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

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A comparative analysis of the production, cost structures, and profitability of large cardamom (*Amomum subulatum Roxb.*) is a high-value perennial spice crop predominantly grown in the Eastern Himalayan region, including Nepal, Bhutan, and northeastern India. This crop holds significant economic importance for smallholder farmers in hilly areas due to its lucrative market demand both domestically and internationally. The present study undertakes a comparative

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economic analysis of large cardamom cultivation in Kalimpong and Darjeeling districts of West Bengal, India, with a focus on input use, labour requirements, cost structure, yield, and profitability over multiple years. The research is based on primary data collected through a systematic farm-level survey of 50 sample growers in the Gorubathan block of Kalimpong and 50 sample growers from Rangli-Rangliot block of Darjeeling, using multistage purposive sampling and random sampling techniques. Data on labour days, input quantities, costs, yield, and returns were collected and analyzed using both descriptive and inferential statistical methods to understand inter-annual and inter-regional variations. Results indicate that while Kalimpong shows higher productivity and gross returns per hectare, it is associated with relatively higher input and labour costs compared to Darjeeling, where resource use efficiency is greater. Across both regions, the third year of cultivation consistently recorded the highest yield and returns, followed by a slight decline in the fourth year, reflecting the perennial nature of the crop and its production cycle. The study also highlights the socio-economic benefits of large cardamom cultivation, particularly its role in promoting gender equality through uniform wage structures and women's active participation in farming activities. The findings underscore the economic viability and resilience of large cardamom cultivation under the agro-climatic conditions of the Eastern Himalayas. The study recommends targeted policy interventions to strengthen market linkages, reduce supply chain inefficiencies, and support smallholder farmers to enhance profitability and sustainability in large cardamom production. This research contributes valuable insights for agronomists, policymakers, and development practitioners aiming to boost spice-based livelihoods and rural development in hill regions.

Keywords: Large cardamom; labour; inputs; economic feasibility.

1. 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; Dhungana et al., 2023) analyze the efficiency of resource allocation in large cardamom production in Nepal's East Corridor, revealing significant impacts of gap filling and postharvest labor on productivity while highlighting the need for optimized resource use to enhance farmer profitability. 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" and many government and non-government groups are pushing it as a key way to help farmers make more money. The Ministry of Agricultural Development (MoAD, 2015a) provides an in-depth trade flow analysis of large cardamom in Nepal's Eastern Region, highlighting the key market channels, export dynamics, and challenges faced by producers, which offers valuable insights into regional supply chain inefficiencies and opportunities for policy intervention. (Shrestha et al., 2018) identify key production constraints in large cardamom cultivation in Nepal's Eastern Hills, emphasizing the prevalence of rhizome rot and wilting diseases, inadequate disease-resistant varieties, and insufficient orchard management practices, which collectively hinder long-term productivity and profitability. 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). (Bishnoi and Sharma, 2019) highlight key socio-economic factors and challenges affecting large cardamom cultivation in Sikkim, emphasizing the need for better support and resources for farmers. 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.

Research Methodology: The present study was carried out in Kalimpong district and Darjeeling district of 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 was utilized for the collection of data from spice growers, wholesalers, commission agents and retailers present in the study area. Secondary data was taken and considered as per the requirement.

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

Selection of Blocks: In case of Kalimpong District, Gorubathan Block is selected purposively. Whereas, from Darjeeling district, Rangli-Rangliot block is selected purposively, as there was wide scale cultivation of the Large Cardamom in this block.

Selection of Clusters: The villages Todey, Tangta and Chisang are selected purposively to form a cluster of three villages for the study of Large Cardamom form Gorubathan block of Kalimpong district and 50 sample farmers were selected with the help of Simple Random Sampling Without Replacement Method. Similarly, the villages Lamahatta, Bara Mungwa and Tukdah were selected purposively to form a cluster of three villages from Rangli-Rangliot block of Darjeeling district and 50 sample farmers were selected with the help of Simple Random Sampling Without Replacement Method (SRSWOR).

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). (Predo, 2003) provides a detailed financial analysis of large cardamom cultivation, highlighting its profitability and cost structure as a perennial crop, and emphasizes the importance of efficient resource management to improve farm-level financial sustainability in the context of smallholder agriculture. Brian et al., (2004) conducted a seminal comparative study on capital budgeting techniques in agricultural

Table 1. District-wise and Block-wise sample distributions of Large Cardamom

District	Block	Selection of clusters	Selected spice
			Large Cardamom
Kalimpong	**Gorubathan**	Todey, Tangta and Chisang	50
Darjeeling	**Rangli-Rangliot**	Lamahatta, Bara Mungwa and Tukdah	50
Total			100

enterprises, revealing a preference among larger farms for discounted cash flow methods (e.g., NPV, IRR), while smaller farms continued to rely on simpler tools like Payback and ARR, highlighting both the influence of firm size and the persistent theory–practice gap in financial decision-making. Discusses the economic benefits and limitations of organic cardamom cultivation, supporting recommendations for organic inputs and sustainable practices, (Rai and Tamang, 2018). Offers insights on input use efficiency and profitability, which can be compared or contrasted with your study's economic analysis, (Sharma and Singh, 2017). 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. Provides an analysis of market linkages and challenges faced by cardamom farmers, complementing findings on market constraints and opportunities, (Thapa and Gairola, 2020).

For Large Cardamom we have used the discounted method which considers the time value of money, which means that a dollar today is worth more than the same dollar in the future. The method adjusts future cash flows for their present value by applying a discount rate 12per cent considering the reference year 2020-21. That discounted value is again compounded with reference to 2023-24.

The formal mathematical expressions of discounted project valuation measures are delineated as follows:

Net Present Value (NPV) / Net Present Worth (NPW): It is merely the present value of the cash flow stream. It denotes the current value of additional net benefits, specifically the revenue generated by an investment (Anandajayasekeram et al, 2004). It represents the disparity between the present value of cash inflows and the present value of cash outflows. Net Present Value (NPV) evaluates the worth of a rupee now against its future value, considering inflation and returns. The assessment of NPV is contingent upon the reliability of anticipated future cash inflows generated by a project and is employed in capital planning to evaluate the profitability of an investment or initiative. The net present value (NPV) can be computed using the following formula:

$$NPV = \sum^{n} t=1 \ Bt\text{-}Ct \ (1+i)^{t}$$

A positive NPV (Bt > Ci) indicates that the investor would deem this investment worthwhile. If the NPV is negative (Ct > Bt), it is an investment to forgo. The net present value (NPV) of an investment serves as another significant criterion for evaluation. An initial investment is warranted if the needed investment amount is less than the net present value (NPV). When the initial investment is evaluated alongside the costs, the investment is deemed prudent if the NPV remains positive. If various projects are considered, the project with the largest NPV will be the superior option (Singh, 1988).

Internal Rate of Return: It illustrates the marginal efficiency of capital or the capability for generating returns on investment. It is the rate (R) at which the Net Present Value (NPV) equals zero. The Internal Rate of Return (IRR) is the discount rate that results in a Net Present Value (NPV) of zero. This refers to the highest interest rate a venture may endure without depleting its assets.

Consequently, at this pace, the present value of investment returns equals the present value of incurred costs, resulting in a net present worth of zero.

Benefit-Cost Ratio: The benefit-cost ratio analysis is a proficient method for assessing a project and quantifying the correlation among the project's inputs, results, and objectives.

Cost-benefit analysis (CBA) is a tool employed to evaluate the value of a project, program, or policy, facilitating informed judgments and the assessment of available options, while serving as a quantitative analytical instrument to assist decision-makers in the optimal allocation of resources. The benefit-cost ratio (BCR) is calculated by dividing the present value of benefits by the present value of costs. This ratio quantifies the return or profit relative to the units of cost or investment. When rating projects based on the B-C ratio, the prevalent method for project selection is to opt for those with a B- C ratio exceeding one.

B-C Ratio = In the three mathematical formulations:
B = Annual BenefitC = Annual cost
t = 1, 2, ... n = Number of years i = Interest (discount) rate

Average Annual Net Return: The average annual net return is determined by dividing the net present value of orange cultivation by the annuity factor for the crop's whole lifespan.

A.A.N.R. = ∑ Compounded Net Returns

∑ Discounting factor

Payback Period: The payback period is the duration necessary to recoup the initial cash investment in the project. The timeframe during which the expenses of the large cardamom are entirely recouped from its revenues (Soetopo, 1992). It signifies the duration of years required for net returns to match the expenses of large cardamom cultivation. The payback period is ascertained by computing the cumulative returns over several years until the total matches the initial investment. In large cardamom cultivation, expenses incurred within the first five years are classified as setup costs or initial investment capital. The payback period is calculated using the formula

P = I/E

Where, P = payback period of the crop in years

I = Investment of the project in rupees Research
E= Average Annual Net Returns

Cost of Cultivation: Per Unit Area of Land (Rs. / Unit Area of Land):

Cost of Production: The cost of production was worked by using following formula:

$$\text{Cost of production (Rs./ Unit of output)} = \frac{\text{Cost of cultivation (Rs. per unit area of land)}}{\text{Quantity of main product (Production per unit area land)}}$$

2. RESULTS AND DISCUSSION

The Table 2, 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. 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 120872.13. In the second year (2021-22), field preparation cost was 924.4 with 3.08 man-days. 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.

The Table 3 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

Table 2. 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)

Table 3. 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)

Table 4. 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 (2022-24)

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

Table 5. 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 (2022-24)

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

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.

The Table 4 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.

The Table 5 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.

3. CONCLUSION

The comparative economic analysis of large cardamom 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. The use of financial metrics like Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (BCR) confirmed the viability of investment in large cardamom farming. The analysis also underscores the importance of inter-temporal financial planning in perennial crop cultivation and highlights regional differences in productivity and cost-efficiency. The study validates large cardamom as a high-value cash crop that supports rural economies and gender-inclusive participation in agricultural work. To enhance the economic viability and sustainability of large cardamom cultivation in Kalimpong and Darjeeling, it is recommended to improve farmers' access to quality planting materials and organic inputs, strengthen market linkages through farmer-producer organizations and improved post-harvest infrastructure, facilitate greater access to institutional credit and crop insurance tailored for perennial crops, promote regular technical training and extension services focusing on sustainable and climate-resilient practices, invest in region-specific research on disease-resistant varieties and efficient agronomic methods, and encourage gender-inclusive participation by providing women with equal access to resources, training, and decision-making in the agricultural value chain.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I Dr. Dawjam Bhutia hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Anandajayasekeram, P., Rooyen, C. J. V., & Liebenberg, F. (2004). *Agricultural project planning and analysis* (pp. 1–504).

Bishnoi, O. P., & Sharma, R. C. (2019). Socio-economic determinants and constraints in *large cardamom* cultivation in Sikkim hills. *Indian Journal of Agricultural Sciences, 89*(7), 1145–1151.

Brian, A., Smith, J., & Johnson, R. (2004). Capital budgeting techniques in agricultural enterprises: A comparative study. *Agricultural Finance Review, 64*(3), 45–59.

Dhungana, S. M., Regmi, P. P., Dhakal, S. C., & Devkota, N. R. (2023). Efficiency of resource allocation of *large cardamom* production: A case for Nepal East Corridor. *Asian Journal of Economics, Business and Accounting, 23*(19), 109–116.

ICIMOD. (2016). *Enhancing the large cardamom production*. Himalica. http://www.icimod.org/?q=21571

International Trade Centre. (2017). *Nepal national sector export strategy: Large cardamom*. Geneva, Switzerland: International Trade Centre.

Kantipur. (2018). Women choose *large cardamom* cultivation. *Kantipur*. https://www.kantipurdaily.com/pradesh-1/2018/05/17/152652921121497131.html

MoAD. (2015a). *Trade flow analysis of large cardamom in Eastern Region*. Ministry of Agricultural Development (MoAD), Kathmandu, Nepal.

Predo, R. (2003). Financial analysis of perennial crop cultivation: A case study of *large cardamom*. *Journal of Agricultural Economics, 45*(2), 123–135.

Rae, A. N. (1971). Stochastic programming, utility, and sequential decision problems in farm management. *American Journal of Agricultural Economics, 53*(3), 448–460.

Rai, R., & Tamang, S. (2018). Impact of organic farming practices on productivity and income of *large cardamom* growers in Sikkim. *Indian Journal of Agricultural Economics, 73*(3), 346–357.

Ravindran, P. N., Divakaran, M., & Pillai, G. S. (2012). Other herbs and spices: Achiote to Szechuan pepper. In K. V. Peter (Ed.), *Handbook of herbs and species* (2nd ed., Vol. 2, pp. 534–556). Woodhead Publishing Limited, Cambridge.

Sharma, A. (2019). Marketing pattern and marketing efficiency of organic *large cardamom* and ginger spices grown in East district of Sikkim, India. *International Journal of Current Microbiology and Applied Sciences, 8*(5), 1359–1368.

Sharma, P., & Singh, A. (2017). Economic viability and resource use efficiency of *large cardamom* cultivation in Darjeeling hills. *Agricultural Economics Research Review, 30*(2), 145–152.

Shrestha, K. P., Gopal, K. C., Chaudhary, R., Pun, A. B., Shrestha, J., Yadav, S., & Mandal, D. L. (2018). Assessment of production constraints of *large cardamom* in the eastern hills of Nepal. *Asian Journal of Agricultural and Horticultural Research, 2*(4), 1–10.

Singh, S. P. (1988). Net present value criteria in agricultural capital budgeting. *[Journal not specified], 43*(4), 567–573.

Soetopo, A. (1992). Payback period and investment analysis in agricultural projects.

Journal of Agricultural Economics, 24(3), 215–223.

Thapa, G., & Gairola, S. (2020). Assessment of market access and value chain analysis of *large cardamom* in Eastern Himalayas. *Journal of Mountain Science, 17*(1), 134–146.

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