves a balanced production output, underlining its commitment to both coffee varieties. The results are highly correlated to the study *Gairhe, and Reddy, (2012)*.

Table:1 State wise Area and production of coffee in India during 2022-23

SN	State	Arabica-Area (ha)	Robusta-Area (ha)	Total Area (ha)	Arabica-Production (MT)	Robusta-Production (MT)	Total Production (MT)
1	Karnataka	98496	129115	227611	72945	181630	254575
2	Kerala	3955	81021	84976	2000	71750	73750
3	Tamil Nadu	27900	6004	33904	13850	5490	19340
4	Andhra Pradesh	76708	264	76973	12170	40	12210
5	Odisha	4183	0	4183	465	0	465
6	Assam	130	84	214	70	90	160

Source: Anonymous, (2023)

Table-2 presents regression results for the coffee area in India from 1992-93 to 2021-22. The model exhibits high goodness of fit (R Square = 0.918), indicating that 91.8% of the variation in coffee area is explained

by the predictor variable (X) time. The coefficient for X is 0.0212, suggesting a significant positive relationship and the Compound Annual Growth Rate (CAGR) is 2.144%, signifying robust growth in coffee area. Table-2 focuses on coffee production in India from 1992-93 to 2021-22, showing a good fit (R Square = 0.691). The positive coefficient for X (0.0173) implies a significant growth impact, with a CAGR of 1.741%. Both results are highly significant at the 1% level. Further from the table-3 the regression analysis indicates a strong positive relationship (R Square = 0.69) between the independent variable (X) and the dependent variable. The intercept (12.26) represents the estimated value when X is zero. The coefficient for X (0.0173) signifies a significant positive impact on the dependent variable. The Compound Annual Growth Rate (CAGR) of Coffee Production is 1.741, indicating a substantial growth rate. The p-values for the intercept and X are highly significant (both < 0.05), suggesting the model's reliability and results also supported by (RangegowdaandUmesh2017).

Table-2: Regression results of Coffee area in India from 1992-93 to 2021-22

Summary Output								
Regression Statistics								
Multiple R	*0.958336*							
R Square	*0.918408*							
Adjusted R Square	*0.915494*							
Standard Error	*0.056659*							
Observations	*30*							
ANOVA								
	df	***SS***	***MS***	***F***	***Significance F***			
Regression	*1*	*1.01176*	*1.01176*	*315.1706*	*9.01E-17*			
Residual	*28*	*0.089886*	*0.00321*					
Total	*29*	*1.101645*						
	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	*12.39004*	*0.021217*	*583.9648*	*9.45E-59*	*12.34658*	*12.43351*	*12.34658*	*12.43351*
X	*0.021217*	*0.001195*	*17.75304*	*9.01E-17*	*0.018769*	*0.023665*	*0.018769*	*0.023665*
Compound Annual Growth Rate (CARG) of Coffee Production: 2.144***								

*Note: *** 1% level significant level*

Table-3: Regression results of Coffee Production in India from 1992-93 to 2021-22

Summary Output								
Regression Statistics								
Multiple R	*0.831141*							
R Square	*0.690796*							
Adjusted R Square	*0.679753*							
Standard Error	*0.103488*							
Observations	*30*							
ANOVA								
	df	***SS***	***MS***	***F***	***Significance F***			
Regression	*1*	*0.66995*	*0.66995*	*62.55502*	*1.29E-08*			
Residual	*28*	*0.299874*	*0.01071*					

Total	*29*	*0.969823*						
	Coefficients	***Standard Error***	***t Stat***	***P-value***	***Lower 95%***	***Upper 95%***	***Lower 95.0%***	***Upper 95.0%***
Intercept	*12.26095*	*0.038753*	*316.3835*	*2.67E-51*	*12.18157*	*12.34033*	*12.18157*	*12.34033*
X	*0.017265*	*0.002183*	*7.909173*	*1.29E-08*	*0.012794*	*0.021737*	*0.012794*	*0.021737*
Compound Annual Growth Rate (CARG) of Coffee Production: 1.741***								

*Note: *** 1% level significant level*

Table 4 provides a comprehensive analysis of coffee production in India from 1992-93 to 2021-22, showcasing decade-wise Compound Annual Growth Rates (CAGR) for both Coffee Area and Coffee Production. The data reveals a significant overall increase in both Coffee Area (2.144% CAGR) and Coffee Production (1.741% CAGR) during the entire period, signifying a robust growth trend in the Indian coffee industry. Interestingly, the highest growth rates were observed in the first decade (1992-93 to 2001-02) for both Coffee Area (4.860%) and Coffee Production (6.675%), highlighting a more rapid expansion during that period compared to subsequent decades.

Table-4: Decade wise growth rates of coffee production in India from 1992-93 to 2021-22

SN	Year in decades	Coffee Area CAGR (%)	Coffee Production CAGR (%)
1	1992-93 to 2001-02	4.860***	6.675***
2	2002-03 to 2011-12	1.456***	1.207**
3	2012-13 to 2021-22	1.500 **	0.357*
4	Overall (1992-93 to 2021-22)	2.144***	1.741***

Note: *** 1% level significant level
** 5% level significant level
* 10% level significant level

Table-5 presents the export quantities of coffee from India to the top 20 countries worldwide in terms of Green Bean Equivalent (in metric tons) from 2014-15 to 2021-22. Notable trends include a decline in exports to Italy, Turkey, and Russia, while countries like Belgium, the United Arab Emirates, and Egypt witnessed significant growth and outcome of the research paper related to the study by (*Kumareswaran et al 2019).* The Compound Annual Growth Rate (CAGR) reflects both positive and negative trends, impacting India's coffee export landscape. Linking this data to India's $5 Trillion Economic Ambitions, the performance in high-growth markets such as the UAE, Egypt, and Belgium could contribute positively to the nation's economic goals. However, challenges in traditional markets like Italy and Russia may necessitate strategic adjustments. The coffee export dynamics, when scaled up to billions, underscore the importance of diversifying and strengthening trade ties to bolster India's economic aspirations.

Table-6indicates the export values of coffee from India to the top 20 countries from 2014-15 to 2021-22, measured in crores. The data indicates dynamic trends in coffee exports with notable fluctuations in values. Germany emerges as a consistent top importer, experiencing a positive Compound Annual Growth Rate (CAGR) of 4.26%, showcasing a steady demand for Indian coffee. Notably, Jordan and the United Arab Emirates demonstrate remarkable CAGR values of 11.48% and 16.91%, respectively, indicating substantial market growth.The results are highly supported *Gurusamy and Yamakanith (2015).*

Table-5: Export quantity of Coffee from India to top 20 Countries in the world during 2014-15 to 2021-22 (Green Bean Equivalent - Quantity In MT)

SN	Destination	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	CAGR
1	ITALY	60173	77361	83560	79024	76452	63605	59002	75502	-0.73
2	GERMANY	25222	28286	34804	39128	31818	34099	32205	37949	3.93
3	BELGIUM	12092	15909	19994	18106	18510	19941	23856	29495	10.36
4	RUSSIAN FEDERATION	21135	25306	28805	26345	22293	26862	16179	24802	-1.76
5	JORDAN	6195	9407	6972	10778	9095	7604	9197	17837	9.18
6	TURKEY	15526	15180	17230	15951	14742	10723	6029	15497	-7.04
7	POLAND	4805	6493	11133	13709	14056	16503	11749	12790	14.02
8	LIBYA	6179	6019	6447	10545	10301	3811	9790	10722	5.74
9	U.S.A.	5766	5418	7361	13398	7354	7037	8072	10422	6.64
10	UNITED ARAB EMIRATES	2131	1911	2289	2406	3142	2753	4662	9316	20.42
11	MALAYSIA	6837	5788	6389	6918	9201	7735	8588	8317	5.13
12	GREECE	5852	6533	7790	5616	6137	5607	5503	7725	0.22
13	ISRAEL	2440	4064	3317	5199	4356	4347	4780	7203	11.34
14	EGYPT	1573	1649	1334	2682	3022	3477	3764	7000	23.27
15	UKRAINE	5332	3844	5096	6748	7327	6947	5711	6880	5.85
16	AUSTRALIA	5013	6759	5599	7857	6398	5985	6168	6808	2.02
17	SPAIN	5464	6295	9593	9960	7663	7155	5330	6619	-0.75
18	KUWAIT	4292	5343	5001	6457	5870	6675	6647	6032	5.18
19	SYRIA	2309	1634	4028	3149	4482	3366	2054	5900	9.37
20	SAUDI ARABIA	4031	3688	3511	4846	4293	3152	3793	5352	2.02

Source: Anonymous, (2023)

Table-6: Export value of Coffee from India to top 20 Countries in the world during 2014-15to 2021-22(in Crores)

SN	Destination	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	CAGR
1	ITALY	1007	1113	1155	1121	1168	916	856	1194	-0.92
2	GERMANY	473	481	548	631	510	548	546	734	4.26
3	BELGIUM	249	298	367	373	326	334	429	589	9.24
4	RUSSIAN FEDERATION	372	440	501	453	453	443	277	504	-0.69
5	JORDAN	141	206	135	191	173	149	251	438	11.48
6	TURKEY	278	265	281	272	236	157	89	267	-8.69
7	U.S.A.	102	92	131	141	134	126	163	218	10.02
8	POLAND	78	92	172	218	221	236	255	199	16.12
9	KUWAIT	100	115	110	131	113	152	173	189	9.13
10	UNITED ARAB EMIRATES	57	46	52	54	62	63	104	185	16.91
11	LIBYA	99	85	92	153	153	56	141	171	5.95
12	AUSTRALIA	106	127	101	130	112	108	118	145	2.22
13	SAUDI ARABIA	80	82	73	93	85	67	99	131	4.99

14	ISRAEL	42	59	74	77	64	64	75	126	10.47
15	MALAYSIA	94	85	95	96	125	107	114	125	4.87
16	EGYPT	25	23	20	38	44	56	61	124	25.82
17	GREECE	89	86	103	78	84	82	83	124	1.78
18	UKRAINE	100	66	83	102	112	98	84	121	3.72
19	SPAIN	92	82	125	138	110	101	75	109	-0.17
20	SYRIA	35	22	57	53	65	47	30	93	10.07

Source: Anonymous, (2023)

While some countries, like Italy and Turkey, show negative CAGR, suggesting a decline in demand, others like Australia and Greece display modest but positive growth. The table underscores the need for strategic approaches to bolster exports to certain nations and mitigate declines in others. Aligning with the "Beans to Billions for India's $5 Trillion Economic Goal," fostering sustained growth in coffee exports requires targeted interventions, market diversification, and product positioning to harness India's coffee industry potential and contribute to the overall economic goal.

Conclusion

The findings of this research underscore the robust growth in India's coffee industry, particularly in key states like Karnataka, Kerala, and Tamil Nadu. The regression analyses affirm strong relationships between variables, emphasizing the industry's significance. Notably, the export dynamics to top 20 countries reveal both challenges and opportunities, necessitating strategic adjustments in alignment with India's $5 trillion economic ambitions. By transforming "Beans to Billions," India can harness the potential of its coffee industry to contribute substantially to the overarching economic goal.The regression analysis reveals a strong positive relationship between coffee area and production in India from 1992-93 to 2021-22, with compound annual growth rates (CAGR) of 2.144% and 1.741%, respectively. The decade-wise growth rates further emphasize the sustained expansion of coffee cultivation, especially in the first decade. Export data indicates varying performance across top destinations, with Germany, Belgium, and the UAE showing consistent growth. However, challenges like negative CAGR in export quantity to Italy and declining export values to key markets like the USA and Italy pose concerns. State-wise, Karnataka dominates coffee cultivation and production, contributing significantly to India's coffee industry.

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