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A Marginal Value of Resource Efficiency Approach on Analysis of Total Factor Productivity of Coffee in India

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Abstract

Coffee popularly called brown gold is the second largest trading commodity in the world next to petroleum products. Coffee is one of the important plantation crops grown optimally between the Tropic of Cancer and the Tropic of Capricorn known as the Coffee belt, at an altitude between 800 and 2000 meters above sea level. The Coffee takes three to five years to bear fruit after sowing. Good yield starts from the fifth year onwards and continues up to fifty years of the life of the plant. Coffee requires heavy initial capital investment and high-level technology for its growth, processing, and harvesting. Hence economic viability of Coffee cultivation is based on the productivity level. Though India's cultivation practices are on par with the rest of the countries producing Coffee, Vietnam, Ethiopia, Brazil, and Colombia have the advantage of higher productivity than India's Coffee productivity level. Hence the study is undertaken with the objectives of analyzing the change in area, production, and productivity over the period 2011 to 2021. The study analyses the resource use efficiency and Cobb-Douglas production function to test the relationship between the yield of Coffee and the independent factors of production variables and to identify the reasons for the low productivity by Garrett Ranking technique.

Keywords: coffee, crops, production, countries, globally

1. Introduction

Coffee is one of the important plantation crops. Coffee is grown across the tropical regions in Asia, Africa, and Latin America at 25.5 percent, 12.5 percent, and 61.9 percent of World Coffee production respectively. Though Coffee is produced in nearly 70 countries of the World, some countries are found prominent in production and productivity. So an analysis of the area, production, and productivity in selected countries (based on the top productivity level) Vietnam, Ethiopia, Brazil, Colombia, and India is made and presented in this study. In India, Coffee was introduced in the 18th century. Consistently India stands as the largest producer in the world at a share of 3.4 percent of World Coffee production. In India, the

traditional Coffee growing regions are in the Southern state of Karnataka. Kerala and Tamil Nadu produce 98 percent of the country's Coffee. Non-traditional regions of Coffee cultivation are Arunachal Pradesh, Assam, Manipur, Meghaland and Nagaland, Tripura, Mizoram, and Orissa accounting for only 2 percent of India's total Coffee output. The study is undertaken for a decade from 2011 to 2021, which has shown that the Coffee cultivation area has registered a positive growth rate CAGR at 1.61 percent as the cultivated area under Coffee has increased from 3,60,485 hectares in 2011 to 4,22,924 hectares in 2021. Coffee production had shown a positive growth rate of 1.01 percent. But Coffee productivity had registered a negative growth rate of -0.59 percent. Hence it necessitates a study to analyze the factors responsible for such loss of yield.

2. Review of Literature

U.S. Agency for International Development Bureau for Food Security (2017) highlighted that the viability of Coffee depends on Coffee productivity. Vietnam has the highest yield in the world due to the renovation and rehabilitation of the Coffee project. USAID has identified that 50 percent of the coffee trees in India passed out peak productivity, Hence 50 percent of the area needs renovation and rehabilitation. Adriana Roldan et.al., (2008) Coffee Cooperation and Competition: A comparative study of Colombia and Vietnam published by United Virtual institute, this paper explored the cooperation and competition between Colombia and Vietnam Coffee, Coffee quality constitute an important competitive advantage. Specialty Coffee fetch higher export to promote specialty Coffee. Colombia and Vietnam should cooperate to produce value-added Coffee. XII plan scheme by the Coffee board Government of India (2018), has given the action plan to improve the production and productivity of Coffee plantations by encouraging replantation of those aged 25 years in the case of Arabica and 40 years in the case of Robusta by adopting incentives and subsidy to support the farmers. Assefa Ayele & Yadeta Bekele (2021), Trend, Instability and Decomposition Analysis of Coffee Production in Ethiopia (1993-2019), Agricultural reform program must be implemented to increase the productivity of Coffee. Coffee productivity in Brazil and Vietnam increased by 30 and 100 percent respectively due to the utilization of advanced mechanization, selective crop breeding techniques, and irrigation technologies. Karla Walker, S, (2021) "The impact of natural disasters on Coffee production" by Speciality Coffee Association has given that Cyclone Gaja hits hard Coffee plantations in Karnataka and Tamil Nadu in the year 2018. Pulney hills in the Dindigul District of Tamil Nadu were worst hit as the cyclone caused uprooting trees, snapped power lines, and crushing not less than 31000 acres of land under cultivation. Extensive damage to Coffee crops in lower Kodaikanal and lower Pulney hills resulted in low productivity in recent years. Niranjana Chandran et.al., "International Journal of advances in Agricultural Science and Technology" vol 7 issue 11, Nov (2020) pages 145-156. The majority of the farmers are small and marginal were not affordable to maintain the agricultural operations in Coffee. The prices of the input are costlier and changing weather conditions, the proliferation of pests and diseases resulted in declined production and yield of Coffee.

3. Field work and collection of data

The present study is based on both primary and secondary data. The primary data were collected from the Coffee planters through the personal interview method. In India Coffee is traditionally grown in the Western Ghats spread over Karnataka, Kerala, and Tamil Nadu. The State Tamil Nadu was purposively selected for the study since the reduction in yield from 2017 to 2021 was lower when compared to the yield level of the previous periods and on comparing

with Karnataka and Kerala. The purposive sampling technique is adopted. In the Dindigul district, Pulney Hills which is spread over a wider part of Western Ghats accounts for 50 percent of the Coffee area of Tamil Nadu State. A total of 300 Coffee cultivators out of 500 Coffee planters constitute the sample size for collecting primary data. Time series data of the harvested area, production, and productivity of selected countries over a decade from 2011 to 2021 was obtained from the FAO STAT database and India Coffee Board Database.

3.1 Objectives of the study

The following are the specific objectives of the present study.

To analyze the trend and compound growth rate of area under Coffee cultivation, production, and productivity.

1. To study resource use efficiency.
2. To analyze the determinants of Coffee yield.
3. To identify the reasons for low productivity

3.2 Period of Study

Primary data were collected from Coffee planters during January to March 2022. Primary data were collected from the Coffee planters relating to the year 2020-2021 based on empirical data.

3.3 Tools of analysis

The Cobb-Douglas type of production function was used to analyze the determinants of Coffee yield. To evaluate the resource use efficiency, the marginal value productivity of each type of input variable was equated with the acquisition cost. To find the growth rate in the area, production, and productivity of Coffee the compound growth rate was calculated. The Garrett ranking technique was used to identify the reasons for low productivity in the study area.

4. Results and Discussion

4.1 Decadal changes in the Coffee area, production, and yield in India

Table 1 depicts that Vietnam is the second-largest producer of Coffee in the world and first in Asia. The Table 1 and 2 accordingly Vietnam shows an annual Compound Growth Rate in area and production of Coffee every year by 2 percent and 4.5 percent respectively. The results demonstrate that in Vietnam the renovation and rehabilitation project has brought Coffee productivity in the year 2021 is 2824 kg/ha which is three times higher than the World Coffee yield. The cumulative replanted area from 2011 to 2021 stands at 1, 66,579 hectares with new high-yielding Coffee varieties and good quality.

It could be observd from the Table 3 that In Brazil, Coffee yield stands at an average of 1544 kg/ha over the decade during 2011-2021. Due to Coffee topography being affected by the main factor of climate change and it is evident from the Table 1 that the Area under Coffee shows declined Compound Growth Rate of -1.56 per cent during the study period. In Brazil, Coffee trees are relatively young (10 to 20 years), Compound Growth Rate of productivity stands at 2.63 percent over a decade from 2011-2021 according to Table 3

Ethiopia is Africa's biggest producer of Coffee. In Ethiopia the Coffee topography is scattered throughout the country, It is evident from Table 3 that the productivity of Coffee stands at 665 Kg/ha in the year 2021 with a Compound Growth Rate of -0.93 percent over the decade 2011-2021 due to the factor-driven by old Coffee trees (50-70 years).

Colombia is the world's third largest producer of Coffee with a strong replanting program that the Table 2 shows that the Compound Growth Rate of production was about 1.81 percent over the decade during 2011-2021.

India is the second largest producer of Coffee in Asia next to Vietnam. The Table 1 revealed that Indian Coffee area during 2011-2021 showed a steeply increasing trend with a significant growth rate of 1.61 percent over a decade but the productivity showed a decreasing cyclical trend with a negative Compound Growth Rate of -0.59 percent over a decade as revealed by Table 3, due to Cyclone Gaja hit hard the State of Karnataka and Tamil Nadu followed by heavy rain due to cyclone resulted in the loss of Coffee quality and productivity.

Table 4 depicts that in India area under Coffee cultivation had shown the overall compound growth rate during the decade 2011-2021 is 0.77 percent, 0.11 percent, and 1.30 percent in Karnataka, Kerala, and Tamil Nadu respectively. It could be observed from the Table 5 State-wise production of Coffee in India had shown a Compound Growth Rate of 1.53 percent, 0.48 percent, and 0.92 per cent in the states of Karnataka, Kerala, and Tamil Nadu respectively. It is evident from Table 6 that State-wise productivity of Coffee in India had shown the Compound Growth Rate of 0.097 percent, -0.894 percent, and -0.557 percent in the State Karnataka, Kerala, and Tamil Nadu.

Table 1. *The country-wise area under Coffee cultivation during 2011-2021 in hectares*

	Vietnam		Ethiopia		Brazil		Colombia		India	
	Area	CAGR	Area	CAGR	Area	CAGR	Area	CAGR	Area	CAGR
2011	543865		515882		2148775		723921		360485	
2012	572600	5.28	528571	2.46	2120080	-1.34	696023	-3.85	368687	2.28
2013	581381	1.53	538466	1.87	2085522	-1.63	771725	10.88	376305	2.07
2014	589041	1.32	561762	4.33	1997827	-4.20	795563	3.09	381304	1.33
2015	593800	0.81	653910	16.40	1977714	-1.01	801118	0.70	423270	11.01
2016	597597	0.64	700475	7.12	1996604	0.96	778362	-2.84	434436	2.64
2017	605178	1.27	725961	3.64	1802417	-9.73	903950	16.13	449357	3.43
2018	618879	2.26	764863	5.36	1863966	3.41	877140	-2.97	413020	-8.09
2019	624100	0.84	758523	-0.83	1825283	-2.08	853698	-2.67	416741	0.90
2020	637563	2.16	856592	12.93	1898239	4.00	844744	-1.05	418167	0.34
2021	653192	2.45	685294	-20.00	1836741	-3.24	840112	-0.55	422924	1.14
CAGR for decade		1.85		2.88		-1.56		1.50		1.61

Source: Food and Agriculture Organization of the United Nations FAOSTAT database.

Table 2. *Country-wise production of Coffee during 2011-2021 (in metric tonnes)*

Year	Vietnam		Ethiopia		Brazil		Colombia		India	
	Production	CAGR	Production	CAGR	Production	CAGR	Production	CAGR	Production	CAGR
2011	1276506		376823		2700540		468540		302000	
2012	1260463	-1.26	275530	-26.88	3037534	12.48	462000	-1.40	314000	3.97
2013	1326688	5.25	392006	42.27	2964538	-2.40	653160	41.38	318200	1.34
2014	1406469	6.01	419980	7.14	2804070	-5.41	728400	11.52	304500	-4.31
2015	1452999	3.31	457014	8.82	2647504	-5.58	827750	13.64	327000	7.39
2016	1460800	0.54	469091	2.64	3024466	14.24	818243	-1.15	348000	6.42
2017	1542398	5.59	449230	-4.23	2684508	-11.24	851640	4.08	312000	-10.34
2018	1616307	4.79	494574	10.09	3552729	32.34	813420	-4.49	316000	1.28
2019	1686765	4.36	482561	-2.43	3011745	-15.2	885120	8.81	319500	1.11
2020	1763476	4.55	584790	21.18	3700231	22.9	833400	-5.84	298000	-6.73
2021	1845033	4.62	456000	-22.02	2993780	-19.1	560340	-32.76	334000	12.08
CAGR for decade		3.75		1.93		1.04		1.81		1.01

Source: Food and Agriculture Organization of the United Nations FAOSTAT database.

Table 3. *Country-wise productivity of Coffee during 2011-2021 in kg/ha*

Year	Vietnam		Ethiopia		Brazil		Colombia		India	
	Yield	CAGR	Yield	CAGR	Yield	CAGR	Yield	CAGR	Yield	CAGR
2011	2347		730		1256		647		837	
2012	2201	-6.22	521	-28.63	1432	14.01	663	2.47	851	1.67
2013	2282	3.68	728	39.65	1421	-0.77	846	27.60	845	-0.71
2014	2387	4.60	748	2.69	1403	-1.27	915	8.16	798	-5.56
2015	2446	2.47	698	-6.63	1338	-4.63	1033	12.90	772	-3.26
2016	2444	-0.08	669	-4.15	1514	13.15	1051	1.74	801	3.76
2017	2548	4.26	618	-7.62	1489	-1.65	942	-10.37	694	-13.36
2018	2611	2.47	646	4.53	1906	28.01	927	-1.59	765	10.23
2019	2702	3.49	636	-1.55	1650	-13.43	1036	11.76	766	0.13
2020	2766	2.37	682	7.23	1949	18.12	986	-4.83	712	-7.05
2021	2824	2.10	665	-2.49	1629	-16.42	667	-32.35	789	10.81
CAGR for decade		1.87		-0.93		2.63		0.30		-0.59

Source: Food and Agriculture Organization of the United Nations FAOSTAT database.

Table 4. *The state-wise area under Coffee cultivation during 2011-2021 in hectares*

	Karnataka		Kerala		Tamil Nadu		Non-traditional Ares	
Year	area	CAGR	area	CAGR	area	CAGR	area	CAGR
2011	227750		84931		31344		60620	
2012	229658	0.84	84948	0.020	31344	0	63740	5.15
2013	230333	0.29	85359	0.484	31544	0.64	68095	6.83
2014	230333	0	85359	0	31544	0	71439	4.91
2015	230434	0.044	85456	0.114	31671	0.40	75709	5.98
2016	235438	2.17	85501	0.053	34932	10.30	78548	3.75
2017	244785	3.97	85870	0.432	35607	1.93	85594	8.97
2018	244785	0	85880	0.012	35607	0	88451	3.34
2019	245288	0.21	85880	0	35592	-0.04	92516	4.60
2020	245682	0.16	85880	0	35652	0.17	92517	0.001
2021	245919	0.10	85880	0	35652	0	97913	5.83
CAGR FOR DECADE		0.77		0.111		1.30		4.91

Source: Coffee Board of India Database.

Table 5. *State-wise production of Coffee during 2011-2021 (in metric tonnes)*

	Karnataka		Kerala		Tamil Nadu		Non-traditional Ares	
Year	Production	CAGR	Production	CAGR	Production	CAGR	Production	CAGR
2011	213780		65650		16650		5920	
2012	227675	6.50	69125	5.29	18540	11.35	6900	16.55
2013	234860	3.16	65000	-5.97	17440	-5.93	8000	15.94
2014	211100	-10.12	66675	2.58	18775	7.65	7850	-1.88
2015	236340	11.96	68225	2.32	18125	-3.46	8100	3.18
2016	251520	6.42	69230	1.47	17295	-4.58	9955	22.90
2017	229345	-8.82	62440	-9.81	16335	-5.55	10450	4.97
2018	222300	-3.07	65735	5.28	17560	7.50	10525	0.72
2019	203445	-8.48	65925	0.29	17400	-0.91	11230	6.70
2020	242300	19.10	68800	4.36	18325	5.32	11430	1.78
2021	248900	2.72	68900	0.15	18240	-0.46	12460	9.01
CAGR FOR DECADE		1.53		0.48		0.92		7.73

Source: Coffee Board of India Database.

Table 6. *State-wise productivity of Coffee during 2011-2021 in kg/ha*

Year	Karnataka Yield	CAGR	Kerala Yield	CAGR	Tamil Nadu area		Non-traditional Areas area	CAGR
2011	1027		780		552		162	
2012	1045	1.75	809	3.72	608	10.14	157	-3.09
2013	1045	0	810	0.12	620	1.97	157	0
2014	989	-5.36	790	-2.47	626	0.97	156	-0.64
2015	1093	10.52	802	1.52	596	-4.79	144	-7.69
2016	1152	5.40	817	1.87	532	-10.74	167	15.97
2017	980	-14.93	745	-8.81	487	-8.46	169	1.20
2018	983	0.31	774	3.89	519	6.57	158	-6.51
2019	971	-1.22	829	7.11	531	2.31	167	5.70
2020	897	-7.62	776	-6.39	519	-2.26	155	-7.19
2021	1037	15.61	713	-8.12	522	0.58	150	-3.23
CAGR FOR DECADE		0.097		-0.894		-0.557		-0.767

Source: Coffee Board of India Database.

Table 7. *Total Factor Productivity of Coffee as per Age-wise of the Coffee plant*

Age-group	*Total Cost Per Acre (in `)*	*Output Kilogram Per Acre*	*Cost of Production (` Per Kg.)*
4–10	38435.80	415	92.61
10–35	43873.20	760	57.73
35–45	43880	616	71
45–50	34752	400	86.88

Source: Primary data.

Age-wise Analysis of Productivity and Unit Cost of Production

It could be observed from above Table 7 that Coffee crop is classified into four age groups, namely the initial bearing stage from the 4th 10th years; the peak yielding stage (10 to 35 years), the declining stage (35 years to 45 years), and the depression stage (from 45 to 50 years). The age-wise analysis of the annual productivity of Coffee in the study area disclosed that the average output was 415 kilograms per acre during 4-10 years; 760 kilograms during 10-35 years; 616 kilograms during 35 to 45 years and 400 kilograms in the depression stage. The comparative analysis of the unit cost of production was Rs 92.61per kilogram during 4 to 10 years and during 10 to 35 as it is optimum yield period the cost of production per kilogram is at Rs 57.73. During 35 years to 45 years coffee yield stands at 616 per acre resulted in cost of production Rs71. As the Coffee plant reached its maturity age of 45 to 50 years resuted in high cost of production Rs 86.88per kg due to fact of yield started decreasing

4.2 Determinants of Gross Returns and Resource Use Efficiency

The determinants of gross returns returns to scale, and resource use efficiency was analyzed using the Cobb-Douglas type production function. The function in logarithmic form is as follows.

$$\text{Log } y = \log b_0 + b1 \log X_1 + b_2 \log X_2 + . + b_5 \log X_5 \quad .(1)$$

Where

a. Y = Yield of Coffee in kilograms per acre
b. X_1 = Human labor in man days per acre in year t
c. X_2 = Manures in rupees per acre in year t
d. X_3 = Fertilizers in rupees per acre in year t
e. X_4 = Pesticides in rupees per acre in year t
f. X_5 = Cost of irrigation in rupees per acre in year t
g. X_6 = Age of the plants in years in year t
h. Where t is the actual year (age) of the crop at the time of collection of data.
i. b_0, b_1. . . . b_5 = are the parameters to be estimated.

b_0 = regression constant

b_0, b_1. b_5 = partial elasticity of yield concerning the factors.
X_1, X_2. X_5 = respectively
To test the significance of the estimated parameters b_1, b_2. b_5.
t-test of the following formula has been used.

$$t = \frac{b_1}{SEb_i}$$

SEb_i = standard error of b_i

The sum of all the production elasticities of factor inputs indicates returns to scale is $\sum b_i = 1, 2. 5$

If $\sum bi > 1$ increasing returns to scale
< 1 decreasing returns to scale
= 1 constant returns to scale

4.3 Determinants of Coffee Yield

The Cobb-Douglas type production function (1) is fitted to test the relationship between the yield of Coffee and the independent variables.

The results are presented in Table 8.

Table 8. *Cobb-Douglas Production Function for Coffee Cultivation*

Sl.No.	*Variable*	*Notation*	*Elasticity Co-efficient*	*Standard Error*	*'t' statistics*
1.	Yield (kgs per acre)	Y	–	–	–
2.	Constant	b_0	6.084**	1.124	5.415
3.	Labor (man-days/acre)	X_1	0.654**	0.068	9.615
4.	Manure (`/acre)	X_2	0.057^{NS}	0.037	1.526
5.	Fertiliser (`/acre)	X_3	0.26**	0.015	17.367
6.	Pesticide (`/acre)	X_4	0.011^{NS}	0.013	0.866
7.	Cost of irrigation	X_5	0.104*	0.033	3.122
8.	Age of the plants (in years)	X_6	–0.011*	0.003	–3.719

Source: Primary data.

A sum of elasticity co-efficient 1.075
$R^2$0.764
F-test 190.075
*Significant at one percent level.
**Significant at five percent level.
NS–Not Significant.

It is observed from Table 8 that the coefficient of determination (R^2) of the function was 0.764 which indicated that 76.40 percent of the variation in the output of Coffee was explained by all the five independent variables. The F test shows that the estimated Cobb-Douglas type production function was statistically significant at the one percent level. The regression constant had a positive value and it was statistically significant at the one percent level, revealing that the error of approximation of the functional form is significant. However, the estimated equation was statistically significant and valid to draw inferences. Among the independent variables, human labor, fertilizer, cost of irrigation, and another age of the plant were found to be statistically significant. It could be inferred that the yield of Coffee was significantly influenced by the level of labor utilized. One percent increase in the level of labor used, keeping all other factors constant, would increase the yield by 0.654 percent from its mean level. The elasticity coefficient for the variable cost of fertilizer was 0.26 which indicates that by increasing the expenditure on fertilizer by one percent there would be an

increase in the yield of Coffee by 0.26 percent, ceteris paribus. The variable age of the Coffee plants is one of the important inputs contributing to the yield of Coffee. Its co-efficient was –0.011 and it was significant at the five percent level, indicating that a one percent increase in the age of the plants would reduce the output of Coffee by 0.011 percent from the mean level in the yield-decreasing stage of the plant. The Coffee yield was also influenced by the cost of irrigation. The co-efficient of the cost of irrigation at the five percent level was 0.104. This shows that a one percent increase in the cost of irrigation would increase the yield by 0.104 percent from its mean level.

4.4 Resource use efficiency

The marginal value productivity of resources and the cost of the resources would indicate the reallocation of resources to maximize returns. The optimization principle in resource allocation suggests that the application of a resource should be increased till the marginal value, the product of a factor equals its marginal cost. In the present study, the marginal value product of the inputs.

X_1, X_2, and X_5 were calculated by using the following formula.

$$MVP_j = b_j \frac{\overline{Y}}{\overline{X}_j} \overline{P}$$

Where

a. MVPj = Marginal value product for input
b. Bj = Estimated elasticity co-efficient of variable Xj
c. Y = Geometric mean yield (kg)
d. Xj = Geometric mean value of the variable
e. P = mean net selling price of Coffee (Rs./kg)
f. for j= 1, 2,. 5

1. After computing the MVP of various inputs, it was divided by the marginal input cost or factor cost to arrive at the ratio of the marginal value product to the factor cost.
2. The marginal value products of the significant variables for yield increase were estimated and the details are resented in Table 9.

Table 9. *Marginal Value Productivity of the Resource Use in Coffee Cultivation*

Sl.No.	*Variable*	*Geometric Mean*	*Average Physical Product (kgs)*	*Elasticity Co-efficient*	*Marginal Physical Product(kgs)*	*Marginal Value Product (`)*	*Marginal Input Cost (`)*	*MVP/ MIC*
1.	Yield (kgs/acre) (Y)	410.269						
2.	Labor (man-days/ acre) (X_1)	82.44	4.977	0.654	3.255	278.86	74.53	3.74
3.	Fertiliser (`/acre) (X_2)	3660.48	0.112	0.26	0.029	2.50	1	2.50
4.	Cost of irrigation (X_3)	158.38	2.590	0.104	0.269	23.08	1	23.08
5.	Age of the plants (in years) (X_4)	15	27.351	–0.011	–0.301	–25.78		

Source: Primary data.

It could be observed from Table 9 that the ratio of the marginal value products to the factor cost were 3.74; 2.50 and 23.08 respectively for human labor, fertilizers, and cost of irrigation. It is inferred from the Table that there was wide scope for increasing the use of

human labor, fertilizers, and cost of irrigation to increase the yield of Coffee, as the ratio of marginal value product to factor cost was more than unity. It also revealed that every rupee additionally spent on labor, fertilizers, and the cost of irrigation would yield 3.74 and 2.50, and 23.08 respectively. The increased use of human labor would give the income by 3.74 times the factor cost.

4.5 Reasons for Low Productivity of Coffee in India

Though India's cultivation practices are on par with the rest of the countries producing Coffee, Vietnam, Ethiopia, Colombia, and Brazil have the advantage of higher productivity than India's Coffee productivity level. So the researcher has identified the reasons for the low productivity of Coffee. Table 10 reveals the reasons for the low productivity of Coffee.

Table 10. *Reasons for Low Productivity of Coffee*

Sl.No.	*Factor*	*Garrets Mean Score*	*Rank*
1.	The biological wealth of the soil	47.58	II
2.	Usage of inorganic fertilizers	43.35	III
3.	Lack of proper plant management	35.17	V
4.	Change in climatic conditions	48.16	I
5.	Divided attention due to multiple cropping systems	36.68	IV

Source: Primary data.

The researcher has identified five prominent factors responsible for the low productivity of Coffee. "Climate change" due to global warming has resulted in less productivity of Coffee due to the failure of blossoming showers which leads to a floral imbalance resulting in low production of Coffee whereas Vietnam and Brazil and Ethiopia have special geographical conditions and climatic conditions to thrive well and offer maximum yields. "The biological wealth of the soil" has a mean score of 47.58 and ranks second due to widespread of zinc deficiency of the soil and "the usage of inorganic fertilizers" has a mean score of 43.35, Hence the usage of inorganic fertilizers ranks third and "divided attention due to multiple cropping systems" and interest "on other crops reduces the intensive cultivation of Coffee ranking fourth with the mean score 36.68. The lack of proper plant management" due to financial crisis resulted in low productivity ranking fifth with the mean score 35.17.

5. Conclusion

In India, Coffee topography lies in the Western Ghats of Karnataka, Kerala, and Tamil Nadu. The coffee industry employs nearly 700 people daily around the year. Indian Coffee has high economic value, About 70 percent of Coffee produced in India is exported annually, so it is an important foreign exchange earner. The viability of Coffee depends on the Coffee yield level. The study revealed that the yield level has decreased over a decade due to white stem borer disease affecting 40 percent of the Coffee planted area and 46 percent of Coffee trees have passed out 40 years of age, 15 to 20 percent of low land areas are at the risk of climate change. The study suggests that high elevation, rejuvenation of old Coffee trees, conservation of old shade trees, and alternative irrigation during the critical period could enhance the long-run productivity of Coffee.

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