

## Performance and economics of replanted cardamom (*Elettaria cardamomum* Maton) plantation

V S Korikanthimath

Indian Institute of Spices Research

Cardamom Research Centre

Appangala, Madikeri - 571 201, Karnataka, India.

Received 11 October 1999; Revised 1 March 2000; Accepted 3 March 2000.

### Abstract

The performance and economics of replanting of cardamom (*Elettaria cardamomum*) was studied at Chettalli (Kodagu District, Karnataka, India). An average yield of 749 kg (dry)/ha of cardamom was obtained for five crop seasons which was 5.35 times higher than the national average yield of 140 kg/ha. A highest yield of 1775 kg/ha (dry) was recorded during the second year after replanting. Out of 869.8 labour days required per ha per year during the bearing period, the requirement of women labourers was higher (87.4%); 57.8% labour requirement was for picking only. Maximum expenses (69.45%; Rs. 57,230.80/ha) was incurred on labour charges. A net income of Rs. 1,96,986.20/ha (average of five crop seasons) was obtained with a production cost of Rs. 130.97/kg (dry). The discounting cash flow measures namely, Net Present Value (NPV) of Rs. 5,09,296.45, Benefit Cost Ratio (BCR) of 2.78 and Pay Back Period (PBP) of 2.15 years indicated that replanting of cardamom is an economically viable and financially feasible proposition.

**Key words:** cardamom, economics, *Elettaria cardamomum*, replanting.

### Introduction

Cardamom (*Elettaria cardamomum* Maton) is cultivated in an area of 84,000 ha in India mainly in Kerala, Karnataka and Tamil Nadu with an annual production of around 7300 t (Spices Board 1998). In recent years, India has lost its near monopoly in production and export of cardamom mainly through intensive competition from Guatemala. The rate of growth of production of cardamom in Guatemala since the late seventies has been over 14% compared to 0.7% in India. Among the various reasons attributed for the low production of cardamom in India was lack of adoption of scientific and integrated management practices. This has resulted in set back of India's competitiveness in the world market (Chandrashekhar 1988). As the international market becomes increasingly competitive, only high productivity and low cost of production per unit area would ensure the survival of cardamom in India.

A research-cum-demonstration trial was carried

out during 1981-94 at North Kodagu (Karnataka, India) by adopting the high production technology (HPT) evolved at Indian Institute of Spices Research, Cardamom Research Centre, Appangala. A record yield of 662.72 kg (dry) /ha with a net return of Rs. 1,10,360/ha was obtained (average of 10 crop seasons) in the trial as against the national average of 140 kg/ha (Korikanthimath 1995).

As no published information on replanting of cardamom was available, further investigations on replanting of cardamom in 1 ha (out of total area of 2.2 ha of the demonstration plot) was undertaken from 1993 crop season onwards to study the growth and yield performance of replanted cardamom and to work out the economics.

### Materials and methods

#### General features

A plot of 1 ha was selected at M/s Chettoli Estate, Chettalli (Kodagu District, Karnataka, India) for the study. This estate receives a well distributed

rainfall of 1000 – 1500 mm in 120 – 140 rainy days. The plot had adequate shade tree species comprising of ficus (*Ficus racemosa* L.), garagathi (*F. exasperata* Vahl) and nerale (*Syzygium cumini* (L.) Skeels) planted at 13.5 m x 13.5 m spacing. The soils were moderately acidic, rich in available nitrogen, low in phosphorus and medium in potash contents.

#### *Input management and cultural operations*

Cardamom was replanted by adopting the trench method of cultivation as this system was advantageous for better soil and moisture conservation, anchorage and spread of rooting system (NRCS 1991). The trenches were opened across the slope at 1.8 m distance row to row with 45 cm width, 45 cm depth and up to the entire length in 1 ha area. The top 25 cm soil was excavated and stocked on the upper side of the trenches whereas the lower 20 cm soil from the trenches was removed and put across the slope adjacent to the trenches. Subsequently, the trenches were filled with the top 25 cm soil. The remaining top portion was filled with a mixture of top fertile soil (scraped from the interspace of trenches) up to a height of 15 cm along with composted coffee husk up to the top of the trench. The filled in soil and compost mixture in the trenches was allowed for decomposting for 30 days.

Cardamom (10 months old) seedlings raised from pre-potent mother plants (collected from the previous demonstration plot) were planted at a spacing of 1.8 m x 1.8 m during July 1993. The HPT followed in this replanted trial included, drip irrigation from February to May; regulation of overhead shade to allow 60–65% filtered sunlight; application of fertilizers @ 120:120:240 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per ha in 4 splits at quarterly intervals and application of composted organic wastes like coffee husk; plant protection measures namely, application of 5 rounds of insecticides and 2 rounds of Bordeaux mixture; 10 rounds of *katte* disease tracing and removal of affected plants; regular schedule of after care namely, weeding, mulching, light earthing up, 3 rounds of trashing; picking at right stage and drying and processing to retain green colour. Other routine and need-based operations were also carried out during the pre-bearing and bearing periods (Korikanthimath *et al.* 1989).

#### *Economic analysis*

The data relating to various farm operations and

inputs during pre-bearing (establishment) and bearing periods (third year onwards) were computed based on actual man-days employed and expenditure incurred on various other inputs. The total expenditure was calculated on the basis of prevailing wage rates as per the Plantation Act of Karnataka State during the corresponding years. The total cost towards various farm inputs was calculated based on the price prevailing during each year. The economic analysis was carried out as per the methodology suggested by Das (1985). The actual price realised for cardamom during each year was used for arriving at total gross return.

## **Results and discussion**

### *Pre-bearing period*

#### *Labour utilization*

The labour requirement for various operations during replanting and establishment of cardamom is furnished in Table 1. The requirement of men labourers was 252/ha when compared to 135 women labourers/ha because of strenuous operations like land clearing, shade regulation, pitting, planting, etc. During the second year when bearing had started, 387 labourers were required to carry out various operations (65.1% men and 34.9% women labourers). This was similar to the requirement of labour for coffee (arabica and robusta) during first and second years of establishment (CCRS 1985).

The cost incurred towards various operations during the establishment period (1993–94) was Rs. 9930.42/ha. The share of expenditure for opening of trenches and planting was highest (41.3%) followed by weeding (10.9%) and other operations.

#### *Input requirement*

A total cost of Rs. 43,440.42/ha was incurred on various inputs during the establishment period (1993–94) among which a major share (35.5%) was for seedlings followed by labour charges (22.9%).

### *Bearing period*

#### *Yield*

A maiden yield of 155 kg (dry)/ha was obtained during the second year of replanting. The highest yield (1775 (dry) kg/ha) was recorded during the second year after replanting which is on par with the world record for yield of cardamom (Korikanthimath 1995). An average of 74 kg (dry)/ha was obtained for the five crop seasons

**Table 1.** Labour requirement during pre-bearing (establishment) period of replanted cardamom (1993–94)

Operation	Men (days)	Women (days)	Amount (Rs.)	% of expenditure
Land preparation (Uprooting and removing of old cardamom clumps)	40	-	1026.64	10.3
Shade regulation	25	-	641.50	6.5
Opening of trenches and planting	145	15	4105.60	41.3
Mulching (2 rounds)	-	30	769.80	7.7
Weeding (3 rounds)	-	42	1077.72	10.9
Trashing	-	7	179.62	1.8
Cleaning of roads and drains	15	-	384.90	3.9
Application of fertilizers	5	12	436.22	4.4
Application of coffee compost	4	10	359.24	3.6
Plant protection measures	10	15	641.50	6.5
Assembling of irrigation pipelines	8	4	307.92	3.1
Total	252	135	9930.42	100.0

than the national average yield of 140 kg/ha. The highest yield in cardamom generally occurs during the third or fourth year after planting (Korikanthimath *et al.* 1989; Korikanthimath 1990;

**Table 2.** Input requirement during pre-bearing (establishment) period of replanted cardamom (1993–94)

Input	Amount (Rs.)	% of expenditure
Cardamom seedlings	15430.00	35.5
Compost	4500.00	10.4
Fertilizers	1751.60	4.0
Pesticides	2713.40	6.2
Fuel (diesel) charges for irrigation	450.00	1.0
Labour		
Total labour wages (actual daily wages + 63% other benefits)	993.42	22.9
Total salary of supervisory staff (salary + 63% other benefits)	815.00	1.9
Maintenance of jeep, trailer, irrigation pump, sprayers and other implements	350.00	0.8
Depreciation	7500.00	17.3
Total	43,440.42	100.0

Korikanthimath 1995) and similar results were obtained in this study too. A drastic decline of yield 383 kg (dry)/ha (21.7%) was noticed after peak crop season of 1995–96 (177 kg/ha) which is a usual phenomenon in Malabar type cardamom (Table 3). Regular replanting after picking 5–6 crops is a common phenomenon in Guatemala whose national average yields are higher when compared to India.

#### Labour utilization

On an average for five crop seasons, 869.80 labour days/ha were required of which women labour utilization was higher (87.4%) when compared to

**Table 3.** Yield of replanted cardamom

Year after planting/Crop	Yield (kg/ha) (dry)	Per cent of total yield
2 (1994–95) I crop	155	4.1
3 (1995–96) II crop	1775	47.4
4 (1996–97) III crop	385	10.3
5 (1997–98) IV crop	560	15.0
6 (1998–99) V crop	870	23.2
Total	3745	100.0
Average	749	

men labour (12.6%). A similar trend in labour requirement was observed in coffee-based black pepper cropping systems also (Korikanthimath & Peter 1992). A maximum of 57.8% of labour was utilized for harvesting. Since harvesting is a skilled and specialized job, it is normally done by women labourers. It involves picking of mature fruits from the panicles and usually 6–7 rounds of picking are done during a crop season (Table 4).

#### Partitioning of input requirement

The cost incurred on labour was highest among the various inputs utilized. On an average for five crop seasons (1994–95 to 1998–99), 869.8 labourers/ha were utilized for various operations. The labour requirement was highest (1554 labourers/ha) during the second year after replanting (1995–96) when the peak yield was obtained. An average

**Table 4.** Labour requirement during bearing (yielding) period of replanted cardamom (average of 5 crop seasons: 1994–95 to 1998–99)

Operation	Men (days)	Women (days)	Amount (Rs.)	% of expenditure
Mulching	-	20.8	837.34	2.4
Trashing	-	60.2	2576.64	7.3
Weeding	-	14.4	538.24	1.5
Light earthing up	26.4	-	1052.62	3.0
Cleaning the base of clumps and exposing panicles	-	20.8	823.44	2.3
Shade regulation	8.4	-	335.03	1.0
Cleaning roads and drains	12.6	-	447.83	1.3
Fertilizer application	10.0	28.0	1529.88	4.4
Application of coffee compost	5.0	15.0	803.60	2.3
Plant protection measures	10.4	38.0	1976.74	5.6
Arrangement of irrigation facilities	18.0	25.0	1727.74	4.9
Harvesting	-	502.8	20,299.76	57.7
Processing and grading	19.0	55.0	2231.02	6.3
Total	109.0	760.0	35,179.88	100.0

**Table 5.** Wages paid for production of replanted cardamom

Crop/Year	No. of labourers	Actual daily wages (Rs.)	Benefits other than actual wages (Rs.)	Total (Rs.)
I Crop (1994–95)	403	10,752.48	6,774.07	17,526.55
II Crop (1995–96)	1554	52,804.92	33,217.12	86,022.04
III Crop (1996–97)	690	30,180.60	19,013.78	49,194.38
IV Crop (1997–98)	746	34,659.16	21,835.29	56,494.45
V Crop (1998–99)	956	47,188.08	29,728.50	76,916.58
Total	4349	1,75,585.24	1,10,568.76	2,86,154.00
Average	869.8	35,117.05	22,113.75	57,230.80

Wages paid (per ha/year) includes actual wages + other benefits

Other benefits: Bonus 20 %; Provident and Pension Fund 10 %; Earned Leave 5 %; Gratuity 4 %; Medical expenses 6 %; Workmen's compensation (insurance and other welfare schemes) 5%; Housing, fuel and subsidised food grains 13%.

**Table 6.** Partitioning of total input requirement during bearing (yielding) period of replanted cardamom (average of 5 crop seasons: 1994-95 to 1998-99)

Input	Amount (Rs.)	% of expenditure
Fertilizers	3,419.21	4.2
Compost	6,190.00	7.5
Pesticides	3,076.10	3.7
Fuel (diesel for irrigation pumpset)	1,042.00	1.3
Labour		
Total labour wages (actual daily wages + 63% other benefits)	57,230.80	69.4
Total salary of supervisory staff (salary + 63% other benefits)	3,496.33	4.2
Maintenance of jeep, trailer, drying kiln, irrigation pump sprayers, etc.	2,696.95	3.3
Depreciation	5,259.70	6.4
Total	82,411.09	100.0

of Rs. 35,117.05/ha was paid to labourers in the form of actual wages and Rs. 22,113.75/ha in the form of 63% of other benefits on the actual wages for five crop seasons (Table 5). An amount of Rs. 82,411.09/ha per year was incurred in the trial which included input costs, various operations, labour charges as well as depreciation and maintenance charges for capital inputs as average of five crop seasons. Out of this, a major expenditure was in terms of labour charges (including other 63% benefits) accounting for Rs. 57,230.80/ha (Tables 5 and 6).

#### Economic analysis

Out of a total investment of Rs. 56,697.82/ha made towards replanting of cardamom, the actual investment was Rs. 43,440.42/ha and the compound interest @ 14% on the investment was Rs. 13,257.40/ha. The total annual maintenance cost for the year (bearing period) was Rs. 82,411.09/ha and the total cost per year was Rs. 91,611.50/ha. Thus the value of average production of 749 kg (dry)/ha of cardamom was Rs. 2,95,080/ha with a net return of Rs. 2,03,468.50/ha. It was evident that for every kg of cardamom obtained, Rs. 122.32 was incurred as cost of production. From the discounting cash flow measures namely,

**Table 7.** Economics of cultivation of replanted cardamom

Expenditure>Returns	Amount/ha (Rs.)
Investment-Establishment	43,440.42
Compound interest on investment @ 14 %	13,257.40
Total investment	56,697.82
Annuity value @ 14 %	9,200.41
Total cost per year	91,611.50
Average production/ha (749 kg dry capsules)	2,95,080.00
Net returns	2,03,468.50
Cost of production/kg of dry cardamom	122.32
Net Present Value (NPV)	5,09,296.45
Benefit Cost Ratio (BCR)	2.78
Pay Back Period (PBP) (years)	2.15

Net Present Value (NPV) of Rs. 5,09,296.45/ha; Benefit Cost Ratio (BCR) of 2.78 and Pay Back Period (PBP) of 2.15 years (Table 7), it could be inferred that replanting of cardamom after 12 years is an economically viable and financially feasible proposition.

#### Acknowledgements

The authors are highly grateful to Mr. C P Appanna and Mr. C A Ponnappa of M/s Chettoli Estate, Chettalli, North Kodagu, Karnataka for their keen interest in the study and kind assistance in carrying out the on-farm trial. Thanks are due to Prof. (Dr.) K V Peter, former Director, Indian Institute of Spices Research, Calicut, for his valuable inspiration and constant encouragement in taking up this study.

#### References

- Central Coffee Research Station (CCRS) 1985 Coffee Guide. Central Coffee Research Station, Chickmagalur District, Karnataka.
- Chandrashekar K M 1988 Restoring the lost flavour. In: Survey of Indian Agriculture (pp. 109-111). M/s Kasturi & Sons Ltd., National Press, Madras.
- Das P S 1985 Cost of Production and Cost-Benefit Analysis of Small Holder Plantation Crops. Technical Bulletin. Central Plantation Crops Research Institute, Kasaragod.
- Korikanthimath V S 1990 Breakthrough in cardamom production. Indian Agron. News 6 : 2.

- Korikanthimath V S 1995 Economics of sustained production of cardamom (*Elettaria cardamomum* M.). J. Spices Aromatic Crops 4 : 119-128.
- Korikanthimath V S & Peter K V 1992 Coffee based pepper cropping system. Planters Chronicle 87 (3) : 121-139.
- Korikanthimath V S, Venugopal M N & Naidu R 1989 Production of cardamom - a success story. Spice India 2 (9) : 19-24.
- National Research Centre for Spices (NRCS) 1991 Annual Report for 1990-91 National Research Centre for Spices, Calicut.
- Spices Board 1998 Cardamom Statistics 1998-99, Spices Board, Cochin.