

COMPARITIVE ANALYSIS OF AREA, PRODUCTION AND PRODUCTIVITY OF COFFEE IN CHIKKAMAGALURAND HASSAN DISTRICTS OF KARNATAKA

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Abstract

Coffee is one of the most important commercial crops of the tropics. Coffee is the second most traded commodity in the world next only to crude oil. It was first brought into India from Yemen in 1600 AD and plant in the high mountains of Baba Budan's Courtyard, Karnataka district of Chikkamagaluru. The coffee was produced commercially in two major species, namely *Coffea arabica* and *Coffea canephora*, commonly referred to as arabica and robusta coffee. Chikmagalur is known as coffee country of India. It is an abode of large coffee plantations as well as the hub of coffee research in India, the Central Coffee Research Institute is situated here. Hassan, small district coffee pocket sandwiched between two of the largest coffee regions of the country viz., Chikmagalur and Coorg. Manjarabad (Hassan) is traditionally recognised as an arabica growing region. With respect to area, Arabica coffee is popular in two districts comparatively than robusta coffee. Chikkamagaluru district is contributing more area compared to Hassan. Production was higher in case of arabica coffee compared to robusta coffee in both Chikkamagaluru and Hassan district. Productivity of robusta coffee was higher in case of both Chikkamagaluru and Hassan districts. Hence, we can conclude that robusta was more productive compared to arabica coffee, but quality of arabica coffee was much more preferred because of its fine taste and aroma.

Key Words: *Coffee, Area, Production, Arabica, Robusta, Hassan and Chikkamagluru.*

INTRODUCTION

Coffee is one of the most important commercial crops of the tropics. Coffee is the second most traded commodity in the world next only to crude oil. It was first brought into India from Yemen in 1600AD and plant in the high mountains of Baba Budan's Courtyard, Karnataka district of Chikkamagaluru. The coffee was produced commercially in two major species, namely *Coffea arabica* and *Coffea canephora*, commonly referred to as arabica and robusta

coffee. Indian coffee is mainly grown in the Western Ghats spread over Karnataka, Kerala and Tamil Nadu. Now, India has 16 unique coffee varieties. That has been grown under a canopy of natural shade in ecologically sensitive regions of the Western and Eastern Ghats.

Coffee contains some antioxidants and beneficial nutrients that can improve health. Coffee mainly contains caffeine substance, which can scientifically prove to be helpful in improving mental performance. The area under coffee plantation in India has increased by more than three times, from 120,321 hectares in 1960-61 to 459,895 hectares in 2018-19. This phenomenal increase in area could be attributed both to the increase in production and improvement in productivity levels.

In India, coffee is grown in regions that receive 2,500-4,000 mm rainfall for more than 100 days, followed by a continuous dry period of a similar duration. Coffee growing areas in the country have diverse climatic conditions, which are suitable for the cultivation of different varieties of coffee. In India coffee is an important plantation crop, which is mainly cultivated in the southern states of Karnataka (57%), Kerala (24%) and Tamil Nadu (9%) and to a lesser extent, in non-traditional areas like Andhra Pradesh, Orissa and North Eastern States (10%).

The major coffee growing areas are Chikkamagaluru, Coorg and Hassan districts in Karnataka. Wynad, Idukki and Nelliampathys in Kerala and Pulneys, Shevroys, Anamalai's and Nilgiris in Tamil Nadu.

India cultivates both the commercially important species of coffee, viz., arabica and robusta varieties of coffee in an area of 459,895 ha in 2018-19, producing nearly 299,300 MT of coffee per annum. There are approximately 1,78,308 coffee holdings of which, nearly 98.8% of the holdings are small with less than 10 ha per household. These smallholdings occupy 74.6% of the total area under coffee and contribute about 70% of the country's total coffee production. The remaining 1.2% of the holdings, which are large, occupy 25.4% of the area and contribute 30% of the total production. The productivity of Arabica and robusta is 470 kg/ha and 1,047 kg/ha, respectively and the national average productivity is 767 kg/ha during 2018-19.

Karnataka covers major percentage area of coffee cultivation in India compared other states especially it is grown in Chikkamagalur, Coorg and Hassan districts. Hence this study was carried out with an objective of analyzing the trend in area, production and productivity of Arabica coffee in Hassan and Chikkamagalur districts.

Area's taken for study,

Chikmagalur - Known as coffee country of India, Chikmagalur is an abode of thick jungles, wildlife sanctuaries and large coffee plantations as well as the hub of coffee research in India, the Central Coffee Research Institute. The region receives medium to heavy rain fall (1500-3000 mm), with moderate elevation (700-1200 m MSL). The arabica varieties like \$795 are carefully nourished under a two-tier mixed shade, comprising Erythrina Lithosperma as lower canopy and the Albizzia SP. Ficus sp. Terminalia bellarica as top canopy, in a traditional way and often grown amidst spices like Pepper, Cardamom, Vanilla etc. The cup reveals medium body, light acidity and flavour with medium to intense aroma.

Manjarabad (Hassan) - A small district coffee pocket sandwiched between two of the largest coffee regions of the country viz., Chikmagalur and Coorg, Manjarabad is traditionally recognised as an arabica growing region. Hassan is famous for world famous sculptures of Belur and Hale Beedu. Coffee was introduced into this region by renowned British planters, Robert Green and Robert H. Elliot. The region with medium elevation peaks (900-1100 m MSL) and wide range of rain fall from 1000-2500 mm has some of the best maintained arabica plantations under mixed shade. Ever enterprising planters, always willing to experiment with new technologies, craft best quality coffees. The coffees are known to have medium to full body, mild acidity, medium to intense aroma and pleasant flavour.

Review of literature

Sunanda and Nagaraja (2014) studied an overview of coffee production in Karnataka. Their study revealed that compared to Robusta, productivity of Arabica was 1.7 times higher in 1950-51, but in 2010-11 it is reversed, i.e., productivity of Robusta is around 1.8 times higher than the productivity of Arabica. During 1960-61 and 1980-81 productivity of both are almost same, but in the remaining periods productivity of Robusta is higher. When we look into the planted area of coffee pertaining to the district Chikmagalur, for a six years period 2006-07 to 2011-12, taking 2006-07 as base year only 01% decline in Arabica and 01% increase in Robusta are noticed. Even the total planted area is also increased by just 01%. However, a clear signal of 01% shift from Arabica to Robusta in the total planted area for this period. The planted area of Hassan district shows a different picture altogether as compared to other two districts. Taking 2006-07 as base year, we notice a 07% decline in the planted area of Arabica and a 07% increase in the planted area of Robusta variety. Overall increase of 05% in the total planted area is noticed. The table clearly depicts that there is 07% shift in the area of

cultivation from Arabica to Robusta for the period in the district. The planted area of Chikmagalur, Coorg and Hassan districts show a clear difference in varieties of plantation. In the districts, Chikmagalur and Hassan around 2/3 of the planted area is Arabica variety and remaining 1/3 is of Robusta. But vice-versa in the case of Coorg district - it is 28% Arabica and 72% Robusta.

Majumder *et al.* (2012) analysed the global changes in area and production of tea during the last decade of 20th century. During 1991, tea was cultivated globally in 2563.76 thousand ha which increased to 2661.88 thousand ha with a compound growth rate of 0.42 percent. With the advent of 21st century the world tea industry saw a steady increase in the overall area under tea. During 2001 the area under tea was 2727.42 thousand ha which increased to 3691.89 thousand ha in 2010 with a compound growth rate of 3.42 percent. The production in 1991 was 2631.05 million kg which remained almost same till 1997. However, in 1998 world tea production was 3026.13 million kg but, in 2000, it decreased to 2928.67 million kg. The compound growth rate during the period of 1991-2000 was 1.2 percent. From 2001 onwards production of tea increased steadily and reached 4162.33 million kg with a compound growth rate of 3.48 percent during the period of 2001 -2010.

Avinash Kumar (2011) analysed the production of coffee in Chikmagalur district of Karnataka. A multistage random sampling procedure was adopted in selection of the sample farmers. Per hectare establishment cost of coffee was found to be 393,371.00 and 361,860.00 in small and large plantations, respectively. Per hectare maintenance cost during bearing period worked out to be as 110,761.90 and 102,968.20 in small and large plantations, respectively. The average per ha yield from small plantation was 3143.80 kg and from large plantation it was 3125.96 Kg. Net returns were 201,634.40 from small plantation and 215,664.67 from large plantation.

Namasivayam and Paul (2004) estimated the trend in area, production and productivity of coconut in India. The entire analysis was done separately in three phases for the overall period under the study. Period 1977-78 to 1986-87 was I phase, 1987-86 to 1996-97 was II phase and, 1997-98 to 2001-2002 was III Phase. The trend in growth rate analysis revealed that the growth in

area, production and productivity over the years was there in the first two periods while in the third period productivity was negative.

Varghese (2004) worked out the trend in area, production and productivity of cardamom in Kerala for a period from 1970-71 to 2002-03 using semi-logarithmic growth equation. The area under cardamom registered a negative percentage annual growth rate of -1.216 which was statistically significant. The output grew at an average annual growth rate of 4.14 per cent and yield registered an average annual growth rate of 5.51 per cent during the period.

Guledgudda *et al.* (2002) studied the trend in world tea production and export. India's share in the world tea production has slipped gradually from 38.12 per cent in 1960-61 to 28.83 per cent in 1990- 91 and further marginally came down to 27.45 per cent in 1999-2000. Similarly, its share in world tea exports has been similarly decreased gradually from 36.41 per cent in 1960-61 to 18.83 per cent in 1990- 91 and further decreased to 17.86 per cent in 1998-98.

Material and Methods

Secondary data regarding area, production and productivity of Chikkamagluru and Hassan districts were collected from database of coffee Board. To examine the trend in the area, production, productivity of coffee in Hassan and Chikkamagalur districts. Mean, Standard deviation and co-efficient of variance was worked out. The standard deviation as a percentage of mean is called as the coefficient of variation.

Standard deviation is calculated by using formula,

$$S = \sqrt{\frac{\sum (X - \bar{x})^2}{n - 1}}$$

Where,

S= Standard deviation , \bar{X} = Arithmetic mean, n = number of samples.

The coefficient of variation (CV) is a measure of relative variability. It is the ratio of the standard deviation to the mean (average)

Table 1. Year wise area of arabica and robusta coffee with its percent contribution from 2006-07 to 2019-20.

Year	District	Arabica (ha)	Percent contribution (%)	Robusta (ha)	Percent contribution (%)	Total	Percent change from base year (2006-07=100%)
2006 - 07	Chikkamagalur	56590	64.55	31078	35.45	87668	100.00
	Hassan	25250	73.64	9040	26.36	34290	100.00
2007-08	Chikkamagalur	56872	64.87	31233	35.63	88106.34	100.5
	Hassan	25376	74.01	9085	26.49	34461.45	100.5
2008-09	Chikkamagalur	56995	64.36	31565	35.64	88560	101.02
	Hassan	24475	69.90	10540	30.10	35015	102.11
2009-10	Chikkamagalur	56995	64.30	31650	35.70	88645	100.10
	Hassan	24225	68.99	10890	31.01	35115	100.29
2010-11	Chikkamagalur	56995	64.30	31650	35.70	88645	100.00
	Hassan	23875	67.21	11650	32.79	35525	101.17
2011-12	Chikkamagalur	57000	64.15	31853	35.85	88853	100.23
	Hassan	24075	66.83	11950	33.17	36025	101.41
2012-13	Chikkamagalur	56900	64.03	31968	35.97	88868	100.02
	Hassan	24140	66.00	12435	34.00	36575	101.53
2013-14	Chikkamagalur	56900	64.03	31968	35.97	88868	100.00
	Hassan	24140	66.00	12435	34.00	36575	100.00
2014-15	Chikkamagalur	56913	64.03	31974	35.97	88886	100.02
	Hassan	24150	65.94	12475	34.06	36625	100.14
2015-16	Chikkamagalur	58175	64.37	32196	35.63	90371	101.67
	Hassan	24946	64.73	13594	35.27	38540	105.23
2016-17	Chikkamagalur	55225	56.69	42192	43.31	97417	107.80
	Hassan	25480	63.26	14799	36.74	40279	104.51
2017-18	Chikkamagalur	55225	56.69	42192	43.31	97417	100.00
	Hassan	25430	63.13	14849	36.87	40279	100.00
2018-19	Chikkamagalur	55225	56.59	42357	43.41	97582	100.17
	Hassan	25409	62.88	15001	37.12	40410	100.33
2019-20	Chikkamagalur	55225	56.59	42357	43.41	97582	100.00
	Hassan	25258	62.31	15276	37.69	40534	100.31
Mean	Chikkamagalur	56516.85	62.11	34730.96	37.93	91247.74	100.82
	Hassan	24730.66	66.77	12429.94	33.26	37160.6	101.25
Max	Chikkamagalur	58175	64.87	42357	43.41	97582	107.8
	Hassan	25480	74.01	15276	37.69	40534	105.23
Min	Chikkamagalur	55225	56.59	31078	35.45	87668	100
	Hassan	23875	62.31	9040	26.36	34290	100
Standard Deviation	Chikkamagalur	916.81	3.6	4959.91	3.57	4143.84	2.07
	Hassan	622.63	3.73	2093.81	3.66	2362.22	1.67
Co- efficient of variene (CV) %	Chikkamagalur	61.64	-	7.00	-	22.02	-
	Hassan	39.71	-	5.93	-	15.73	-

Table 2. Year wise production of arabica and robusta coffee with its percent contribution of Chikkamagalur and hassan districts from 2006-07 to 2019-20.

Year	District	Arabica	Percent contribution	Robusta	Percent contribution	Total	Percent change from base year (2006-07=100%)
2006-07	Chikkamagalur	28565	50.61	27875.5	49.39	56440.5	100.00
	Hassan	12509.5	63.03	7338.25	36.97	19847.75	100.00
2007-08	Chikkamagalur	29,000	50.61	28,300	49.39	57,300	101.52
	Hassan	12,700	63.03	7,450	36.97	20,150	101.52
2008-09	Chikkamagalur	37,450	53.39	32,700	46.61	70,150	122.43
	Hassan	14,400	59.14	9,950	40.86	24,350	120.84
2009-10	Chikkamagalur	56995	64.30	31650	35.70	88645	126.36
	Hassan	23875	67.21	11650	32.79	35525	145.89
2010-11	Chikkamagalur	57000	64.15	31853	35.85	88853	100.23
	Hassan	24075	66.83	11950	33.17	36025	101.41
2011-12	Chikkamagalur	37,825	50.42	37,200	49.58	75,025	84.44
	Hassan	19,175	58.28	13,725	41.72	32,900	91.33
2012-13	Chikkamagalur	38,250	55.52	30,640	44.48	68,890	91.82
	Hassan	19,150	63.10	11,200	36.90	30,350	92.25
2013-14	Chikkamagalur	38,200	48.31	40,880	51.69	79,080	114.79
	Hassan	18,525	57.84	13,505	42.16	32,030	105.54
2014-15	Chikkamagalur	42,425	50.62	41,385	49.38	83,810	105.98
	Hassan	18,950	59.54	12,875	40.46	31,825	99.36
2015-16	Chikkamagalur	36,150	50.91	34,860	49.09	71,010	84.73
	Hassan	17,325	56.11	13,550	43.89	30,875	97.01
2016-17	Chikkamagalur	31,600	42.20	43,275	57.80	74,875	105.44
	Hassan	17,875	57.89	13,000	42.11	30,875	100.00
2017-18	Chikkamagalur	33,550	43.07	44,350	56.93	77,900	104.04
	Hassan	17,500	56.60	13,420	43.40	30,920	100.15
2018-19	Chikkamagalur	29,300	42.71	39,300	57.29	68,600	88.06
	Hassan	14,470	52.29	13,200	47.71	27,670	89.49
2019-20	Chikkamagalur	35,800	44.58	44,500	55.42	80,300	117.06
	Hassan	18,800	51.51	17,700	48.49	36,500	131.91
Mean	Chikkamagalur	38007.86	50.81	36340.61	49.19	74348.46	103.35
	Hassan	17809.25	59.46	12179.52	40.54	29988.77	105.48
Max	Chikkamagalur	57000	64.3	44500	57.8	88853	126.36
	Hassan	24075	67.21	17700	48.49	36500	145.89
Min	Chikkamagalur	28565	42.2	27875.5	35.7	56440.5	84.44
	Hassan	12509.5	51.51	7338.25	32.79	19847.75	89.49
Standard Deviation	Chikkamagalur	9015.2	6.98	5953.37	6.98	9916.6	13.36
	Hassan	3506.16	4.75	2664.67	4.75	5297.88	16.24
Co- efficient of variance (CV) %	Chikkamagalur	4.21	-	6.10	-	7.49	-
	Hassan	5.07	-	4.57	-	5.66	-

Table 3. year wise productivity of arabica and robusta coffee of chikkamagalur and hassan districts from 2006-07 to 2019-20.

Year	District	Arabica	Robusta	Total	Percent change from base year (2006-07=100%)
2006-07	Chikkamagalur	504.77	896.95	643.80	100
	Hassan	495.43	811.75	578.82	100
2007-08	Chikkamagalur	509.91	906.08	650.35	101.02
	Hassan	500.47	820.01	584.71	101.02
2008-09	Chikkamagalur	657.08	1035.96	792.12	121.80
	Hassan	588.36	944.02	695.42	118.93
2009-10	Chikkamagalur	1000.00	1000.00	1000.00	126.24
	Hassan	985.55	1069.79	1011.68	145.48
2010-11	Chikkamagalur	1000.09	1006.41	1002.35	100.24
	Hassan	1008.38	1025.75	1014.07	100.24
2011-12	Chikkamagalur	663.60	1167.86	844.37	84.24
	Hassan	796.47	1148.54	913.25	90.06
2012-13	Chikkamagalur	672.23	958.46	775.19	91.81
	Hassan	793.29	900.68	829.80	90.86
2013-14	Chikkamagalur	671.35	1278.78	889.86	114.79
	Hassan	767.40	1086.05	875.73	105.54
2014-15	Chikkamagalur	745.44	1294.33	942.89	105.96
	Hassan	784.68	1032.06	868.94	99.22
2015-16	Chikkamagalur	621.40	1082.74	785.76	83.34
	Hassan	694.50	996.76	801.12	92.20
2016-17	Chikkamagalur	572.20	1025.67	768.60	97.82
	Hassan	701.53	878.44	766.53	95.68
2017-18	Chikkamagalur	607.51	1051.15	799.66	104.04
	Hassan	688.16	903.76	767.65	100.15
2018-19	Chikkamagalur	530.56	927.83	703.00	87.91
	Hassan	569.48	879.94	684.73	89.20
2019-20	Chikkamagalur	648.26	1050.59	822.90	117.06
	Hassan	744.32	1158.68	900.48	131.51
Mean	Chikkamagalur	671.74	1048.77	815.78	102.59
	Hassan	722.72	975.45	806.64	104.29
Max	Chikkamagalur	1000.09	1294.33	1002.35	126.24
	Hassan	1008.38	1158.68	1014.07	145.48
Min	Chikkamagalur	504.77	896.95	643.8	83.34
	Hassan	495.43	811.75	578.82	89.2
Standard Deviation	Chikkamagalur	155.02	123.91	113.18	13.52
	Hassan	155.03	115.05	137.55	16.58
Co- efficient of variance (CV) %	Chikkamagalur	4.33	8.46	7.20	-
	Hassan	4.66	8.47	5.86	-

Results and Discussion

The data regarding year wise area, production and productivity of arabica and robusta coffee in two prime coffee growing regions of Karnataka i.e. Chikkamagaluru and Hassan were presented in Table 1, Table 2, Table 3 respectively. Comparative analysis was done among two coffee growing regions by using analysis tools such as Mean, standard deviation and co-efficient of variance.

The area of cultivation under arabica coffee in Chikkamagaluru and hassan districts were 55,225 ha and 25,228 ha respectively during 2019-20. This implies that Chikkamagaluru district is contributing more area compared to Hassan. Whereas area under cultivation of robusta coffee was 42,357 ha and 15,276 ha respectively in Chikkamagluru and Hassan district. Arabica coffee is popular in two districts comparatively than robusta coffee. With respect to both arabica and robusta coffee, variability is less in case of Hassan district (39.71 % and 5.93 % respectively) compared to chikmagaluru district (61.64% and 7.00 % respectively)

Production of arabica and robusta coffee were analysed in Chikkamagaluru and Hassan districts respectively from 2006-07 to till 2019-20 along with co efficient of variation. The production of arabica coffee during 2019-20 was 25800 and 18800 MT respectively in Chikkamagaluru and Hassan district. Whereas robusta coffee production was, 45500 and 17700 MT in Chikkamagaluru and Hassan district respectively. This clarify the thing that Robusta coffee is vigorous and more productive compared to arabica coffee, but in Hassan district production was higher in case of arabica coffee compared to robusta coffee. In case of arabica coffee, variability was less compared to robusta coffee in Chikkamagaluru and vice versa in Hassan district (Table.2).

The productivity of arabica coffee in Chikkamagaluru and Hassan districts were 648.26 kg per ha and 744.32 kg per ha respectively. But in case of robusta coffee, productivity was 879.94 kg per ha and 1050.59 kg per ha in Chikkamagaluru and Hassan respectively. Productivity of robusta coffee was higher in case of both Chikkamagaluru and Hassan districts. Hence, we can conclude that robusta was more productive compared to arabica coffee, but quality of arabica coffee was much more preffered because of its fine taste and aroma.

As we observed that, even though arabica coffee is popular in two regions, but productivity was higher in case of robusta coffee.

Suggestion and conclusions

Based on the study conducted on secondary data of area, production and productivity of arabica coffee, we can suggest to use the healthy and disease-free planting material, should take appropriate plant protection measures. Proper guidance should be provided to famers regarding good cultivation practices and subsidies given by government organisations and coffee board. Skillfull labours were used effectively to bring out high productivity. Shade management and soil management should be taken care to avoid pest and diseases. We have to encourage the farmers to adopt good marketing statergies to get more goods value in order to avoid the middlemen problems. Although robusta is resulting in good productivity, arabica coffee is preferred for its fine taste and aroma.

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