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Production and marketing of small cardamom in Tamil Nadu and Kerala

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Abstract
Small cardamom is a perennial crop which is cultivated predominantly along the Western Ghats of South India. Though the cardamom is a high-value export-oriented spice crop, the production and productivity are volatile over the last few years. Hence, an attempt was made to study production and marketing of Tamil Nadu and Kerala. This study was conducted in Theni district of Tamil Nadu and Idukki district of Kerala. The results of the study revealed that the average establishment cost of cardamom plantation was Rs. 353881 per hectare and maintenance cost of the plantation was Rs. 308797 per hectare and the net income was Rs. 340846 per hectare. Age of the plantation, application of fertilizer and plant protection had significantly influenced the productivity of cardamom in the study area. Among the marketing Channels, Channel II which included Farmer- Spices Board Auction Centre -Primary Wholesaler- Secondary wholesaler – retailer – Consumer was the most efficient channel in the study area.

Keywords: Small cardamom, Tamil Nadu, Kerala, production function, marketing channels, marketing efficiency

Introduction
Cardamom is a tropical perennial herb belongs to the ginger family (Zingiberaceae), mostly cultivated in the Western Ghats of South India. It is a shade-loving plant and requires intensive cultivation practices such as weeding, mulching, dethrashing, protection against pests and harvesting. The production of small cardamom in the country was 17990 tonnes from the area of 69357 hectares during the year 2016-17. Among the small cardamom producing states, Kerala ranks first with 15650 tonnes (86.99 percent) followed by Karnataka (8.05 per cent) and Tamil Nadu (4.96 per cent) (Spices Board, 2018) [3].

Indian cardamom is highly preferred spices in the international market for its' superior aroma and taste. India exported 3,850 tonnes of small cardamom to the value of Rs. 421.50 crores during the year 2016-2017. Saudi Arabia is the major small cardamom importer from India, which imported 2,500 tonnes to the value of Rs.275 crores during 2016-2017 (Spices Board, 2018) [3]. The other major importing countries are UAE, Kuwait, USA and Japan, Malaysia, Israel, UK, Canada, Pakistan, Australia, and South Africa.

Cardamom is one of the high value spices after saffron and vanilla. However, cardamom production has highly fluctuated in India over the last few years. The production had fluctuated from 17990 tonnes to 23890 tonnes over the years. This fluctuation in production leads to uncertainty in the product supply for exports which in turn leads to the volatility of export prices. Floods during 2018 in Idukki and Waynad districts of Kerala had also damaged the crop. Further, the cost of production of cardamom was also increased due to increased labour and input costs. Hence, cardamom cultivators were at losing ground, especially among the small farmers when cost of cultivation includes the rental value of owned land and family labour cost (Varghese, 2007) [4]. In this condition, the present study was conducted to study production and marketing of cardamom in Tamil Nadu and Kerala.

Materials and methods
Sampling
Idukki district of Kerala and Theni district of Tamil Nadu were purposively selected for the study based on the largest area under cardamom in the respective state. From each selected district, one taluk was selected based on the largest area under cardamom. From each selected taluk three villages were selected by random and 20 farmers selected from each village by random sampling. Thus, the total sample accounted for120 farmers with 60 farmers from each state.

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Production function analysis
Production function analysis was used to estimate the cause and effect relationship between inputs and output. Cobb-Douglas form of production function was used since it directly estimates the elasticity of the output with respect to input (Gujarati, 2004) [2]. The productivity of cardamom was used as the dependent variable in the analysis and human labour, quantity of fertilizer, cost of plant protection chemicals, quantity of manures, age of plantation, experience of the farmers, farm size, education and age of the farmers were used.

$$Y = \ln\beta_1 + \beta_2\ln X_{2i} + \beta_3\ln X_{3i} + \beta_4\ln X_{4i} + \beta_5\ln X_{5i} + \beta_6\ln X_{6i} + \beta_7\ln X_{7i} + \beta_8\ln X_{8i} + \beta_9\ln X_{9i} + \beta_{10}\ln X_{10i} + u_i$$

Where,
Y = Yield of cardamom (Kg / ha)
X_2 = Human labour (Man hours / ha)
X_3 = quantity of fertilizer (Kg / ha)
X_4 = cost of plant protection chemicals (Rs / ha)
X_5 = quantity of manures (Kg / ha)
X_6 = age of plantation (Years)
X_7 = experience of farmer (Years)
X_8 = farm size (Ha)
X_9 = Education (Years)
X_{10} = age of farmer (Years)
u = Disturbance term
$\ln \beta_1$ = Intercept
β_2-β_{10}= Coefficients

Marketing efficiency
Acharaya's method was used to estimate the marketing efficiency of the identified market channels. The following formula was used to calculate the efficiency of market channels (Acharya and Agarwal, 2011) [1].

$$ME = FP \div (MC + MM)$$

Where,
ME – Marketing efficiency
FP – Net price received by farmers
MC – Total marketing cost
MM –Total marketing margin

Results and Discussion
Cost of cultivation for small cardamom
Small cardamom is a perennial crop which can grow up to fifteen years but the yield would reduce after ten years. So, the farmers maintain the crop up to ten years and after that, they would go for replantation. Further, maintenance of cardamom plantation is labour and capital-intensive activity. Hence, information on costs and returns of small cardamom were collected. Various costs involved in the cardamom production had been calculated on the hectare basis. Cardamom was perennial crop and it starts to yield after two years of planting. So, establishment cost and maintenance cost for the cardamom crop was calculated.

In the cost of establishment of cardamom, labour cost accounted for 64.32 per cent (Rs. 227611.7) of total expenditure which includes land preparation, pit making, planting, weeding, mulching and application of the fertilizer and plant protection chemicals. Labour cost accounted for Rs. 224130 (65.20 per cent) and Rs. 231093.3 (63.49 per cent) of the total establishment cost for Theni and Idukki districts respectively. The material costs accounted for 35.68 per cent in overall sample and 34.80 and 36.51 in Theni and Idukki districts respectively. It included planting materials, fertilizer, manures and plant protection chemicals. The details of various expenses incurred during the establishment of the cultivation are presented in Table 1.

Table 1: Establishment cost and first-year maintenance cost (up to two years)

S. No	Components	Cost (Rs/ha)		
		Theni district	**Idukki district**	**Overall**
1.	Labour			
	a)Land preparation	10800 (4.82)	12000 (5.19)	11400 (5.01)
	b) Pit making	68400 (30.52)	76320 (33.03)	72360 (31.79)
	c) Planting and Staking	40200 (17.94)	39600 (17.14)	39900 (17.53)
	d) Weeding	25200 (11.24)	24000 (10.39)	24600 (10.81)
	e) Mulching	18600 (8.30)	18266.66 (7.90)	18433.33 (8.10)
	f) Irrigation	3900 (1.74)	4666.66 (2.02)	4283.33 (1.88)
	g) Manure and fertilizer application	17430 (7.78)	22000.01 (9.52)	19715 (8.66)
	h) Plant protection operations	39600 (17.67)	34240.01 (14.82)	36920 (16.22)
	Total labour cost	224130 (65.20)	231093.3 (63.49)	227611.7 (64.32)
2.	Planting material	44220 (12.86)	42768 (11.75)	43494 (12.29)
3.	Manures	4950 (1.44)	11413.34 (3.14)	8181.67 (2.31)
4.	Fertilizer	40938 (11.91)	46410.67 (12.75)	43674.34 (12.34)
5.	Plant protection chemicals	29520 (8.59)	32320.01 (8.88)	30920 (8.74)
	Total Establishment Cost	343758 (100)	364005.4 (100)	353881.7 (100)

(Figures in the parenthesis are percentage to the total)

Labour cost was Rs. 155612.3 and Rs. 169482.3 for Theni and Idukki districts respectively. The material costs consist of expenditure on manures, fertilizers, plant protection chemicals and drying. It accounted for 47.36 per cent of total expenditure in the overall sample whereas it was 46.65 per cent and 48 per cent for Theni and for Idukki districts respectively. Drying is the major post-harvest operation that is undertaken by the farmers for sale of cardamom. It costs Rs. 14831.40 (4.80 per cent) for overall sample farmers, while it was Rs. 14830.08 (5.08 per cent) and Rs. 14832.72 (4.55 per cent) for Theni and Idukki district farmers respectively. The total maintenance cost of the overall sample was Rs. 308797.20, whereas, it was Rs. 291683 and Rs. 325911.30 in Theni and Idukki districts respectively. The details on the annual maintenance cost are presented in Table 2.

Table 2: Annual maintenance cost from third year onwards

S. No	Components	Cost (Rs/ha)		
		Theni district	Idukki district	Overall
1.	Labour			
	a) Weeding	29561.54 (19.00)	27517.66 (16.24)	28539.60 (17.56)
	b) De-thrashing& Mulching	28430.76 (18.27)	29694.12 (17.52)	29062.44 (17.88)
	c) Irrigation	2732.304 (1.76)	2531.76 (1.49)	2632.03 (1.62)
	d) Manure and fertilizer application	17404.63 (11.18)	27503.52 (16.23)	22454.08 (13.81)
	e) Plant protection operations	38990.76 (25.06)	41957.64 (24.76)	40474.20 (24.90)
	f)Harvesting	38492.3 (24.74)	40277.64 (23.77)	39384.97 (24.23)
	Total labour cost	155612.30 (53.35)	169482.30 (52.00)	162547.30 (52.64)
2.	Manures	8681.54 (2.98)	8089.41 (2.48)	8385.48 (2.72)
3.	Fertilizer	65843.09 (22.57)	88843.30 (27.26)	77343.19 (25.05)
4.	Plant protection chemicals	46716 (16.02)	44663.52 (13.70)	45689.76 (14.80)
5.	Drying	14830.08 (5.08)	14832.72 (4.55)	14831.4 (4.80)
	Total Maintenance Cost	291683 (100)	325911.30 (100)	308797.20 (100)
	Annual Establishment Cost	41250.96	43680.64	42465.80
	Total Cultivation Cost	332934	369591.90	351263

(Figures in the parenthesis are percentage to the total)

The cost and return of small cardamom plantation were presented in Table 3. The average yield was 617.92 Kg in Theni district, whereas it was 678.03 Kg in Idukki district and the overall average dry cardamom yield was 647.98 kg. The price per kilograms of dry cardamom was calculated from the average price realized by the sample farmers.

Table 3: Cost and Returns of small cardamom plantation

S. No	Details	Theni district	Idukki district	Overall
1	Yield (Kg / ha)	617.92	678.03	647.98
2	Price received (Rs / kg)	1061.53	1074.11	1067.82
3	Gross income(Rs / ha)	655940.6	728278.8	692106.7
4	Total cost of cultivation (Rs / ha)	332934	369591.9	351263
5	Net income (Rs / ha)	323006.6	358686.9	340846.75

It could be concluded from the table that the cardamom plantation was profitable for the sample farmers. The net income earned by the overall sample farmers was Rs. 3,40,846.75. However, the net income earned by the Idukki farmers (Rs. 3,58,686.9) was more than the Theni farmers (Rs. 3,23,006.6) due to the higher yield.

Production Function of Small Cardamom
The Cobb-Douglas production function was used to estimate the factors influencing the productivity of the small cardamom. The independent variables included in the analysis were age of farmer (years), education (years), farm size (Ha), experience in farming (years), age of plantation (years), fertilizer (Kilogram per hectare), manures (Kilogram per hectare), total labours (man-days per hectare) and plant protection chemicals (Rs per hectare) and the dependent variable was yield (kilogram per hectare).

Table 4: Production function of small cardamom

S. No	Explanatory variables	Coefficient	Standard error	t-stat	p-value
1.	Constant	2.0398*	0.2706	7.5354	1.46E-11
2.	Age of farmer (Years)	0.1389	0.0767	1.8097	0.0730
3.	Education (Years)	0.0137	0.0081	1.6823	0.0953
4.	Farm size (ha)	0.0054	0.0054	1.0019	0.3185
5.	Experience in farming (years)	-0.0368	0.0239	-1.5358	0.1274
6.	Age of plantation (years)	0.1600*	0.0202	7.9217	2.05E-12
7.	Labours (Man days per ha)	0.0322	0.0198	1.6202	0.0180
8.	Fertilizers (Kg per ha)	0.2190*	0.0220	9.9145	6.14E-17
9.	Plant protection chemicals (Rs per ha)	0.0871*	0.0308	2.8241	0.0056
10.	Manures (kg per ha)	0.0064	0.0070	0.9046	0.3676

R^2– 0.87, Adjusted R^2 – 0.86, *- Significant at one percent level

Result of production function analysis of small cardamom is presented in Table 4. The coefficient of multiple determination (R^2) value was 0.87, which indicated that 87 per cent variation explained by the independent variables included in the analysis. The coefficient of variables namely age of crop, plant protection chemicals and fertilizers were significant at one per cent level of probability, which indicated that one percent increase in use of plant protection chemicals and fertilizer would increase the yield by 0.08 and 0.21 per cent from geometric mean level respectively.

Similarly, one per cent increase in the age of the plantation would increase the yield by 0.16 percent from the mean level. Hence, it could be concluded that the cardamom farmers could increase the yield by appropriate years of maintenance of crop and application of fertilizer and plant protection chemicals.

Marketing of the Small Cardamom
Marketing channels are essentially the routes through which produce reaches the ultimate consumer. These channels

consist of number of intermediaries who exchange the produce or change the form of produce by value addition. During the process, intermediaries spent money on their operations and enjoy some margin out of it. The major market channels identified in the study area are presented below.

Channel I:
Farmers → Village Trader → Spices Board Auction Centre → Primary Wholesalers → Secondary Wholesaler → Retailer → Consumer

Channel II:
Farmers → Spices Board Auction Centre → Primary Wholesaler → Secondary Wholesaler → Retailer → Consumer

Channel III:
Farmers → Village Trader → Aggregators → Secondary Wholesaler → Retailer → Consumer

Channel IV:
Farmers → Aggregators → Spices Board Auction Centre → Primary Wholesaler → Secondary Wholesaler → Retailer → Consumer

Price spread
In order to understand the quantum of price spread in all the four channels, data on various aspects viz., cost of grading, packing, loading, unloading, transportation and storages were gathered and marketing cost and marketing margin for each intermediary were worked out to arrive at the price spread and the details are presented in Table 5.

Table 5: Price spread of different market channels

S. No	Particulars	Price (Rs/Kg)			
		MC I	MC II	MC III	MC IV
	1. Farmers				
	Net Price Received	1030.48	1037.04	1030.48	1034.65
	Marketing Cost	29.60	37.70	29.60	32.65
	Gross Price Received	1060.08	1074.74	1060.08	1067.30
	2. Village trader				
	Price Paid	1060.08	----	1060.08	----
	Marketing Cost	17.10	----	17.10	----
	Marketing Margin	46.67	----	16.30	----
	Price Received	1123.85	----	1093.48	----
	3. Aggregators				
	Price Paid	----	----	1093.48	1067.30
	Marketing Cost	----	----	33.10	32.70
	Marketing Margin	----	----	32.80	38.85
	Price Received	----	----	1159.38	1138.85
	4. Primary wholesaler				
	Price Paid	1123.85	1074.74	----	1138.85
	Marketing Cost	25.38	25.38	----	25.38
	Marketing Margin	34.28	34.28	----	34.28
	Price Received	1183.51	1134.37	----	1198.51
	5. Secondary wholesaler				
	Price Paid	1183.51	1134.37	1159.38	1198.51
	Marketing Cost	13.90	13.90	13.90	13.90
	Marketing Margin	27.50	27.50	27.50	27.50
	Price Received	1224.91	1175.77	1180.78	1239.91
	6. Retailer				
	Price Paid	1224.91	1175.77	1180.78	1239.91
	Marketing Cost	11.40	11.40	11.40	11.40
	Marketing Margin	17.50	17.50	17.50	17.50
	Price Received	1253.81	1204.67	1209.68	1268.81
	7. Consumer				
	Price Paid	1253.81	1204.67	1209.68	1268.81
8.	Price spread	193.73	129.93	149.60	201.51

From the above table, it was clear that marketing channel II had less price spread (Rs. 129.93 per Kg) when compared with the other marketing channels. Farmers received maximum price (Rs. 1037.04 per Kg) for their produce due to selling the produce directly in the auction center through auctioneer. But, most of the farmers were not willing to sell their produce through auction due to the high price fluctuation and delay in the cash settlement. Consumer also paid less price (Rs. 1204.67 per Kg) for cardamom when compared with the other channels.

Marketing efficiency
A marketing channel is said to be efficient if the total marketing margins are higher per unit of marketing cost. Acharaya's method was used to estimate the marketing efficiency of different market channels.

Table 6: Marketing efficiency of the cardamom market channels

S. No	Market channel	Net price received by the farmer (Rs/Kg)	Marketing cost + Marketing margin (Rs/Kg)	Marketing Efficiency
1.	Channel I	1030.48	223.33	4.61
2.	Channel II	1037.04	167.66	6.18
3.	Channel III	1030.48	199.20	5.17
4.	Channel IV	1034.65	234.16	4.41

From the Table 6, it could be inferred that the market channel II was the efficient channel (6.18) followed by channel III (5.17), channel I (4.61) and channel IV (4.41). This implies that the channel II was more efficient than that of other channels

Conclusion

It is concluded from the study that the total cost of cultivation of small cardamom was Rs. 351263 and the net income earned by farmers was Rs. 340846.75.The production function analysis revealed that the productivity of small cardamom was significantly influenced by increased application of fertilizer and plant protection chemicals. Hence, training programme on optimum application of inputs to the farmers by the Spices Board and state agricultural department may be helpful to increase the cardamom yield.

Among the four channels, channel II (Farmers-Spices Board Auction Centre - Primary Wholesaler-Secondary Wholesaler-Retailer -Consumer) was efficient with the marketing efficiency of 6.18, when compared with other channels. It was inferred that the marketing channel in which farmers directly sold their cardamom through Spices Board auction centre was identified as the most efficient channel. It was also beneficial for both the farmer and consumer. Hence, participation in the spice board electronic auction may be promoted among the farmers in the study area. Further, efforts may also be taken to address the constraints in participation of electronic auction by the farmers. This would help for large scale participation of farmers in Spices Board electronic auction.

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