An Economic Evaluation of Coorg Mandarin Cultivation in Kodagu District of Karnataka State

K. Likin Bopanna, M. S. Ganapathy and M. T. Lakshminarayan

Department of Agricultural Marketing, Co-operation and Business Management

College of Agriculture, UAS, GKVK, Bengaluru - 560 065

Abstract

The present study was carried out in three taluks of Kodagu district of Karnataka state during 2014-15 to analyze the area and production of coorg mandarin and to compute the cost and returns of coorg mandarin. A sample of 120 coorg mandarin growers (40 small growers, 40 medium growers and 40 large growers) were randomly selected from 12 villages of Madikeri, Somwarpet and Virajpet taluks. Data was collected using a pre-tested interview schedule. The results revealed that there existed a positive growth rate of coorg mandarin both in area (3.13 and 2.80) and production (8.18 and 8.15) in Coorg district and Karnataka State, respectively. The total cost of growing coorg mandarin, average gross income and net returns was Rs. 62,065/-, Rs 1,56,447/- and Rs. 94,412/- respectively. The benefit cost ratio of producing coorg mandarin was worked out to be 1:1.96 indicating that coorg mandarin cultivation is a profitable agricultural venture.

The Mandarin (*Citrus reticulata*) originated from tropical and sub-tropical region of South East Asia, particularly from India, China and Philippines. Coorg mandarin, Nagpur santra, Khasi orange, Darjeeling orange and Kinnow are all strains of mandarin and each of them are known for their juiciness, taste and quality. Coorg mandarin is classed under mandarin group and also popularly known as Santras in India. They are also referred as loose jacket orange. Mandarins are famous for its excellent quality characteristics viz., taste, flavour and colour. They have good content of Vitamin C, Vitamin A, Calcium, Iron and Copper and can lower the risk of developing liver cancer and is good for the skin and immune system. Mandarins are also having anti-microbial properties which prevents viral, fungal and bacterial infections. A major portion of mandarin produced is marketed as a fresh fruit. It is also preserved in the form of juice, marmalade, jam, canned product, squash, syrup, candy and other products.

China ranks first in the production of mandarin contributing to more than 50 per cent of the world production followed by Spain, Brazil and Japan. Mandarin is commercially the most important citrus fruit grown in India and is second among the most widely produced fruits in the world after banana. The area under mandarin constituted 4.60 per cent of total fruit area and contributed 3.90 per cent to the total fruit production in India during 2013-14. The total citrus production in India during 2013-14 was 11,147 thousand MT with an area of 1,078 thousand hectares having a productivity of 10.3 MT/ha. Punjab, Madhya Pradesh, Maharashtra, Rajasthan, Assam and Karnataka are the major mandarin producing states in India. The country during 2013-14 achieved a production potential of 3431.4 thousand MT.

Karnataka stood sixth in the country both in terms of production (75.9 thousand MT) and area (3.4 thousand hectares) of coorg mandarin. The state stood first in the country with respect to the productivity at 22.3 MT/ha of coorg mandarin followed by Punjab (21.6 MT/ha) and Rajasthan (20.5 MT/ha) during the year 2013-14. In Karnataka, Coorg district is the highest producer with a production of 39,225 tonnes of mandarin and it was cultivated in an area of 1,569 hectares during the year 2013-14 . With this background, the present study was carried out with the following specific objectives: to analyze the area and production of Coorg mandarin and to compute the cost and returns of Coorg mandarin.

Methodology

The present study was conducted in Kodagu district of Karnataka state during 2014-15. Coorg district was purposively selected for the study, as it is the major producer of Coorg mandarin in Karnataka. The district comprises of three taluks namely, Madikeri, Somwarpet and Virajpet. All the three taluks were selected for the study. Two village panchayats were selected from each taluk and two villages from each gram panchayat were chosen for the study. From each village, three categories of growers, viz., small growers

(possessing land of less than 2.00 ha), medium growers (2.01 to 4.00 ha) and large growers (more than 4.00 ha) based on the area under Coorg mandarin were selected. In total, 120 mandarin growers (40 small growers, 40 medium growers and 40 large growers) from 20 villages were selected for the study following simple random technique. The data for the study included both primary and secondary data. The primary data was obtained from the sample growers through personal interview method using a pre-tested structured schedule.

Compounded growth rate analysis was employed to assess the trend in area and production of coorg mandarin. It was computed using exponential function $(Y_t = ab^t u_t)$. Establishment cost, annual cost and returns were worked out for arriving at the cost and returns of coorg mandarin. Benefit cost ratio, net present value and internal rate of returns were worked out to know the financial viability of coorg mandarin.

RESULTS AND DISCUSSION

Compound annual growth rates in area and production of Coorg mandarin : The details about area and production of Coorg mandarin in Coorge district and Karnataka state with respect to the compound growth rates during the period 2000-01 to 2013-14 are presented in Table I.

The area under mandarin in Coorg district increased from 980 hectares in 2000-01 to 1,540 hectares in 2013-14 and the production of mandarin increased from 1,2970 MT in 2000-01 to 39,225 MT in 2013-14. There is a positive growth rate of mandarin in Coorg district in respect of area and production from 2000-01 (3.13) to 2013-14 (8.18). The increase in area and production of mandarin in Coorg district has occurred in two different phases from 2000-01 to 2004-05 and from 2007-08 to 2013-14.

The area under mandarin in Karnataka state increased from 2,050 hectare in 2000-01 to 3410 hectares during 2013-14 and the production of mandarin increased from 25,340 MT in 2000-01 to 71,885 MT during 2013-14. The growth rate of mandarin showed a positive trend in respect of area and production between 2000-01 (2.80) and 2013-14 (8.15). The increase in area and production of mandarin

TABLE I

Compound annual growth rate in area and production of Coorg mandarin

Years	Coorg District		Karnataka State	
	Area (ha)	Production (tons)	Area (ha)	Production (tons)
2000-01	980	12970	2050	25340
2001-02	990	14200	2100	26645
2002-03	1120	15680	2250	28970
2003-04	1350	17640	2320	32674
2004-05	1380	18340	2330	33300
2005-06	1050	11260	1790	22360
2006-07	1120	10970	1760	21035
2007-08	1330	17540	1820	35580
2008-09	1340	18760	1860	36630
2009-10	1360	19110	1900	36645
2010-11	1400	22300	2210	41355
2011-12	1480	32450	3000	63640
2012-13	1500	38670	3210	71865
2013-14	1540	39225	3410	71885
Cumulative Average Growth Rate	3.13	8.18	2.80	8.15

has occurred in two different phases ie., from 2000-01 to 2004-05 and from 2007-08 to 2013-14.

The increased growth rate of mandarin in Coorg district and Karnataka state could be attributed due to the adoption of various area expansion and rejuvenation programmes of the Government by mandarin growers of Coorg district during the recent years. Reduced incidence of pest and disease, better availability of input services and market facilities have also contributed to the positive rate of growth. The decrease in area and production between 2005-06 and 2006-07 is due to the incidence of Citrus greening disease during the same period.

It can be inferred that there is a small positive difference in growth rates between Coorg district and Karnataka state from 2000-01 to 2013-14 indicating that Coorg district is showing better growth rates in both area and production compared to the Karnataka state.

Age of Coorg mandarine plantations : Table II presents the age profile of Coorg mandarin plantations of the sampled growers. It could be observed from Table I that a larger number (27.50 %) of the sampled plantations were in the age group of 16 to 20 years, followed by the age groups of 21 and above years (26.67 %), 11 to 15 years (24.16 %) and 0 to 10 years (21.67 %). It is interesting to note that

TABLE II

Age of coorg mandarin plantations

| Age (Years) | Coorg mandarin growers | | | |
	Small growers (<2 ha)	Medium growers (2 to 4 ha)	Large growers (< 4 ha)	Overall
0-10	10	8	8	26 (21.67)
11-15	11	8	10	29 (24.16)
16-20	10	13	10	33 (27.50)
21 and above	9	11	12	32 (26.67)
Total	40	40	40	120

Note : Figures in parentheses indicate percentages to the column total

more number of small growers had 0 to 10 years old plantations (10 Nos) and 11-15 years old plantations (11 Nos) revealing that small growers are late adopters in the cultivation of coorg mandarin. Similar findings were reported by Satnaamsingh (2004), Kanaujia *et al.,* (2009) and Kumar and Singh (2010).

Establishment cost incurred for different plantation groups : Table III reveals that the total establishment cost for raising Coorg mandarin plantation was Rs. 1,42,780/- per hectare for small growers, Rs. 1,41,708/- per hectare for medium growers and Rs. 1,38,586/- per hectare for large growers. The difference in cost for different farm groups is due to economies of scale. The establishment cost for the pooled sample was Rs. 1,41,013/. Of the total establishment cost, the four major cost items were towards manure and fertilizers (23.43%, 24.12%, and 25.16% for small, medium and large growers, respectively), cost on irrigation (15.28 %, 15.53 % and 14.12 % for small, medium and large growers, respectively), intercultural operations (14.53 %, 13.85

TABLE III

Establishment cost incurred for different plantation groups of coorg mandarin

| Particultars | Farm groups (Rs. / ha for five years) | | | | | | | |
	Small growers		Medium growers		Large growers		Pooled	
Land preparation	2723	(1.90)	2678	(1.93)	2523	(1.82)	2641	(1.87)
Digging and filling of pits	4437	(3.13)	4193	(3.03)	3975	(2.87)	4202	(3.04)
Cost of seedlings	9138	(6.40)	9054	(6.53)	9208	(6.64)	9133	(6.48)
Planting and staking	2280	(1.60)	2155	(1.56)	2144	(1.55)	2193	(1.56)
Manures and fertilizers	33456	(23.43)	34223	(24.12)	34869	(25.16)	34183	(24.24)
Application of manures and fertilizers	16657	(11.67)	16503	(11.43)	16468	(11.40)	16543	(11.73)
Irrigation charges	21818	(15.28)	21924	(15.53)	18732	(14.12)	20825	(14.77)
Plant protection chemicals	12287	(8.61)	12359	(8.70)	13102	(9.45)	12583	(8.92)
Application of plant protection chemicals	6944	(4.86)	6790	(4.70)	7083	(5.11)	6939	(4.85)
Intercultural operations	20741	(14.53)	19548	(13.85)	18266	(13.18)	19518	(13.84)
Interest on working capital	1043	8(7.31)	10359	(7.25)	10109	(7.18)	10301	(7.30)
Land revenue	150	(0.11)	150	(0.11)	150	(0.11)	150	(0.11)
Depreciation	1675	(1.17)	1772	(1.34)	1957	(1.50)	1795	(1.27)
Total cost	142780	(100.00)	141708	(100.00)	138586	(100.00)	141013	(100.00)

Note: Figure in parentheses indicate percentages to the column total

% and 13.18 % for small, medium and large growers, respectively) and application of manure and fertilizers (11.67%, 11.43% and 11.40% for small, medium and large growers, respectively) in the order of importance. The above trend of findings could be attributed to high cost of manures, fertilizers and agricultural implements and high wage rate of labours.

Annual cost incurred and returns for different plantation groups : The total annual cost for Coorg mandarin plantations was Rs. 60,832/-, Rs. 62,800/-, Rs. 62,562/- for small, medium and large growers, respectively. The difference in total annual cost among the growers is because of the number of plantations above 15 years of age is more in case of medium and large growers (Table IV) resulting in higher yield and higher harvesting cost which has subsequently increased the total cost.

The overall average of total annual cost for the pooled sample was Rs. 62,065/-. Of the total annual cost, the total variable cost accounted for 64.83 per cent (Rs. 40,239/-) and total fixed cost accounted for the remaining 35.17 per cent (Rs.21,826/-). The major share in variable cost was harvesting cost (11.00%, 10.79% and 10.89% for small, medium and large growers, respectively) followed by manure and fertilizers (10.07 %, 10.08 % and 9.95 % for small, medium and large growers, respectively) and plant protection measures (8.63%, 7.99% and 8.21% for small, medium and large growers, respectively). The above trend of findings could be attributed to high cost of manure, fertilizers and plant protection chemicals and high wage rate of labour.

The major cost item under fixed cost was rental value of land for all the growers (20.61 %, 21.78 %

TABLE IV

Annual cost incurred and returns for different plantation groups

Particultars	Farm groups (Rs./ha years)							
	Small growers		Medium growers		Large growers		Pooled	
Weeding and intercultural operations	4916	(8.07)	5028	(8.01)	5042	(8.06)	4995	(8.05)
Training and pruning	4540	(7.46)	4712	(7.50)	4756	(7.60)	4669	(7.52)
Manures and fertilizers	6123	(10.07)	6328	(10.08)	6223	(9.95)	6225	(10.03)
Plant protection chemicals	5248	(8.63)	5015	(7.99)	5137	(8.21)	5133	(8.27)
Irrigation charges	4525	(7.44)	4487	(7.14)	4462	(7.13)	4491	(7.24)
Harvesting cost	6692	(11.00)	6776	(10.79)	6812	(10.89)	6760	(10.89)
Transportation cost	4837	(7.95)	5142	(8.19)	4974	(7.95)	4984	(8.03)
Interest on working capital	2950	(4.85)	2999	(4.78)	2992	(4.78)	2981	(4.80)
Total variable cost	39831	(65.48)	40487	(64.47)	40398	(64.57)	40239	(64.83)
Fixed Cost								
Depreciation	1795	(2.95)	1892	(3.01)	2077	(3.32)	1921	(3.10)
Land revenue	30	(0.05)	30	(0.05)	30	(0.05)	30	(0.05)
Rental value of land	12540	(20.61)	13685	(21.78)	13412	(21.43)	13210	(21.28)
Interest on fixed capital	548	(0.90)	662	(1.05)	735	(1.17)	648	(1.04)
Amortized cost	6088	(10.01)	6044	(9.62)	5910	(9.45)	6014	(9.69)
Total fixed cost	21001	(34.52)	22313	(35.53)	22164	(35.43)	21826	(35.17)
Total cost	60832	(100.00)	62800	(100.00)	62562	(100.00)	62065	(100.00)
Returns (tons/ha)								
Yield	13.13		13.65		14.04		13.61	
Gross returns	150995		156975		161460		156476	
Net returns	90162		94174		98897		94411	

Note: Figure in parentheses indicate percentages to the column total

and 21.43 % for small, medium and large growers, respectively). The total overall average yield was 13.61 tonnes per hectare per annum. The average yield was 13.13, 13.65 and 14.04 tonnes per hectare per year for small, medium and large growers, respectively. The difference in yield is due to the number of plantation above 15 years of age is more in case of medium and large growers resulting in higher yield. The net returns were worked out to be Rs. 90,162/- Rs. 94,174/- and Rs. 98,897/- for small, medium and large growers, respectively. Whereas, the net return for the pooled sample was Rs. 94,411/-.

Average cost and returns from Coorg mandarin plantation per year : The establishment cost was amortized over 25 years at the rate of eight per cent that accounted to Rs. 6,014/- (Table V). The maintenance cost was calculated to be Rs. 56,051/-. Thus the total cost per hectare per year was Rs. 62,065/-. The average gross return per year was Rs. 1,56,477/- and thus the net return per year was Rs. 94,412/-. The returns realized in Coorg mandarin production are found to be profitable and beneficial to the growers in relation to the total cost incurred by them.

TABLE V

Average cost and returns from Coorg mandarin plantation per year

Particulars	Amount (Rs.)
Establishment cost amortized over 25 years @ 8% per year	6014.00
Average maintenance cost per annum	56051.00
Total cost per year	62065.00
Average gross income	156476.7
Net income per year	94411.67

Financial viability of Coorg mandarin cultivation : The Benefit-Cost ratio and the Net present value per hectare were worked out as 1.96 and Rs. 3,91,947/-, respectively. The internal rate of return was worked out to be 32.73 per cent. The research results indicates that the cultivation of Coorg mandarin is profitable to the growers (Table VI).

The total cost per year for growing coorg mandarin was worked out to Rs. 62,065/-, whereas the average gross income was Rs. 1,56,476/- and net returns was worked out to Rs. 94,411/-. The Benefit

TABLE VI

Financial viability of Coorg mandarin cultivation

Measures of investment worth	Value
Benefit-Cost ratio @ 8% discount rate	1.96
Net present value @ 8% discount rate per ha (Rs.)	3,91,947
Internal rate of return (%)	32.73

Cost ratio, Net present value and internal rate of return was worked out to be 1.96, Rs. 3,91,947/- and 32.73 per cent, respectively indicating that the coorg mandarin cultivation is profitable in nature.

There is an increasing demand for Coorg mandarin because of its distinctive taste and excellent blend of acid and sugar. Hence, there is a need to increase the production and productivity of the coorg mandarin. Extension educational activities (Demonstrations, farmers field school, field day etc.) needs to be organized by the Karnataka State Department of Horticulture and concerned agencies for motivating the farmers to adopt improved cultivation practices for getting higher yield and income.

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