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Cardamom cultivation in Idukki, India: Practices, challenges, and historical insights

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Abstract

Cardamom, known as the "Queen of Spices," holds significant economic and cultural value, especially in the Idukki district of Kerala, India. This study explores the historical evolution, current cultivation practices, and challenges of cardamom farming in Idukki's Zones A and C. Utilizing a mixed-methods approach, data were collected through field visits, interviews with farmers, estate owners, and laborers, structured surveys, and a review of historical and secondary sources. The research highlights that while Idukki's cardamom industry has a rich history dating back to the 11th century, modern challenges such as price volatility, labour shortages, soil degradation, and pest management continue to impact productivity and sustainability.

The study reveals that traditional practices, including the use of specific varieties like Nallani, and meticulous planting, pruning, and fertilization methods, are crucial for maintaining high yields. Despite these practices, many farmers face difficulties due to rising input costs, inadequate irrigation facilities, and labor shortages, with North Indian laborers comprising a significant portion of the workforce. The study identifies key factors influencing yield variability, such as the number of pesticide sprays, frequency of pruning, and soil management practices. Notably, farmers who invest in comprehensive pest management, soil health, and appropriate shading practices achieve yields of up to 800 kg per acre, compared to the average yield of 300-350 kg per acre observed among others.

This research underscores the need for integrated pest management, sustainable farming practices, and support for labor training to enhance productivity. Furthermore, it suggests that policy interventions should focus on stabilizing prices, reducing input costs, and improving access to credit and technical support for farmers. By addressing these challenges, the study aims to bolster the sustainability and profitability of the cardamom industry in Idukki, thus enhancing the livelihoods of local farmers and contributing to the global spice market.

Keywords: Cardamom cultivation, sustainability, labor dynamics, price fluctuation, Kerala, India

Introduction

Cardamom (*Elettaria cardamomum*), often referred to as the "Queen of Spices," is one of the most valuable and sought-after spices in the world. Known for its unique aroma and flavor, cardamom is widely used in culinary and medicinal applications. India, particularly the state of Kerala, is one of the largest producers of cardamom, contributing significantly to the global supply. The Idukki district of Kerala, in particular, is renowned for its high-quality cardamom plantations, making it a critical area of study for understanding the intricacies of cardamom cultivation and production.

Historical Context and Literature Review

The history of cardamom cultivation in Idukki is deeply intertwined with the region's socio-economic development. Historical records indicate that cardamom was initially a wild crop, with formal cultivation practices being introduced as early as the 11th century by traders from the Kudagu hills in Karnataka. The commercial cultivation of cardamom intensified with the arrival of European colonists in the 16th century, who recognized its economic potential and promoted its cultivation in the fertile highlands of Kerala (Kurian *et al.*, 2019) ^[1]. Research by Nair *et al.* (2015) ^[2] highlights the transition of cardamom from a wild to a cultivated crop, emphasizing the role of Tamil settlers who migrated to Idukki and played a crucial role in its commercial expansion. The government's land settlement policies in the mid-20th century further facilitated this transition, providing land and financial assistance to settlers, which significantly boosted cardamom cultivation (Raghavan & Mathew, 2018) ^[3].

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Current Challenges and Research Gaps

Despite its historical significance and economic importance, the cardamom industry in Idukki faces several contemporary challenges. Price fluctuations, increasing input costs, labor shortages, and declining soil fertility due to continuous monocropping are significant concerns for farmers (Sukumaran & George, 2020) [4]. Additionally, pest and disease management remains a critical issue, with farmers relying heavily on chemical treatments to protect their crops (Thomas & Philip, 2021) [5].

Previous research has extensively documented the agronomic practices and economic aspects of cardamom cultivation. However, there is a paucity of comprehensive studies that integrate historical context, current practices, and the socio-economic challenges faced by farmers. Moreover, there is limited empirical data on the variations in cultivation practices and productivity across different zones within Idukki, which are classified based on the quality of cardamom production (Zone A, B, C, and D).

Significance and Objectives of the Study

This study aims to fill these research gaps by providing a holistic understanding of cardamom cultivation in Idukki, with a specific focus on Zones A and C. By examining the historical evolution of cardamom cultivation, current farming practices, and the challenges faced by farmers, this research seeks to offer valuable insights for stakeholders, including farmers, policymakers, and researchers.

The primary objectives of this study are to:

1. Document the historical context and evolution of cardamom cultivation in Idukki.
2. Analyze the current cultivation practices, input usage, and labor dynamics in Zones A and C.
3. Identify the key challenges faced by farmers and propose potential solutions.
4. Provide empirical data on the variations in yield and productivity across different farming practices.

Understanding these aspects is crucial for developing strategies to enhance the productivity and sustainability of cardamom cultivation in Idukki. The findings of this study are expected to contribute to the existing body of knowledge on spice cultivation and provide actionable recommendations for improving the livelihoods of cardamom farmers.

Importance and Implications

Cardamom cultivation is not just an economic activity; it is a way of life for many farmers in Idukki. Enhancing the productivity and profitability of cardamom farming has significant implications for the socio-economic well-being of these communities. By addressing the challenges identified in this study, stakeholders can work towards creating a more resilient and sustainable cardamom industry.

Furthermore, this research holds importance beyond the local context, as it offers insights into the broader challenges of spice cultivation in similar agro-climatic regions. The methodological approach and findings can serve as a reference for future studies and interventions aimed at improving spice cultivation practices globally.

In conclusion, this study seeks to provide a comprehensive understanding of cardamom cultivation in Idukki, Kerala, by integrating historical context, current practices, and

contemporary challenges. By doing so, it aims to offer valuable insights and recommendations for enhancing the sustainability and profitability of the cardamom industry, thereby contributing to the overall development of the region.

Methodology

Research Design

This study adopts a mixed-methods research design, combining both qualitative and quantitative approaches to gather comprehensive insights into cardamom cultivation practices in Idukki, Kerala. The primary data were collected through field visits, interviews, and surveys conducted with farmers, estate owners, managers, and laborers. Secondary data were gathered from existing literature, agricultural reports, and historical documents to provide context and background.

Study Area

The research was conducted in the Idukki district of Kerala, a region known for its cardamom plantations. The study focused on two primary zones: Zone A and Zone C, which are classified based on the quality of cardamom production.

Sampling Procedure

A purposive sampling method was used to select participants for the study. The sample included:

- 10 estate owners
- 15 farmers
- 5 plantation managers
- 20 labourers

Data Collection Methods

1. **Field Visits:** Direct observation of cardamom plantations in Zones A and C to understand the cultivation practices and challenges faced by farmers.
2. **Interviews:** Semi-structured interviews with estate owners, farmers, managers, and laborers to gather in-depth qualitative data about their experiences, practices, and challenges.
3. **Surveys:** Structured questionnaires were administered to gather quantitative data on various aspects of cardamom cultivation, including planting methods, input usage, labor costs, yield, and pest management practices.
4. **Focus Group Discussions:** Group discussions with farmers and laborers to discuss common issues and share best practices.
5. **Secondary Data Review:** Analysis of existing literature, agricultural reports, and historical documents to provide a contextual background for the study.

Data Analysis

- **Qualitative Data:** Thematic analysis was used to identify and analyze patterns and themes within the qualitative data collected from interviews and focus group discussions.
- **Quantitative Data:** Descriptive statistics were used to summarize the survey data. Correlation and regression analyses were conducted to identify relationships between various factors affecting cardamom yield and production costs.

Case Study Results

Cultivation Practices

The study revealed that farmers in Zones A and C follow a range of cultivation practices to ensure high-quality cardamom production. The primary planting season is just before the onset of the monsoon (April-May). Farmers prefer the Nallani variety due to its resilience and yield potential. The average spacing for planting is 10x10 feet, with a pit size of 2x2 feet. Farmers apply lime as a basal treatment before planting to improve soil pH and reduce nematode infestation.

Input Usage

The study found that the use of fertilizers and pesticides is intensive in cardamom cultivation. Farmers apply fertilizers three times a year, with the first application focusing on the development of side plants using DAP or other compound fertilizers. Subsequent applications include DAP, animal bone powder, neem cake, micronutrients, urea, magnesium, and bone powder. Pesticide sprays are applied every 25-30 days to control pests and diseases.

Labor Costs and Challenges

Labor is a significant component of cardamom cultivation costs. Pruning, spraying, and harvesting require substantial labor input. The average cost of labor is ₹500-600 per day. The study noted a shortage of skilled labor, with a large proportion of workers coming from North India. The high cost and scarcity of labor are major challenges for farmers.

Yield and Productivity

The yield per acre varies significantly based on the practices followed by the farmers. Innovative farmers who invest more in inputs and follow best practices reported yields of 600-800 kg per acre. In contrast, average farmers with lower investment reported yields of 300-350 kg per acre. Proper management, including timely application of inputs and pest control measures, is crucial for achieving higher yields.

Post-Harvest Practices

Post-harvest processing involves drying the green cardamom pods. Farmers without their own driers use rental services at a cost of ₹12 per kg. The drying process reduces the weight of cardamom by approximately 50%, resulting in a final yield of 250-300 kg of dried cardamom per acre. The market rate for dried cardamom at the time of the study was ₹1500-1650 per kg.

Historical Context of Cardamom Cultivation in Idukki, Kerala

Interviews with long-term residents and historical data revealed that cardamom cultivation in Idukki has a rich history, influenced by migration patterns, government policies, and market dynamics. Tamil settlers played a significant role in the development of the cardamom industry, transitioning from laborers to landowners and traders over time. Government initiatives in the 1960s and 1970s provided land and financial assistance to settlers, facilitating the expansion of cardamom cultivation.

Early Beginnings

Cardamom, known as the "Queen of Spices," has been an integral part of Kerala's agricultural heritage. Its cultivation dates back to ancient times when it grew wild in the forests

of the Western Ghats. Historical records suggest that by the 11th century, traders from the Kudagu hills in Karnataka began the formal cultivation of cardamom in the Idukki district. These early efforts were driven by the spice's medicinal properties and its role in traditional Indian medicine, such as Siddha and Ayurveda.

European Influence and Commercial Expansion

The commercial importance of cardamom grew significantly during the 16th century with the arrival of European traders. The Portuguese, followed by the Dutch and the British, recognized the value of this spice in global markets. The British, in particular, played a pivotal role in transforming cardamom from a minor forest product to a major commercial crop. They introduced systematic cultivation techniques and established plantations, significantly boosting production.

Post-Independence Developments

The socio-political landscape of Idukki underwent considerable changes post-Indian independence in 1947. The reorganization of states in 1956 led to the formation of Kerala, and the Idukki district became a part of this new state. This period saw an influx of Tamil settlers, who were initially laborers but gradually transitioned to landowners and traders.

The Kerala government facilitated this transition by providing land and financial assistance. For instance, during the 1960s, the government offered 5 acres of land and ₹500 to families settling in Idukki, encouraging them to cultivate plantation crops like cardamom. Initially, these settlers had no land rights, but by 1965, the government issued land pattas, formalizing their ownership. This policy helped transform Idukki into the "Spice Capital of Kerala," with a significant increase in cardamom, pepper, and tea cultivation.

Demographic Shifts and Cultural Integration

The demographic composition of Idukki changed as Tamil settlers became the majority, surpassing the local Malayalam-speaking population. This shift led to cultural integration and influenced agricultural practices. Despite their initial challenges, Tamil settlers contributed significantly to the development of the cardamom industry, bringing in their traditional knowledge and adapting to new cultivation techniques.

Current Challenges in Cardamom Cultivation

Price Fluctuations

One of the major challenges faced by cardamom farmers in Idukki is the high price volatility. The prices of cardamom are subject to significant fluctuations due to various factors such as market demand, climatic conditions, and global spice market trends. This unpredictability affects farmers' income stability, making it difficult for them to plan and invest in their plantations.

Increasing Input Costs

The cost of inputs, including fertilizers, pesticides, labor, and machinery, has been steadily rising. For instance, farmers spend approximately ₹1-1.5 lakh per acre annually on chemicals and fertilizers alone. This increase in input costs, coupled with fluctuating cardamom prices, puts substantial financial pressure on farmers, reducing their

profit margins.

Labor Shortage and Rising Wages

The cardamom industry in Idukki heavily relies on manual labor for various stages of cultivation and harvesting. However, there is a growing shortage of skilled labor. Currently, about 60% of the labor force comprises workers from North India, indicating a reliance on migrant labor. The daily wage rates for laborers have also increased significantly, with local laborers earning ₹600 per day and North Indian laborers ₹500 per day. This rise in labor costs adds to the overall production expenses.

Soil Fertility Issues

Continuous monocropping of cardamom has led to soil fertility depletion in many areas. The intensive cultivation practices, combined with inadequate soil management, have resulted in reduced soil health. This decline in soil fertility affects plant growth and yield, necessitating the use of more fertilizers and soil amendments, further escalating costs.

Pest and Disease Management

Cardamom plantations in Idukki are susceptible to various pests and diseases, including thrips, pod borer, scales, whiteflies, clump rot, root rot, and viral diseases like Cutta disease. Managing these pests and diseases requires regular chemical sprays and interventions, which are costly and can have environmental impacts. Inadequate pest and disease management can lead to significant yield losses, further affecting farmers' livelihoods.

Water Scarcity and Irrigation Challenges

Although cardamom requires a humid and moist environment, water scarcity during critical periods can adversely affect crop growth and yield. Not all farmers have access to adequate irrigation facilities, making them dependent on erratic monsoon rains. The lack of timely and sufficient water supply can lead to poor plant health and lower productivity.

Economic and Policy Issues

Farmers also face broader economic and policy-related challenges. The lack of supportive policies, limited access to credit, and inadequate market infrastructure are significant barriers to sustainable cardamom cultivation. Additionally, smallholder farmers often struggle with limited bargaining power and market access, making it challenging to secure fair prices for their produce.

Cultivation Practices

Cardamom cultivation is a meticulous process requiring careful attention to detail and precise agricultural practices. The cultivation process can be broadly divided into several stages: land preparation, planting, maintenance, pest and disease management, and harvesting.

Land Preparation

- **Timing:** Planting season is just before the onset of the monsoon, typically in April-May.
- **Pit Preparation:** Pits of 2x2 feet are dug with a spacing of 10x10 feet. Each pit is provided with 100 gm of lime as a basal application before planting, left for one week to neutralize soil pH and control soil-borne pathogens.

Planting

- **Plant Selection:** Farmers usually prefer the Nallani variety, although Thiruguthali and Pavalakodi are also used depending on soil conditions.
- **Method:** A single mother plant is planted per pit. After 35-45 days, the mother plants begin to ratoon, producing side shoots.

Fertilization

- **Initial Fertilization:** After 30-40 days of planting, 100 gm of DAP (Di-Ammonium Phosphate) or other compound fertilizers are applied.
- **Subsequent Applications:** Fertilizers are applied three times a year. The first dose is for side plant development, the second dose includes DAP, animal bone powder, or neem cake, and the third dose involves micro-nutrients, urea, magnesium, and bone powder.

Pest and Disease Management

- **Chemical Sprays:** Pesticides are sprayed every 30 days to control pests and diseases. Zinc spray is applied twice after 16 months of planting.
- **Pruning:** Essential for good growth, 2-3 prunings per year are performed to manage plant health and yield.

Irrigation and Shading

- **Watering:** Adequate watering is crucial, especially if the monsoon is delayed or insufficient.
- **Shading:** Proper shading is maintained to protect the plants from direct sunlight and maintain an optimal microclimate.

Harvesting

- **Timing:** Cardamom plants are ready for harvest after 16 months, with harvesting rounds every 60 days.
- **Yield:** Each round yields progressively, with the first round typically producing 50 kg per acre and subsequent rounds increasing in yield.

Uniqueness Compared to Other Crops

Cardamom cultivation is unique due to its specific agro-climatic requirements, labor-intensive nature, and long growth cycle. Unlike annual crops, cardamom plants require a longer maturation period and continuous maintenance. The need for specific shade conditions, regular pruning, and precise spacing for optimal growth distinguishes cardamom from many other spice and cash crops. Additionally, the heavy reliance on chemical sprays and fertilizers to manage pests and diseases highlights the intensive management practices required for successful cardamom cultivation.

Case Studies

Roopan's Family

- **Background:** Migrated in 1936, transitioned from labourers to landowners.
- **Current Holdings:** 50 acres in Zone C, 5 acres in Zone A.
- **Management:** Employ managers and field workers, own drying facilities, and provide rental drying services.

Mr. Muthuperumal

- **Experience:** 30 years.
- **Current Holdings:** 3 acres.

- **Practices:** Intensive use of fertilizers and pesticides, frequent pruning, and custom drying services.

Sathish (Chittamparai)

- **Investment:** Higher investment leads to higher yields.
- **Practices:** Enhanced soil preparation and use of innovative methods for root development and soil loosening.

Mr. Muniandi (Anavilasam)

- **Migration History:** Moved from Madurai due to drought in the 1960s.
- **Current Holdings:** 8 acres (including leased land).
- **Practices:** Similar to others, with emphasis on proper spacing, frequent chemical sprays, and regular fertilization.

Mr Selvakumar

- **Migration History:** Moved from Periyakulam due to unemployment in the 1980s.
- **Current Holdings:** 3 acres (including leased land).

- **Practices:** Similar to others, with emphasis on proper spacing, frequent chemical sprays, and regular fertilization.

**Labor Dynamics and Mobilization
Labor Requirements**

Cardamom cultivation is highly labor-intensive, involving several stages that require skilled and unskilled labor. The cost of labor in cardamom cultivation is relatively high due to the need for regular maintenance and skilled labor for specific tasks. Tamil Nadu is main supplier of skilled labour force initially and predominantly until 2010. Skilled labour from Tamil Nadu charges 600-700 per day and work from 7-3 pm only. Labor charges are typically Rs 500-600 per day, with North Indian laborers often employed at a slightly lower rate of Rs 500 per day as they considered as unskilled and they also ready to work more time until 6 pm. If estate owners provided the accommodation and food they ready to work round the clock for much cheaper charges than locals. The overall labor cost given in the table 1

Table 1: Labour Requirements and cost for Cardamom Plantation per year

	Labour activities	No. of Labour Required	Frequency	Cost per labour/day	Total Cost (INR)
I	Pit preparation and Planting				
	Digging and Lime Application	10	1	500	5000
	Planting	5	1	500	2500
	irrigation	3	10	500	15000
II	Chemical Spray				
	Labour for spray	4	13 times/Year Every 30 days	500	26000
III	Pruning and Shade Management				
	Labour for Pruning	20	3 times/year per pruning cycle	500	30000
IV	Fertiliser Application				
	Labour for application	10	4 Every 3 Months	500	20000
V	Harvesting				
	First Harvest (50kg)	50	5 Round/year one time	500	25000
	Second Harvest (150 kg)	50	one time	500	25000
	Third Harvest (200 Kg)	75	one time	500	37500
	Fourth Harvest (150 kg)	40	one time	500	20000
	Fifth harvest (50 kg)	30	one time	500	15000
VI	Drying and Processing				
	labour for drying and processing	4	12-14/hour/per cycle	500	8000
VII	Total annual labour cost				229000

Source: Field Survey 2023

The data provides a detailed breakdown of the labor costs associated with various cardamom plantation activities throughout the year. Here's a critical analysis of the key aspects:

Labor Intensity: Cardamom cultivation is labor-intensive, with a total annual labor cost of Rs. 229,000. This cost is spread across various activities, with harvesting being the most labor-intensive, accounting for Rs. 125,000 (54%) of the total cost. This highlights the significant manpower requirement during harvest seasons.

Activity-wise Cost Breakdown

- **Pit preparation and planting:** This activity requires a relatively small workforce (10-15 laborers) for a short duration (1 day). The total cost for this stage is Rs. 7,500, which is minimal compared to other activities.
- **Chemical spraying:** Chemical spraying is another significant expense, accounting for Rs. 26,000 annually. This cost can potentially be reduced by implementing integrated pest management (IPM) practices that

minimize reliance on chemical controls.

- **Pruning and shade management:** Pruning is performed thrice a year, requiring 20 laborers per cycle. This translates to a total cost of Rs. 30,000 annually for pruning and shade management.
- **Fertilizer application:** Fertilizer application is done every three months, requiring 10 laborers each time. The total annual cost for fertilizer application is Rs. 20,000.
- **Harvesting:** Harvesting is the most labor-intensive and expensive activity, with five rounds per year. The labor requirement varies depending on the harvest yield, ranging from 30 to 75 laborers per harvest. The total cost for harvesting is Rs. 125,000, which can be a significant strain on small cardamom growers.
- **Drying and processing:** Drying and processing require a smaller workforce (4 laborers) compared to harvesting. The total cost for drying and processing is Rs. 8,000 annually.

Cost-saving Opportunities

The data suggests potential areas for cost savings in cardamom cultivation:

- **Adopting IPM practices:** Implementing integrated pest management strategies can help reduce reliance on chemical spraying, potentially lowering the Rs. 26,000 annual cost.
- **Exploring alternative harvesting methods:** Investigating alternative harvesting methods that require less labor could be beneficial, especially for small growers. This could involve using tools or equipment that can improve efficiency.

- **Evaluating fertilizer application practices:** Optimizing fertilizer application practices based on soil testing and crop needs can potentially reduce fertilizer use and the associated labor costs (Rs. 20,000 annually).

Production Economics for One Acre

The economics of cardamom production involve several cost components, including land preparation, planting, maintenance, harvesting, and post-harvest processing is given in the Table: 2

Table 2: Cost of Cultivation of Cardamom

S, No	Cost Components	Amount in Rs
I	Initial Cost	
	Pit preparation and planting	10000
	Fertilizer and chemicals	30000
	Labour for planting and intial maintenance	20000
II	Annual maintenance cost	
	Chemical spray and fertilizers	200000
	Pruning and shade management	30000
	Watering and irrigation	10000
III	Harvesting Cost	
	Labour for harvesting	122500
	Dying and processing	8000
	Total Annual Cost	430500
IV	Revenue	
	Yield (600 Kg of Dried cardamom)	600
	Market Price per Kg	1500
V	Total Revenue	900000
VI	Profit	
	Total Revenue-Total Cost	469500

Source: Field survey, 2023.

The cost of cultivating cardamom can be broken down into three main categories: initial cost, annual maintenance cost, and harvesting cost. The initial cost includes the cost of pit preparation and planting, fertilizer and chemicals, and labor for planting and initial maintenance. The annual maintenance cost includes the cost of chemical spray and fertilizers, pruning and shade management, and watering and irrigation. The harvesting cost includes the cost of labor for harvesting and drying and processing.

In the data you provided, the total initial cost is Rs. 60000, the total annual maintenance cost is Rs. 240000, and the total harvesting cost is Rs. 130500. The total annual cost is Rs. 430500.

The revenue from cardamom cultivation is determined by the yield and the market price per kilogram. In the data you provided, the yield is 600 kg of dried cardamom and the market price per kilogram is Rs. 1500. The total revenue from cardamom cultivation is therefore Rs. 900000.

The profit from cardamom cultivation is the total revenue minus the total cost. In the data you provided, the profit is Rs. 469500.

Conclusion

Our case study showed that Cardamom cultivation in Idukki involves intricate practices and significant investment in labor and inputs. The study highlights the complexities of cardamom cultivation and its rich historical legacy and remains a vital component of the region's economy in Kerala. While the region has a rich historical legacy and significant commercial importance, farmers face numerous

challenges that impact their productivity and profitability. It represents a unique agricultural practice that blends traditional knowledge with modern techniques. The labour-intensive nature and specific agro-climatic requirements make it distinct from other crops. Understanding the detailed labor dynamics and production economics is crucial for optimizing yields and enhancing the profitability of cardamom farming. Addressing these challenges requires a multi-faceted approach, including improving access to inputs, enhancing labor availability, promoting sustainable cultivation practices, and implementing supportive policies. If police makers execute appropriate intervention as mentioned in this paper, the cardamom industry is continuing to thrive, benefiting farmers and contributing to the regional and global spice market.

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