**Original Research Article**

**Comparative Economic Analysis of Input Application of Large Cardamom in Kalimpong and Darjeeling District of West Bengal**

**Abstract**

A comparative analysis of the production, cost structures, and profitability of large cardamom (*Amomum subulatum Roxb.*) cultivation in the Gorubathan Block of Kalimpong and the Rangli-Rangliot Block of Darjeeling, West Bengal. Using a multistage sampling technique, primary data were collected from 50 randomly selected growers through a structured interview schedule. The study spans four agricultural years (2020–21 to 2023–24) and adopts an inter-temporal financial analysis framework suitable for perennial crops. The findings indicate that both regions achieved peak productivity in the third year, with Kalimpong producing 304.41 kg/ha and Darjeeling 289.39 kg/ha. Corresponding gross returns were ₹3,34,855.02/ha and ₹3,18,338.79/ha, respectively. Kalimpong demonstrated higher yield and profitability, whereas Darjeeling exhibited greater cost efficiency, especially in labour utilization and input management. The results confirm that large cardamom holds strong potential as a high-value cash crop, contributing significantly to rural incomes and offering socio-economic benefits, particularly in gender equity and sustainable agriculture in the Eastern Himalayan region.

**Keywords:** Large cardamom, labour, inputs, economic feasibility.

**Introduction**

India, which is called the "Home of Spices," grows, buys, and sells more spices than any other country in the world. In India, almost all the states produce one or more spices and this land of spices grows about 70 per cent of the world's spices. Large cardamom (Amomum subulatum roxb.), a plant in the Zingiberaceae family and the order Scitaminae, Sciophyte plants, which like to grow in shady places, are spread out over large areas that get about 3000 to 3500 mm of rain a year. This plant comes from Nepal, Bhutan, and India. Most of the world's large cardamom comes from these three countries in the Indian subcontinent, where it is grown naturally. Cash crop areas include eastern Nepal, southern Bhutan, Sikkim, the Darjeeling district in West Bengal, Arunachal Pradesh, and Nagaland in India (Ravindran et al., 2012). Nepal grows more large cardamom than any other country (ITC, 2017). About 68 per cent of the world's large cardamom market is made up of Nepal, 22per cent is made up of India, and 9per cent is made up of Bhutan (ICIMOD, 2016). The large cardamom has a lot of potential as a high-value cash crop to help small-scale farmers make more money. This is because it is in high demand around the world and grows well in the hilly areas of these countries. For this reason, the crop is called "Black Gold" (MoAD, 2015a; ITC, 2017), and many government and non-government groups are pushing it as a key way to help farmers make more money. Also, all agricultural workers who do work linked to growing and processing large amounts of cardamom are paid the same, no matter what gender they are. Because of this, Nepal's female farmworkers are drawn to large-scale cardamom farming. As a result, it promotes gender equality and gives women more power in the rural Nepalese economy (Kantipur, 2018). One of the main cash crops grown in West Bengal's sub-Himalayan Kalimpong and Darjeeling districts. Large cardamom has been a major cash crop and foreign exchange-earning crop in the northeastern Himalayas, which includes the Darjeeling area. According to the Spice Board, about 9893 families grow Large Cardamom. Most of the families in the hill blocks of Darjeeling and Kalimpong grow large cardamom trees because they make good money and grow well in the area's climate. India makes more large cardamom than any other country, with a 54 per cent share of the world market (Sharma et al., 2019). It is second only to Sikkim in India in terms of how much large cardamom it grows. In 2015–16, the area of large cardamom was 3,305 ha, the yield area was 2,829 ha, the production was 848.84 metric tonnes, and the average output was 300.5 kg ha-1. Eighty percent of the land used to grow large cardamom is in Kalimpong. Twenty percent of the land used to grow large cardamom is in Darjeeling. A study from the Regional Research Station, UBKV, Kalimpong, says that 90 per cent of the land in Darjeeling and Kalimpong districts is grown with the Varlangey type.

**Materials and Methods**

The present study is carried out in Gorubathan Block of Kalimpong district, West Bengal. Systematic and scientific approach are followed to outline the results of the study conducted.

**Source of data and sampling design**:

The present study is primarily based on micro level farm survey analysis. With a view to examine the components, a well-structured and pre-tested interview schedule is utilized for the collection of data from spice growers in the study area.

**Selection of District**:

The present work is undertaken to critically analyze the production and marketing of principal spices and for selection of samples, a Multistage sampling technique is followed. Kalimpong district of West Bengal, India are purposively selected based on the availability of spice growers.

**Selection of Blocks:**

 Gorubathan blocks from Kalimpong district is selected purposively.

**Selection of Clusters:**

In Gorubathan Block, a nuclear village along with three adjacent villages are purposively selected to form a cluster of three villages. A list of 50 Large Cardamom producers is prepared separately with the help of Simple Random Sampling without Replacement Method (SRSWOR) for the spice growers. So, for the present study, 50 sample growers have been selected from Gorubathan Blocks.

**Analytical techniques**

In order to fulfil various objectives, set-out, tabular method of analysis was followed. However, statistical tools are also used as and when required.

The methodology for assessing the costs and returns of perennial crops differs from that of seasonal or annual crops. Static analysis is better suitable for seasonal and annual crops within a specific year or time, whereas perennial crops such as Large Cardamom necessitate inter-temporal analysis (Rae, 1971). Consequently, the discounting technique is employed for the financial analysis of Large Cardamom cultivation, owing to the temporal aspect inherent in the perennial nature of the crop, as indicated by Predo (2003); Brian et al. (2004). Due to the challenges in obtaining time series data on the costs and returns of a single plantation throughout its entire lifespan, information was gathered from various growers with nurseries of differing ages, encompassing the crop's life cycle.

**Result and Discussion**

The Table 1, shows the Year-wise and Size-class wise requirement of Labour and other Inputs for Large Cardamom in Gorubathan Block of Kalimpong District. For the data across Kalimpong plots over four years, the following details summarize the agricultural activities and expenditures. In the first year (2020-21), field preparation cost 6,471.09 with 21.57 man-days of labour, and sowing 9,867.15 units of seeds amounted to 49,335.76, requiring 8.37 man-days. Gap filling cost 3,089.00 with 2.10 man-days. Weeding cost 11,178.00, involving 37.26 man-days. Irrigation with tanks and pipes total 2,894.91, needing 9.65 man-days. Applying 937.13 kg of FYM cost 2,811.39 and used 4.00 man-days. Harvesting with the Bhatti system cost 4,259.47 with 14.20 man-days. Trasing cost 1,724.96 with 5.75 man-days. Land revenue was a fixed cost of 750. The total expenditure for this year was 95,986.15. In the second year (2021-22), field preparation cost remained at 6,471.09 with 21.57 man-days. Sowing data were not recorded. Gap filling costs and labour stayed the same. Weeding and irrigation costs remained unchanged. Harvesting with the Bhatti system cost 4,259.47, with 14.20 man-days. Applying FYM and trasing costs were missing. Land revenue remained fixed at 750. The total expenditure for this year was 69,701.30. In the third year (2022-23), field preparation costs and labour were consistent. Sowing data were not available. Gap filling costs and labour remained the same. Weeding cost 11,178.00 with 37.26 man-days. Irrigation costs and labour were unchanged. Harvesting cost increased to 13,161.39 with 43.87 man-days. FYM application data were missing. Trasing cost was 1,725.00 with 5.75 man-days. Land revenue was a fixed cost of 750. The total expenditure for this year was 29,883.74. In the fourth year (2023-24), field preparation costs and labour remained steady. Sowing data were missing. Gap filling costs and labour were consistent. Weeding, irrigation, and trasing costs were the same. Harvesting cost 11,542.29 with 38.47 man-days. FYM application data were missing. Land revenue was a fixed cost of 750. The total expenditure for this year was 28,264.65.

**Table 1: Year-wise and Size-class wise requirement of Labour and other Inputs for Large Cardamom in Gorubathan Block of Kalimpong District (2020-21 to 2023-24)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Kalimpong**  | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| **Particulars** | **1st Year** | **2nd Year** | **3rd Year** | **4th Year** |
| **Input** | **Labour** | **Input** | **Labour** | **Input** | **Labour** | **Input** | **Labour** |
|  | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** |
| **Field Preparation** |  |  | 21.57 | 6471.09 |  |  | 3.08 | 924.44 |  |  | 3.08 | 924.44 |  |  | 3.08 | 924.44 |
| **Sowing** | 9867.15 (nos) | 49335.76 | 8.37 | 2511.47 |  |  |  |  |  |  |  |  |  |  |  |  |
| **Gap Filling** | 617.8 (nos) | 3089 | 2.10 | 630.51 | 617.80 | 3089.00 | 2.10 | 630.51 |  |  |  |  |  |  |  |  |
| **Weeding** |  |  | 37.26 | 11178.00 |  |  | 37.26 | 11178.00 |  |  | 37.26 | 11178.00 |  |  | 37.26 | 11178.00 |
| **Irrigation** | Tank and Pipes | 40000 | 9.65 | 2894.91 |  |  | 9.65 | 2894.91 |  |  | 9.65 | 2894.91 |  |  | 9.65 | 2894.91 |
| **Fym** | 937.13 (kg) | 2811.39 | 4.00 | 1200.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| **Harvesting** |  |  |  |  | Bhatti | 45000.00 | 14.20 | 4259.47 |  |  | 43.87 | 13161.39 |  |  | 38.47 | 11542.29 |
| **Trasing** |  |  |  |  |  |  | 5.75 | 1724.96 |  |  | 5.75 | 1725.00 |  |  | 5.75 | 1725.00 |
| **Land Revenue** |  | 750 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Expenditure** |  | **95986.15** | **82.95** | **24885.99** |  | **48089.00** | **72.04** | **21612.30** |  |  | **99.61** | **29883.74** |  |  | **94.22** | **28264.65** |
| **Total Expenditure** |  | **120872.13** |  |  |  | **69701.30** |  |  |  | **29883.74** |  |  |  | **28264.65** |  |  |

(Nos: No. of Saplings)

The Table 2 shows the Year-wise and Size-class wise requirement of Labour and other Inputs for Large Cardamom in Rangli-Rangliot Block of Darjeeling District (2020-21 to 2023-24). Over the four years, the data for Darjeeling showed trends in both labour and input costs. In the first year, field preparation required 27.77 labour days, costing ₹8,330.43, and sowing involved 9,846.43 seeds, costing ₹49,231.56 with 16.15 labour days at ₹4,846.31. Gap filling used 617.74 seeds, costing ₹3,088.71, and 2.27 labour days costing ₹681.35. Weeding and irrigation remained consistent across all years, with weeding requiring 31.80 labour days in the first year, increasing to 36.86 labour days in subsequent years, costing around ₹11,059.17 annually. Irrigation, involving tanks and pipes, maintained a steady 13.12 labour days each year, costing ₹3,935.71. Farmyard manure (FYM) was applied only in the first year, total 1,357.92 kg at a cost of ₹4,073.76. Harvesting began in the second year with equipment costing ₹45,000, using 23.36 labour days at ₹7,008.20, and labour days increased to 37.86 in the third year before dropping to 30.93 in the fourth year. "Trasing" was a consistent activity from the third year onward, using 4.9 labour days annually, costing ₹1,470.29 each year. The total expenditure peaked in the first year at ₹1,25,998.83, but decreased significantly in subsequent years, with ₹73,433.48 in the second year and further reductions in the third and fourth years to ₹29,012.81 and ₹26,932.89, respectively. These results suggest that the system became more cost-efficient over time, with a noticeable reduction in both input and labour costs from the second year onward, while maintaining consistent levels of weeding, irrigation, and harvesting activities.

**Table 2: Year-wise and Size-class wise requirement of Labour and other Inputs for Large Cardamom in Rangli-Rangliot Block of Darjeeling District (2020-21 to 2023-24)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Darjeeling**  | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| **Particulars** | **1st Year** | **2nd Year** | **3rd Year** | **4th Year** |
| **Input** | **Labour** | **Input** | **Labour** | **Input** | **Labour** | **Input** | **Labour** |
|  | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** | **Qty.** | **Cost** | **No. Of Mandays** | **Cost** |
| **Field Preparation** |  |  | 27.77 | 8330.43 |  |  | 3.97 | 1190.06 |  |  | 3.97 | 1190.06 |  |  | 3.97 | 1190.06 |
| **Sowing** | 9846.43 (nos) | 49231.56 | 16.15 | 4846.31 |  |  |  |  |  |  |  |  |  |  |  |  |
| **Gap Filling** | 617.74 (nos) | 3088.71 | 2.27 | 681.35 | 617.74 | 3088.71 | 2.27 | 681.35 |  |  |  |  |  |  |  |  |
| **Weeding** |  |  | 31.80 | 9540.00 |  |  | 36.86 | 11059.17 |  |  | 36.86 | 11059.17 |  |  | 36.86 | 11059.17 |
| **Irrigation** | Tank and Pipes | 40000 | 13.12 | 3935.71 |  |  | 13.12 | 3935.71 |  |  | 13.12 | 3935.71 |  |  | 13.12 | 3935.71 |
| **Fym** | 1357.92 (Kg) | 4073.76 | 5.07 | 1521.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| **Harvesting** |  |  |  |  | Bhatti | 45000.00 | 23.36 | 7008.20 |  |  | 37.86 | 11357.58 |  |  | 30.93 | 9277.66 |
| **Trasing** |  |  |  |  |  |  | 4.90 | 1470.29 |  |  | 4.90 | 1470.29 |  |  | 4.90 | 1470.29 |
| **Land Revenue** |  | 750 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Expenditure** |  | **97144.03** | **96.18** | **28854.80** |  | **48088.71** | **84.48** | **25344.77** |  |  | **96.71** | **29012.81** |  |  | **89.78** | **26932.89** |
| **Total Expenditure** |  | **125998.83** |  |  |  | **73433.48** |  |  |  | **29012.81** |  |  |  | **26932.89** |  |  |

(Nos: No. of Saplings)

The Table 3 shows the Size-class wise and Year-wise Yield, Avg. price/kg and gross returns of Large Cardamom in Gorubathan Block of Kalimpong District of West Bengal. In the second year, the total production was 99.74 kg/ha, with an average price of 500 kg-1, resulting in a gross return of 49870.79. In the third year, production increased to 304.41 kg/ha, and the price kg-1 rose to 1,100, leading to a gross return of 334855.02. By the fourth year, production slightly decreased to 204.09 kg/ha, but the price remained at 1,100 kg-1, yielding a gross return of 224500.00.

**Table 3: Size-class wise and Year-wise Yield, Avg. price/kg and gross returns of Large Cardamom in Gorubathan Block of Kalimpong District of West Bengal (2023-24)**

|  |  |
| --- | --- |
| **Kalimpong**  | **Yield** |
| **2nd Year** | **3rd Year** | **4th Year** |
| **Total Production (Kg/ha)** | 99.74 | 304.41 | 204.09 |
| **Average Price/Kg (₹)** | 500.00 | 1100.00 | 1100.00 |
| **Gross Return (₹) Per Hectare** | 49870.79 | 334855.02 | 224500.00 |

The Table 4 shows the Size-class wise and Year-wise Yield, Avg. price/kg and gross returns of Large Cardamom in Rangli-Rangliot Block of Darjeeling District of West Bengal. Over the three years, the yield data for Darjeeling showed a fluctuating trend in production and returns. In the second year, the total production was 93.62 kg per hectare, with an average price of ₹500 per kilogram, resulting in a gross return of ₹46810.10. Production increased significantly in the third year to 289.39 kg per hectare, and the average price per kilogram rose to ₹1,100, leading to a much higher gross return of ₹318338.79. In the fourth year, production decreased to 195.77 kg per hectare, but the price remained stable at ₹1,100 per kilogram, generating a gross return of ₹215356.55. The data suggests that while the highest yield and returns occurred in the third year, the fourth year maintained strong financial outcomes due to stable pricing despite the drop in production.

**Table 4: Size-class wise and Year-wise Yield, Avg. price/kg and gross returns of Large Cardamom in Rangli-Rangliot Block of Darjeeling District of West Bengal (2023-24)**

|  |  |
| --- | --- |
| **Darjeeling**  | **Yield** |
| **2nd Year** | **3rd Year** | **4th Year** |
| **Total Production (Kg/ha)** | 93.62 | 289.39 | 195.77 |
| **Average Price/Kg (₹)** | 500 | 1100 | 1100 |
| **Gross Return (₹) Per Hectare** | 46810.10 | 318338.79 | 215356.55 |

**Conclusion**

The study concludes that large cardamom cultivation offers a viable and economically beneficial agricultural option for hill farmers in Kalimpong and Darjeeling districts. Despite regional variations, both areas showed strong performance in yield and income generation, particularly in the third year of cultivation. Kalimpong’s higher productivity was offset by its relatively higher input and labour costs, while Darjeeling demonstrated better efficiency in resource use. Overall, the crop proved resilient and profitable under the prevailing agro-climatic conditions of the Eastern Himalayas. Furthermore, the uniform wage structure and involvement of women in the production cycle enhance its role in promoting gender inclusivity in rural farming systems. Policymakers and development agencies can leverage these insights to strengthen value chain interventions, ensure better market linkages, and support smallholder farmers in enhancing livelihoods through sustainable spice cultivation practices.

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