

RESEARCH PAPER

# Growth in area, production and productivity of coconut in Karnataka

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## ABSTRACT

The growth in area, production and productivity of coconut in Karnataka and its districts was estimated using compounded annual growth rate analysis. The necessary secondary data was collected for a period of fifteen years from 2000-2001 to 2014-15. Growth rates in area, production and productivity of coconut in Karnataka state were positive and significant at 1 per cent. With respect to the districts of Karnataka, Tumkur, Hassan, Chitradurga and Chikamagalur were the major coconut growing areas. There was found to be a significantly positive growth in ten districts and significantly negative growth rate in six districts at 1 and 5 per cent levels of significance. With respect to production, Tumkur, Hassan, Chitradurga and Mandya were the districts with the highest production. The growth rates in productivity were significantly positive in twenty two districts and significantly negative in two districts at 1 and 5 per cent levels of significance. Chikkaballapura had the highest growth rate in production within a period of eight years, which was significant at 5 per cent. Bangalore rural had the highest negative growth rate which was significant at 1 per cent. The declining trend in coconut area in Mandya should also be addressed. The productivity of coconut was highest in districts of Yadgiri, Ramnagara, Chikkaballapura followed by others. The growth rates in productivity were positive and highly significantly in twenty nine districts and non-significantly negative in only one district viz., Yadgiri. Overall, the coconut scenario in Karnataka has been improving, particularly after 2007, as a result of drastic increase in productivity 2007 onwards which may be attributed to the bumper production in 2006 and NHM initiatives in the subsequent years.

**KEY WORDS :** Growth rates, Area, Production, Productivity, Coconut, Karnataka, Tumkur, Hassan, Chikkaballapura, Significant

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Agriculture plays a vital role in India's economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Agriculture is the primary source of livelihood for about 58 per cent of India's population. GDP of agriculture and allied sectors in India was recorded at US\$ 259.23 billion in financial year 2015. According to the advanced estimates of Central Statistical Organization, agriculture and allied sector recorded a

growth of 8.3 per cent in financial year 2015. The share of agriculture and allied sectors (including agriculture, livestock, forestry and fishery) was 16.1 per cent of the Gross Value Added (GVA) during 2014–15 at 2011–12 prices.

Coconut is a major plantation crop in India, both from the point of economic contribution and as a source of livelihood for millions of people. The crop is found throughout the tropic and sub tropic areas of the world and cultivated in around 80 countries. The crop is grown in 12.2 Million hectares of land worldwide which constitutes about 0.7 per cent of net cropped area of the world. Coconut palm provides food security and livelihood to a large size of population in the world particularly in Asia Pacific Countries. It is estimated that about 12 million people in India are dependent on the coconut sector through cultivation, processing and trading activities. With an annual production of around 39,310 million nuts in 2014-15, coconut contribution to nation's GDP was about 15,000 crore rupees.

In India, coconut is grown in an area of 1.97 million ha (2014-15) with a production of 20,439 million nuts and a productivity of 10,345 nuts per hectare. India contributes about 15.46 per cent in area and 26.3 per cent in terms of production of coconut in the world. The major coconut crop acreage is concentrated in the states of Kerala, Karnataka, Tamil Nadu and Andhra Pradesh. Karnataka stands second in area (4.40 lakh hectares) and production (3,931 million nuts).

## METHODOLOGY

The study on growth in area, production and productivity was purposively selected in Karnataka state and its districts, as coconut are one of the major horticultural crops in Karnataka. The time series data on area, production, productivity was used for the study. 15 years data, from 2000-2001 to 2014-2015, was collected from coconut development board.

Although the period considered for the study was 2000-2001 to 2014-2015, some exceptions were made. Ramnagara and Chikkaballapura districts were formed in the year 2007-08 and Yadgiri, the newest district of Karnataka was formed in 2010-11. Hence, the data from the respective periods have been considered for these three districts. The average of the time series data was used for overall ranking the districts. Similar method was used by Saraswati Poudel Acharya and others in 2012 in

study on growth in area, production and productivity of major crops in Karnataka.

Tabular analysis, co-efficient of variation and regression analysis were used to analyze the data. Compounded annual growth rates were calculated by using logest function in excel sheet. Regression analysis was also used to assess the growth rate and to know the significance level.

## ANALYSIS AND DISCUSSION

During the period 2000-01 to 2014-15, the area under coconut in Karnataka has increased from 3.35 lakh hectares to 4.40 lakh hectares with an average of 4.05 lakh hectares. The compounded annual growth rate in area during the study period was 1.76 per cent which was highly significant at 1 per cent level of significance. The co-efficient of variation was low as shown by a value of 8.06 per cent.

The production of coconut during the study period has increased from 17,624 lakh nuts in 2001 to 39,310 lakh nuts in 2014-15 with an average of 26,273 lakh nuts. The growth in production during the study period was 9.27 per cent which was highly significant at 1 per cent. The variation was found to be moderately high with a CV of 44.46 per cent. The variation can be explained by the stagnant growth in production between 2001 and 2005 followed by a considerable increase in production between 2006 and 2011. After 2011-12, there has been a decrease in production and productivity because of droughts and pest and disease incidences during recent years. However, recently there has been an increase in the production from 34,177 lakh nuts in 2013-14 to 39,310 lakh nuts in 2014-15.

The productivity of coconut in Karnataka has increased from 5245 nuts per hectare in 2001 to 8924 nuts per hectare in 2014-15. The average productivity was found to be 6324 nuts per hectare. Overall, during the study period, productivity has increased at a rate of 7.38 per cent per annum. This growth was highly significant at 1 per cent level of significance. The variation for this was found to be moderate with a co-efficient of variation of 37.72 per cent (Table 1). Again this variation can be attributed to the stagnant growth followed by steadily increasing growth in productivity as shown in Table 1.

In Karnataka the major coconut growing districts are Tumkur (30.87), Hassan (14.56), Chitradurga (9.96),

Chikkamagalur (8.79), Mandya (5.07) and Mysore (4.92). The mean value for the study period was computed to assess the ranking of districts. (Figures in parenthesis are percentage contribution to total area). The top ten districts together contribute to around 80 per cent of the state's total area under coconut. Tumkur and Hassan constitute around 45 per cent of total area showing their importance to Karnataka's coconut industry. In terms of growth in area during the study period, the top performing districts were Chikkaballapura with 28.05 per cent growth followed by Bidar (4.07), Mysore (3.34), Vijayapura (3.05), Tumkur (2.86), Chikkamagalur (2.48), followed by other districts. Negative growth rate was observed in districts of Bangalore rural (-17.16), Raichur (-13.84), Gulbarga (-12.81), Mandya (-5.2), Bellari (-2.56), Shimoga (-1.72) and Davangere (-0.87). The growth rates were highly significant in districts of Tumkur, Hassan, Chikkamagalur, Mandya, Mysore, Dakshin Kannada, Udupi, Davangere, Bangalore rural, Uttara Kannada, Shimoga, Bellari, Gulbarga and Raichur. It was significant at 5 per cent in districts of Chikkaballapura and Kodagu. In the remaining districts the growth in area was non-significant as shown in Table 2.

Among the major coconut coverage districts, Tumkur, Chikkamagalur, Mysore, Udupi, Chamrajanagar, Uttara Kannada have shown good growth. These districts can be further concentrated upon to strengthen the coconut sector in Karnataka. Chikkaballapura has shown very promising growth in area. However, its share in the total area is only 0.45 per cent and it has a high CV of 60 per cent, which would mean there, has to be further consistency in its data to consider it as an important coconut growing area. Mandya, Bangalore rural and Shimoga contribute to around 5.27, 2.45 and 1.55 per cent, respectively to the total area under coconut. Hence, the negative growth in coconut area in these districts is a matter of concern to the coconut economy and hence, should be addressed immediately. Bangalore rural was further bifurcated to form Ramnagara district, which explains the rapid fall in area under coconut. However, barring this, there still has been a decreasing trend in area under coconut. Hence, the negative growth rate in area has to be seriously looked into to retain their share and arrest further fall in area under coconut. The reasons for this decrease in area, like conversion of agricultural land to commercial land and changing cropping pattern has to be seriously taken into consideration by the coconut

Table 1 : Growth in area, production and productivity of coconut in Karnataka during 2000-01 to 2014-15			
Year	Area (Ha)	Production ( Lakh nuts)	Productivity ( Nuts/ ha)
2000-01	335996	17624	5245
2001-02	369828	15036	4066
2002-03	375425	15253	4063
2003-04	375957	15291	4067
2004-05	383206	15517	4049
2005-06	395885	16069	4059
2006-07	403635	16358	4053
2007-08	405328	20639	5092
2008-09	418581	28677	6851
2009-10	429860	30562	7110
2010-11	440741	42134	9560
2011-12	443384	44083	9942
2012-13	440426	43368	9847
2013-14	430774	34177	7934
2014-15	440514	39310	8924
Mean	405969.33	26273.22	6324.13
CV	8.06	44.46	37.72
R <sup>2</sup>	0.90	0.77	0.72
CAGR	1.76*	9.27*	7.38*

\* indicates significance of value at P=0.01

Source: Coconut Development Board

development board and district authorities. This data can be validated by the findings of Kavitha *et al.* (2015) who in study on urban expansion and loss of agriculture land in Bangalore in 2015, explains that the agriculture land in Bangalore comprises of 27.57 sq. km of agriculture plantation and 184.91 sq.km of cropland. Out of this, 96.29 sq. km of agriculture land has been converted to “to-be built up area.

In terms of production of coconut in Karnataka, the major districts along with their contribution to total production are Tumkur (32.76), Hassan (12.84),

Chitradurga (11.48), Mandya (5.83), Chikkamagalur (5.22), Dakshin Kannada (4.81), Mysore (4.71), Ramnagar (4.71), Udupi (4.31) and Davangere (2.96) followed by other districts. The top ten districts together contribute to almost 85 per cent of the states coconut production. Tumkur and Hassan together contribute almost 45 per cent of the total production. The districts with the lowest production were Bidar, Yadgiri, Raichur, Vijayapura and Belagavi.

In terms of growth rate in coconut production during the study period, the districts having the highest growth

**Table 2 : Growth in area under coconut in different districts of Karnataka during the period 2000- 01 to 2014-15**

Sr. No.	Districts	Mean	% to total	CV	R <sup>2</sup>	CAGR
1.	Tumkur	127631.87	30.87	12.73	0.95	2.86*
2.	Hassan	60191.67	14.56	6.14	0.46	1.01*
3.	Chitradurga	41202.93	9.96	4.54	0.00	0.09
4.	Chikmagalur	36353.73	8.79	11.62	0.84	2.48*
5.	Mandya	20981.00	5.07	18.30	0.66	-5.45*
6.	Mysore	20339.27	4.92	19.22	0.48	3.34*
7.	Dakshina Kannada	16024.67	3.88	4.73	0.60	0.80*
8.	Udupi	15640.53	3.78	9.67	0.94	2.09*
9.	Ramanagar	14279.38	3.45	3.77	0.02	0.50
10.	Davangere	12097.33	2.93	5.29	0.55	-0.87*
11.	Bangalore Rural	10910.07	2.64	78.27	0.76	-17.16*
12.	Chamarajanagar	10145.87	2.45	18.38	0.25	2.24
13.	Uttara Kannada	7090.60	1.71	10.20	0.83	2.18*
14.	Shimoga	6429.00	1.55	8.49	0.77	-1.72*
15.	Bangalore Urban	2504.47	0.61	25.91	0.036	-1.11
16.	Kolar	2193.73	0.53	22.00	0.14	2.00
17.	Chikkabelpura	1851.75	0.45	62.00	0.65	28.05**
18.	Kodagu	1547.87	0.37	17.62	0.36	2.44**
19.	Haveri	1230.47	0.30	20.77	0.139	1.87
20.	Bellari	1084.53	0.26	26.53	0.76	-2.56*
21.	Bagalkot	657.47	0.16	45.18	0.023	-1.63
22.	Koppal	643.80	0.16	33.84	0.047	1.98
23.	Gulburga	519.80	0.13	51.07	0.86	-12.81*
24.	Gadag	482.07	0.12	35.01	0.152	-3.69
25.	Dharwad	435.33	0.11	10.71	0.007	0.21
26.	Belgaum	334.80	0.08	55.77	0.157	-5.13
27.	Vijayapura	240.80	0.06	28.94	0.238	3.05
28.	Raichur	209.60	0.05	84.10	0.43	-13.84*
29.	Yadgir	203.00	0.05	10.54	0.88	-6.03
30.	Bidar	21.73	0.01	27.41	0.109	4.07
	Total	413479.13	100.00			

\* and \*\* indicate significance of values at P=0.01 and 0.05, respectively

rates were Chikkaballapur (37.01), Mysore (15.56), Mandya (13.79), Chikkamagalur (13.38), Chamarajanagar (12.92), Dakshin Kannada (12.71), Udupi (12.28), Kolar (10.83), Bidar (10.72), Ramnagara (10.58), Shimoga (10.16) followed by other districts. Some districts showed a decline in production during the study period *viz.*, Bangalore rural (-9.9), Yadgiri (-9.39), Raichur (-8.36) and Gulbarga (-7.7). All the growth rates were significant except in case of Ramnagara, Bellari, Bagalkot, Belagavi, Yadgiri and Raichur in Table 3.

The districts with the highest productivity of coconut

in Karnataka were headed by the newest districts *viz.*, Yadgiri, Ramnagara and Chikkaballapura followed by Chitradurga, Dakshina kannada, Mandya, Tumkur, Gulbarga, Bagalkot, Kodagu, Vijayapura and others. The lowest productivity was recorded in the districts of Bangalore rural, Kolar, Bangalore urban, Hassan, Mysore, Shimoga, Chamarajnagar and Chikkamagalur as shown in Table 4.

In terms of the growth in productivity between the study period, the top ranking districts along with their growth rates were Shimoga (12.09), Mysore (11.83),

Table 3 : Growth in production of coconut in different districts of Karnataka during the period 2000-01 to 2014-15						
Sr. No.	Districts	Mean	% to total	CV	R <sup>2</sup>	CAGR
1.	Tumkur	8830.88	32.76	38.61	0.79	7.97*
2.	Hassan	3462.00	12.84	37.29	0.73	5.73*
3.	Chitradurga	3095.32	11.48	52.18	0.62	8.81*
4.	Mandya	1571.61	5.83	68.29	0.71	13.79*
5.	Chikmagalur	1406.75	5.22	54.79	0.84	13.38*
6.	Dakshina Kannada	1296.68	4.81	59.77	0.86	12.71*
7.	Mysore	1269.69	4.71	70.81	0.73	15.56*
8.	Ramanagar	1268.59	4.71	30.27	0.37	10.58
9.	Udupi	1160.87	4.31	62.43	0.87	12.28*
10.	Davangere	797.75	2.96	40.80	0.49	5.85*
11.	Chamarajanagar	542.67	2.01	55.78	0.77	12.92*
12.	Bangalore Rural	483.24	1.79	51.20	0.62	-9.99*
13.	Uttara Kannada	451.27	1.67	34.24	0.91	7.72*
14.	Shimoga	356.39	1.32	49.44	0.67	10.16*
15.	Chikkabellapura	163.32	0.61	71.24	0.62	37.01**
16.	Bangalore urban	152.76	0.57	53.10	0.42	7.55*
17.	Kolar	140.45	0.52	61.00	0.66	10.83*
18.	Kodagu	103.33	0.38	38.56	0.86	8.93*
19.	Haveri	79.04	0.29	44.66	0.56	7.87*
20.	Bellari	78.88	0.29	55.44	0.19	3.62
21.	Bagalkot	43.43	0.16	48.91	0.11	4.60
22.	Koppal	42.80	0.16	44.17	0.41	8.46*
23.	Gulbarga	30.28	0.11	33.75	0.06	-7.77*
24.	Gadag	29.84	0.11	46.17	0.63	2.30*
25.	Dharwad	28.93	0.11	38.67	0.63	6.57*
26.	Belgaum	19.25	0.07	45.70	0.03	1.93
27.	Yadgir	18.84	0.07	17.22	0.88	-9.39
28.	Vijayapura	16.54	0.06	50.33	0.60	9.58*
29.	Raichur	11.34	0.04	70.77	0.26	-8.36
30.	Bidar	1.42	0.01	37.41	0.48	10.72*
	Total	26954.175	100			

\* and \*\* indicate significance of values at P=0.01 and 0.05, respectively

Dakshin Kannada (11.82), Chikkamagalur (10.64), Chamarajnagar (10.45), Mandya (10.20), Ramnagara (10.03) followed by other districts. Only Yadgiri district, which has the highest productivity in Karnataka, recorded a negative growth rate of -5.53 per cent. All growth rates were highly significant except in case of yadgiri as shown in Table 4. The scenario of productivity of coconut looks positive and good in the state. The only concern is the declining trend from the past two years viz., from 2012-13. The decline was very steep in the year 2013-14 which may be attributed to the drought and pest and disease conditions prevalent in the state. Apart from that, overall growth of productivity looks to be positive. Similar work related to the present investigation was also done by

Mehendale *et al.*(2013); Dhara *et al.* (2015) and Nagaraja and Basavaiah (2010).

### Conclusion :

The coconut economy in Karnataka has been consistently increasing during the study period, viz., 2001 to 2015. There has been a sharp increase in production and productivity especially after 2006-07 which may be attributed to the bumper production in 2006 on account of good rainfall. Also, the National horticulture mission, which was introduced in 2006 started undertaking many developmental and crop improvement activities like improved management practices, pest and disease control measures, which resulted in increased productivity.

**Table 4 : Growth in productivity of coconut in districts of Karnataka during the period 2000- 01 to 2014-15**

Sr. No.	Districts	Mean	CV	R <sup>2</sup>	CAGR
1.	Yadgir	9241.00	9.00	0.43	-3.57
2.	Ramanagar	8837.38	28.27	0.59	10.03**
3.	Chikkabelpura	8158.00	21.15	0.51	6.99**
4.	Dakshina Kannada	7962.40	56.02	0.84	11.82*
5.	Chitradurga	7916.73	53.04	0.62	8.70*
6.	Udupi	7128.73	52.93	0.83	9.98*
7.	Mandya	6958.67	53.46	0.67	10.20*
8.	Tumkur	6739.33	27.61	0.62	4.97*
9.	Gulburga	6698.60	30.20	0.75	5.78*
10.	Bagalkot	6580.80	32.36	0.77	6.33*
11.	Kodagu	6580.67	32.36	0.77	6.33*
12.	Vijayapura	6580.20	32.36	0.77	6.34*
13.	Dharwad	6579.53	32.39	0.77	6.34*
14.	Bellari	6579.27	32.39	0.77	6.34*
15.	Koppal	6576.60	32.44	0.77	6.35*
16.	Bidar	6575.87	32.50	0.78	6.40*
17.	Raichur	6574.60	32.42	0.77	6.35*
18.	Gadag	6455.67	33.58	0.72	6.22*
19.	Belgaum	6361.27	36.67	0.80	7.44*
20.	Haveri	6294.87	35.07	0.63	5.89*
21.	Uttara Kannada	6243.27	26.25	0.82	5.42*
22.	Davangere	6238.00	32.93	0.59	6.77*
23.	Bangalore rural	6102.00	42.58	0.74	8.66*
24.	Kolar	6101.60	42.59	0.74	8.66*
25.	Bangalore urban	6090.13	42.78	0.75	8.76*
26.	Mysore	5785.67	56.99	0.71	11.83*
27.	Shimoga	5736.33	54.51	0.75	12.09*
28.	Hassan	5716.67	34.21	0.45	4.67*
29.	Chamarajanagar	5207.80	49.47	0.74	10.45*
30.	Chikmagalur	3720.27	47.29	0.76	10.64*

\* and \*\* indicate significance of values at P=0.01 and 0.05, respectively

With respect to the coconut growing districts of Karnataka, the major growing areas like Tumkur, Hassan, Chitradurga, Mysore, Dakshin kannada, Udupi and others recorded positive growth rates in area which were highly significant. The significantly declining trend in coconut area in Mandya needs to be arrested by taking up awareness programmes among coconut growers in that area and also by having discussion with district authorities about conversion of agricultural land into commercial land. Only Chitradurga recorded non-significant growth. The major concern is the declining trend in area under coconut in some districts. As many as 11 districts have recorded a decline in the area under coconut. This issue needs to be addressed immediately as it directly affects the production of coconut in which case Karnataka may lose its superiority in coconut production in India. The authorities can exploit the high and significant growth trend in Chikkaballapur district which currently contributes 0.45 per cent to the total area under coconut. It has shown the potential of becoming a strong point for Karnataka's coconut economy in the immediate future.

The production of coconut was positive in almost all the districts of Karnataka except in Bangalore rural, Gulbarga, Yadgiri and Raichur. The decline in Bangalore rural and Gulbarga were highly significant. This decline is mainly because of the decline in area under coconut in these districts as the growth in productivity was found to be positive. Yadgiri, the district with highest productivity, was the only district which recorded a negative growth in productivity.

It was also observed that from 2012-13 onwards there has been a declining trend in terms of area, production and productivity in almost all districts barring a few exceptions. This has resulted in the overall decline in area, production and productivity of coconut of Karnataka as a whole. The authorities, mainly the Coconut Development Board has been taking up activities like rejuvenation schemes of coconut plantations in order to reverse the falling trend in productivity and production. It has shown some positive results reflected by the increase in production and productivity in 2014-15. Nevertheless, according to Indian Meteorological Department's report, the rainfall in 2016-17 is expected to be above average and hence, we can conclude that Karnataka state's coconut productivity and production can be expected to increase and hence, its coconut

economy can be expected to fare better than the previous years.

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