

Economics of sustained production of cardamom (*Elettaria cardamomum* M.)

V S KORIKANTHIMATH

Indian Institute of Spices Research
Cardamom Research Centre
Appangala, Heravanad Post, Madikeri - 571 201
Karnataka, India.

ABSTRACT

Large scale field trials were conducted by adopting High Production Technology at Chettalli (Coorg District, Karnataka, India) to study labour utilisation, input requirement and economics of cultivation of cardamom (*Elettaria cardamomum*). A highest yield of 1625 kg/ha (dry) was recorded during the fourth year after planting. The average of nine crop seasons - 695.66 kg/ha (dry) obtained in the trials was 12 times more than the national average yield of 58 kg/ha. Cultivation of cardamom was highly labour intensive. Out of 747.42 labour days required per ha/year during bearing period, the requirement of women labourers was higher (64.05 per cent); 63 per cent of the labour requirement was for harvesting and processing alone. The annual maintenance cost was Rs. 35,148.00/ha. Partitioning of various inputs indicated that maximum expenditure was incurred towards labour (including supervisory charges) i.e., Rs. 19,574.50/ha (55.69 per cent). A net income of Rs. 1,09,967.11/ha (average of nine crop seasons) was obtained with a production cost of Rs. 57.22/kg (dry).

Key words : cardamom, economic analysis, *Elettaria cardamomum*, input requirement, labour utilisation, yield.

Introduction

Cardamom (*Elettaria cardamomum* Maton) is commonly cultivated as an undergrowth in the evergreen forests of Western Ghats of South India in an area of 1,05,000 ha, mainly in Kerala (60 per cent), Karnataka (31 per cent)

and Tamil Nadu (9 per cent). However, cultivation of cardamom as a mix-crop in arecanut and coffee plantations is not uncommon in certain parts of North and South Karnataka. In recent years, India has lost its near monopoly in world production and export of cardamom. In India, the cost of production is high

mainly due to low productivity, affecting the country's (58 kg/ha) competitiveness in the world market (Chandrashekar 1988). Sixty nine per cent of cardamom plantations in India are below 2 ha and are the main source of employment to small and marginal farmers (Cardamom Board 1985). Hence, adoption of intensive cultivation practices for higher yields especially in small holdings and efficient utilisation of labour needs no emphasis (Bavappa 1977; Korikanthimath, Venugopal & Naidu 1989). As the international market becomes increasingly competitive, only 'high productivity' and 'low cost of production per unit area' would ensure the survival of cardamom industry in India. Hence, studies were undertaken at Chettalli (Coorg District, Karnataka, India) from 1982 onwards for sustained cardamom production by systematic conservation and utilisation of natural resources and adopting High Production Technology (HPT), developed at the National Research Centre for Spices, Cardamom Research Centre, Appangala.

Materials and methods

General features

A plot of 2.2 ha was selected at M/s Chettoli Estate, Chettalli for the study. This estate receives a well distributed rainfall of 1000-1500 mm in 120-140 rainy days. The plot had adequate shade trees comprising of *Ficus* (*Ficus glomerata*), 'Garapathi' (*Ficus asperrima*) and 'Nerale' (*Syzigium cumini*) planted at 13.5 m × 13.5 m. The soils were moderately acidic, rich in available nitrogen, low in phosphorus and medium in potash. Cardamom seedlings (10 months old) were planted in the centre of existing four coffee plants (*Coffea arabica* L. var. Kent) at 2.1 m × 2.1 m during 1982. The coffee

plants were removed during the following year to facilitate growth of cardamom.

Input management and cultural operations

The HPT followed in the plantation consisted of regulating overhead shade to allow 60-65 per cent filtered sunlight; opening and filling of pits (45 cm × 45 cm × 30 cm) with forest top soil and organic wastes like coffee husk; planting with 10 month old seedlings of Malabar type cardamom; providing 12 rounds of irrigation during summer from mid January to last week of May/June till commencement of monsoons; application of fertilisers @ 270:270:540 kg N, P₂O₅ and K₂O/ha along with 375 kg neem cake in 4 splits at quarterly intervals; adequate plant protection measures viz., application of 5 rounds of insecticides and 2 rounds of Bordeaux mixture; 3 rounds of dusting with BHC, 10% @ 12.5 kg/ha, 10 rounds of 'katte' disease tracing and removal of affected plants; regular schedule of after care viz., weeding, mulching, light earthing up, 3 rounds of trashing of facilitate better pest control, aeration and light infiltration; picking at right stage; drying and processing to retain green colour. Besides these cultural operations and input management, various other routine and need based operations were also carried out during the pre-bearing and bearing periods (Korikanthimath & Venugopal 1989). 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.

Economic analysis

Economic analysis was carried out as per the methodology suggested by Prafulla Das (1985). The actual price realised per kg of cardamom during each year was used for arriving at total gross return.

Results and discussions

Pre-bearing period

Labour utilisation

During the first year, 272 labourers (per ha) were required for planting and establishment of cardamom among which the requirement of men was higher (172/ha) when compared to that of women (100/ha) due to strenuous

operations like land clearing, shade regulation, pitting, planting etc. (Korikanthimath, Venugopal & Naidu 1989). During the second year, amongst a labour requirement of 162/ha, men constituted only 35 numbers (21.6 per cent) as against 127 (78.4 per cent) women labour. Out of a total of 434 labour days/ha required during pre-bearing period (first and second years), the requirement of women labour was higher i.e., 227 (52.3 per cent) when compared to that of men i.e., 207 (47.7 per cent). This is similar to the requirement of labour for coffee (in arabica and robusta) during the first and second years of establishment (CCRS 1985).

The total cost towards labour during the first and second year of establishment was Rs. 3146.50/ha. The percentage of expenditure was highest for pitting and planting (25.5 per cent), followed by weeding (20.73 per cent) and plant protection (17.07 per cent) (Table 1).

Table 1. Labour requirement* during pre-bearing (establishment) period of cardamom (1982-83 & 1983-84)

| Operation | Men (days) | Women (days) | Amount (Rs.) | Percentage of expenditure |
|---|------------|--------------|--------------|---------------------------|
| Land preparation (uprooting and removal of old coffee stumps) | 21.0 | — | 152.25 | 4.83 |
| Pitting and planting | 100.8 | 10.0 | 803.75 | 25.53 |
| Mulching (2 rounds) | — | 54.0 | 391.50 | 12.44 |
| Weeding (3 rounds) | — | 90.0 | 652.50 | 20.73 |
| Trashing | — | 15.0 | 108.75 | 3.46 |
| Cleaning of roads and drains | 25.0 | — | 181.25 | 5.76 |
| Application of fertilizers | 8.2 | 24.0 | 233.45 | 7.42 |
| Assembly of irrigation pipe lines | 12.0 | — | 87.00 | 2.76 |
| Plant protection | 40.0 | 34.0 | 536.50 | 17.07 |
| Total | 207.0 | 227.0 | 3146.50 | |

* per ha

Table 2. Input requirement* during pre-bearing (establishment) period of cardamom (1982-83 & 1983-84)

| Input | Ist year (Rs.) | IInd year (Rs.) | Total (Rs.) | Percentage of expenditure |
|---|----------------|-----------------|-----------------|---------------------------|
| Cardamom seedlings | 1080.00 | -- | 1080.00 | 6.74 |
| Fertilizers | 2208.60 | 4282.21 | 6490.81 | 40.46 |
| Pesticides | 85.00 | 235.00 | 320.00 | 2.00 |
| Fuel (diesel) charges for irrigation | 90.00 | 200.00 | 290.00 | 1.81 |
| Labour | | | | |
| Total labour wages (actual daily wages + 63% other benefits) | 3214.36 | 1914.43 | 5128.79 | 31.97 |
| Total salary of supervisory staff (salary + 63% other benefits) | 228.20 | 391.20 | 619.40 | 3.86 |
| Maintenance of jeep, trailer, irrigation pump, sprayers etc. | 325.00 | 582.00 | 907.00 | 5.66 |
| Depreciation as accepted by AITO | 525.00 | 683.00 | 1208.00 | 7.53 |
| Total | 7756.16 | 8287.84 | 16044.00 | |

* per ha

AITO : Agricultural Income Tax Office

Input requirement

Out of a total cost of Rs. 16,044/ha for various inputs during the first and second year, Rs. 6490.81 (40.46 per cent) was incurred towards fertilizers, followed by labour - Rs. 5748.19 (35.83 per cent) which included total labour wages and salary of supervisory staff (Table 2). The yield of cardamom depends on the formation of adequate numbers of tillers and storage of source (photosynthates) in the rhizomes. Hence, the first 10 months is very important and it is imperative to follow the appropriate cultural operations methodically (Korikanthimath 1992a).

Bearing period**Yield**

A maiden crop yield of 290 kg/ha (dry) was recorded during the third year (1984-85). A highest yield of 1625 kg/ha (dry) was obtained during the fourth year (1985-86) which is one of the world records. The average of nine crop seasons was 695.66 kg/ha (dry) which is 12 times more than the national average yield of 58kg/ha (Korikanthimath 1992 b) (Table 3). In cardamom the highest yield is generally obtained either during the third or fourth year after planting (Korikanthimath, Naidu & Venugopal 1989; Korikanthimath 1990). Here too a

Table 3. Yield of cardamom during various stages

| Year after planting/Crop | Yield (kg/ha) (dry) | Per cent of yield |
|--------------------------|---------------------|-------------------|
| 3 (1984-85) I crop | 290 | 4.63 |
| 4 (1985-86) II crop | 1625 | 25.95 |
| 5 (1986-87) III crop | 400 | 6.39 |
| 6 (1987-88) IV crop | 775 | 12.38 |
| 7 (1988-89) V crop | 800 | 12.78 |
| 8 (1989-90) VI crop | 450 | 7.19 |
| 9 (1990-91) VII crop | 782 | 12.49 |
| 10 (1991-92) VIII crop | 455 | 7.27 |
| 11 (1992-93) IX crop | 684 | 10.92 |
| Total | 6261 | |
| Average | 695.66 | |

highest crop yield was recorded during the second crop season which came down drastically by 25 per cent during the following year. One of reasons for the low yield after attaining the highest yield may be due to the fact that cardamom is a rhizomatus crop and most of the vegetative buds would have expressed their full potentiality due to conversion of most of the suckers into bearing suckers in a particular year during which the highest yield was obtained. Since the suckers which would have already undergone production die during the following season by giving rise to sister/daughter suckers, the yield comes down drastically subsequently. As there has been a general decline in yield after nine crop seasons, it would be worthwhile to resort to regular replanting atleast in $\frac{1}{4}$ th of total area every year so that a better crop yield could be obtained over a longer period. Regular replanting, after picking 5-6 crops is a common phenomenon in Guatemala

whose national average yields are over 200 kg/ha.

Labour utilisation

The average labour requirement for carrying out various cultural operations during the nine crop seasons was 747.42 labour days/ha. The requirement of women labour was higher (64.06 per cent) when compared to that of men (35.94 per cent). A similar trend in labour requirement was observed in coffee based black pepper cropping systems also (Korikanthimath & Peter 1992). Labour utilisation was maximum for harvesting (59.55 per cent) followed by trashing (10.19 per cent) and for plant protection (7.34 percent) (Table 4).

Harvesting is a skilled and specialised job and is normally done better by women labourers. It involves picking of mature (ripened) and physiologically mature fruits from panicles. Normally 6-7 rounds of picking are done in a crop season. Delay in harvesting results in

Table 4. Labour requirement* during bearing (yielding) period of cardamom (average of 9 crop seasons : 1984-85 to 1992-93)

| Nature of work | Men (days) | Women (days) | Amount (Rs.) | Percentage of expenditure |
|---|------------|--------------|--------------|---------------------------|
| Mulching | — | 16.00 | 246.19 | 2.26 |
| Trashing | 35.55 | 41.33 | 1159.99 | 10.67 |
| Weeding | — | 10.00 | 148.91 | 1.37 |
| Light earthing up | 25.33 | 2.22 | 430.59 | 3.96 |
| Cleaning the base of clumps and exposing panicles | — | 15.77 | 241.11 | 2.21 |
| Shade regulation | 1.89 | — | 28.43 | 0.26 |
| Cleaning roads and drains | 12.33 | — | 186.26 | 1.71 |
| Fertilizer application | 24.55 | 20.22 | 664.45 | 6.11 |
| Plant protection | 11.78 | 41.00 | 798.61 | 7.34 |
| Assembly of irrigation pipe lines | 18.22 | — | 273.11 | 2.51 |
| Harvesting | 114.00 | 331.11 | 6299.61 | 57.93 |
| Processing and grading | 25.00 | 1.11 | 397.63 | 3.66 |
| Total | 268.66 | 478.76 | 10,874.89 | |

* per ha

splitting of capsules and damage by rodents and birds. Studies carried out on the influence of stage of harvesting on recovery indicated that percentage of recovery was 29 when harvested at ripened stage and 24 at physiologically mature stage as against 14 at immature stage (Korikanthimath & Naidu 1986). Hence, for obtaining a higher recovery and to minimise splitting of capsules, cardamom capsules should be picked at a mature stage at intervals of 10-12 days. Thus mobilising skilled and experienced labourers or timely harvesting is an important factor for obtaining high crop recovery and returns.

Partitioning of input requirement

Amongst the various inputs, the cost towards labour was the highest. The average requirement of labour per year was 747.44/ha during bearing period. The requirement of labour was highest (1398/ha) during 1984-85 during which period the highest crop yield was recorded. On an average, the labour wages paid per year (1984-85 to 1992-93) was Rs. 10,874.89/ha. Apart from regular daily wages, the other benefits paid to labourers included bonus, provident fund, etc. which was 63 per cent of actual daily wages paid. Thus an average of Rs. 6851.18/ha per year was paid

Table 5. Wages paid (per ha/year) for production of cardamom

| Crop/Year | No. of labourers | Actual daily wages (Rs.) | Benefits other than actual wages (Rs.) | Total (Rs.) |
|------------------|------------------|--------------------------|--|-------------|
| 1 crop (1984-85) | 471 | 4003.50 | 2522.20 | 6525.70 |
| 2 crop (1985-86) | 1398 | 12,931.50 | 8146.85 | 21,078.35 |
| 3 crop (1986-87) | 547 | 6509.30 | 4100.85 | 10,610.15 |
| 4 crop (1987-88) | 799 | 10,786.50 | 6795.50 | 17,582.00 |
| 5 crop (1988-89) | 847 | 12,747.35 | 8030.83 | 20,778.18 |
| 6 crop (1989-90) | 562 | 9554.00 | 6019.02 | 15,573.02 |
| 7 crop (1990-91) | 763 | 12,971.00 | 8171.73 | 21,142.73 |
| 8 crop (1991-92) | 578 | 10,982.00 | 6918.66 | 17,900.66 |
| 9 crop (1992-93) | 762 | 17,388.84 | 10,954.97 | 28,343.81 |
| Total | 6727 | 97,873.99 | 61,660.61 | 1,59,534.60 |
| Average | 747.4 | 10,874.89 | 6851.18 | 17,726.07 |

Wages paid includes actual wages + other benefits

Other benefits

Bonus 20%

Provident and pension fund 10%

Earned leave 5%

Gratuity 4%

Sickness and medical expenses 6%

Workmen's compensation (insurance and other welfare schemes) 5%

Housing, fuel and subsidised food grains 13%

as benefits during the bearing period (1984-85 to 1992-93) (Tables 4 and 5). A sum of Rs. 35,148.40/ha per year was incurred including inputs as average of nine crop seasons (1984-85 to 1992-93). Out of this, a major expenditure was incurred towards labour i.e., Rs. 17,726.00 (50.43 per cent) which included actual daily wages and other benefits

Economic analysis

The total investment towards establishment was Rs. 22,331.00 which included Rs. 16,038.00 towards actual investment and Rs. 6293.00 towards compound interest on investment @ 18%. The annual maintenance cost during the bearing period was Rs. 35,148.00 and the total cost per year was Rs. 39,807.00. The average production for

Table 6. Partitioning of total input requirement* during bearing (yielding) period of cardamom (average of 9 crop seasons: 1984-85 to 1992-93)

| Input | Amount (Rs.) | Percentage of expenditure |
|---|--------------|---------------------------|
| Fertilizers | 4397.80 | 12.50 |
| Pesticides | 3266.40 | 9.30 |
| Fuel (diesel) for irrigation pumpset | 784.40 | 2.24 |
| Labour | | |
| Total labour wages (actual daily wages+ 63% other benefits) | 17,726.00 | 50.43 |
| Total salary of supervisory staff (salary + 63% other benefits) | 1848.50 | 5.26 |
| Maintenance of jeep, trailer, drying kiln, irrigation pump, sprayers etc. | 1983.90 | 5.64 |
| Depreciation as accepted by AITO | 5141.40 | 14.63 |
| Total | 35,148.40 | |

* Per ha; AITO : Agricultural Income Tax Office

the crop seasons 1984-85 to 1992-93 was 695.7kg/ha (dry) accounting to Rs. 1,49,774.11 as gross income. A net return of Rs. 1,09,967.11 was obtained in this study, the cost of production of cardamom being Rs. 57.22/kg. Higher yields are known to bring down the cost of production in cardamom (Korikanthimath, Venugopal & Naidu 1989; Korikanthimath 1992 b). The benefit cost ratio (BCR) was 3.05 (Table 7).

Table 7. Economics of cultivation of cardamom

| Expenditure>Returns | Amount/ha (Rs.) |
|--|-----------------|
| Investment-establishment | 16,038.00 |
| Compound interest on investment @ 18% | 6,293.00 |
| Total investment | 22,331.00 |
| Annuity value @ 18% | 4,659.00 |
| Total cost per year | 39,807.00 |
| Average production/ha (695.66 kg dry capsules) | 1,49,774.11 |
| Net returns | 1,09,967.11 |
| Cost of production/kg dry cardamom | 57.22 |

Values are averages for 9 crop seasons (1984-85 to 1992-93)

The study revealed that cultivation of cardamom is highly remunerative and labour intensive. Since sucker production and bearing period (initiation of panicles and development of capsules) is spread over a period of 8-9 months in a year, farm operations and input management are to be monitored regularly at appropriate periods for obtaining higher yields and income (Korikanthimath 1990). The crop also fetches an early income (within 30 months of planting) and its cultivation is an ecologically feasible and economically viable proposition (Korikanthimath 1993). The enhanced interest for adoption of HPT in cardamom coupled with encouraging prices in recent years has resulted in not only bringing back suitable areas under cultivation as a mono crop but is also making fast inroads in existing coffee plantations as a mixed crop.

Acknowledgements

The author is highly grateful to Mr. C P Appanna and Mr. C A Ponnappa, of M/s Chettoli Estate, Chettalli, North Coorg, Karnataka for their sustained interest in the study and their help in recording observations on growth and yield. Thanks are due to Prof. (Dr.) K V Peter, Director, National Research Centre for Spices, Calicut, for his keen interest, inspiration and encouragement in the preparation of this paper and to Mr. Jose Abraham, Scientist Selection Grade (Statistics), for carrying out the economic analysis.

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