Original Research Article

Production and Problems in Large Cardamom Cultivation in the Sub- Himalayan Region of West Bengal

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A B S T R A C T

K e y w o r d s constraints, financial viability, large cardamom, profitability **Article Info** *Received:* 01 July 2023 *Accepted:* 04 August 2023 *Available Online:* 10 August 2023	Large cardamom (*Amomum subulatum*), locally known as 'alaichi', is commonly referred to as the queen of spices. India happens to be the second largest producer of this age old spice and shares about 37% of its global production. The present study attempts to analyze the financial & economic performance of Large Cardamom cultivation with the help of primary data collected from 60 randomly selected sample farmers from Kalimpong district of West Bengal during 2019-2020. It is cultivated as one of the most important cash crops in the study area. Garrett's ranking technique is used to identify the major constraints faced during production of large cardamom. Discounted method of financial feasibility analysis explores Benefit-Cost Ratio (BCR) to be 3.01 and Net Present Value (NPV) to be ₹1, 99,929.92 (per ha per annum) at 7 percent discount rate confirming the financial viability and profitability of large cardamom cultivation. It is found that the crop exhibits upward trend in yield with its age and attains the 'maxima' at 6th year, in general. The net return is found to be highest between the age group of 4 to 6 years, 6th year age garden giving the optimum yield and return. Attack of pest and disease is the major problem expressed by majority of the farmers along with other problems. Proper and timely technical guidance & suitable government initiative for development of 'fore-warning system', as well as establishment of newer plantation need to be encouraged with feasible assistance from the concerned line department(s).

Introduction

In India, two types of cardamom are grown viz., small and large. Small cardamom is cultivated and produced mainly in the southern states whereas large cardamom is cultivated as one of the most important cash crops in Sikkim and the Sub-Himalayan regions of Kalimpong and Darjeeling district of

West Bengal. Large Cardamom (*Amomum subulatum*) is a perennial herb, locally known as 'alaichi' belonging to family Zingiberaceae. It is commonly referred to as the Queen of Spices because of its fascinating aromatic essence and is believed to be one of the oldest spice crops, known for its ayurvedic value which dates back to 6th century BC as mentioned by Sushruta (Sharma *et*

al., 2000). Large cardamom is commonly used for flavoring vegetables and many food preparations due to its pleasant aromatic odor. Apart from its aroma it also has high medicinal value; the liquid from the capsule is used to cure infection in gums and teeth. The seeds of large cardamom are also thought-about as a remedy to snake venom or scorpion venom. It is also reported that large cardamom seeds are used for preventive and curative purpose for troubles in throat, lungs congestion, eyelids inflammation, disorders regarding digestion and also for the treatment of pulmonary tuberculosis.

Due to its economic returns and suitability to agro climatic condition of the region, most of the families in the hills of Kalimpong and Darjeeling districts are practicing the cultivation of large cardamom. According to the estimation of Spice Board of India, approximately 9893 families are engaged in the cultivation of large cardamom. India is the second largest producer and the largest exporter of large cardamom, hence contributes 37 % to the world's total production, while the world's largest producer country is Nepal with a share of more than 53 %. (Sharma *et al.,* 2009; Singh and Pothula, 2013; Subedi *et al.,* 2014). In West Bengal, Kalimpong district contributes 80 % and Darjeeling district contributes 20 % of the total area under large cardamom (Tarafder *et al.,* 2018). The total area and production of large cardamom in India during the year 2021-22 was recorded to be 84000 ha and 26000 MT respectively whereas the area and production in 2021-22 from West Bengal was 3305 ha and 1100 tonnes (Annual report of spice board, 2021). Bureau of Indian standards (BSI) has standardized quality specifications for large cardamom. Plantations yielding 300-350kg/ha, 100-250kg/ha and less than l00kg/ha of dried capsules are rated good, medium and poor respectively.

The traditional exports markets of large cardamom from the country have been Pakistan, UAE, UK, USA and Canada. However, in accordance to the trends in export markets, Middle East and Pakistan was observed to be the countries illustrating maximum growth and future scope (Spice Board, Gangtok, Sikkim). Some major domestic markets in India are Delhi, Guwahati and Kolkata. Monitoring and controlling of the spice trade in India is functioned by the Spices Board of India (Spice board, 2018; Sharma *et al.,* 2008).

Materials and Methods

Based on primary and secondary data, the current study on large cardamom was undertaken. Obtaining relevant information required gathering of available literature, identification of the situation at the important location, and personal observations (Agarwal *et al*., 2018). Secondary information and observations were obtained from published articles, official publications (Annual reports etc.) and online journals, among other sources.

Description of the study area and sample size

The study was carried in Kalimpong district of West Bengal, which is situated at an average elevation of 1,250 meters (4,101 ft).This district was chosen purposively as it is one of the largest producers of large cardamom in the state. The district of Kalimpong comprises of three developmental blocks: Kalimpong-I, Kalimpong-II and Gorubathan. Out of the three blocks, Kalimpong-I and Kalimpong-II were selected purposively for the study. Two villages from each block of Kalimpong I and Kalimpong II were selected randomly for the study. Selection of the respondent household was done through proportionate random sampling method. A total of 60 large cardamom growing households were selected from Kalimpong I and Kalimpong II and the randomly selected households were personally surveyed for acquiring detailed information with the help of a structured questionnaire. The study was undertaken during the year 2018-2019.

Analytical Tools and Techniques

Following financial & economic aspects of large cardamom cultivation were undertaken:

Cost of cultivation

Large cardamom is a perennial crop, which means they do not need to be planted every year. The gestation period of cardamom plantation is about 3 years, from third year onwards it starts bearing and can be economically cultivated for about 8-10 years (Bisht *et al.,* 2010). Straight line depreciation method is used for economic analysis. Therefore, the study takes care of both Total Variable costs (TVC) and Total fixed costs (TFC) in arriving at Total Cost of large cardamom.

Total Fixed Costs

Comprised of apportioned cost of establishment, used in large cardamom production. These are expenses which are independent irrespective of the level of goods or services produced. Apportioned cost was estimated by dividing the Total Fixed Cost by number of year of economic yield of cardamom.

Total Variable Costs

Also called as operation and maintenance (O & M) costs which included the expenditure on labor and material inputs. Material costs included cost incurred on planting material, planting equipments etc. The labor costs included labor expenditure (hiring charge) on planting, weeding, fertilizers and manures application and irrigation etc. Human labor was estimated in terms of man hours. The prevailing market wage rate in the study area as reported by the respondents was Rs.500 per day i.e. Rs 62.5 per hour.

Therefore, Total Cost of Production = Apportioned Fixed Costs + Variable Cost

Yields and Returns

Gross Returns

The gross rate of return is the total rate of return on an investment before the deduction of any fees, commission or expense. It is calculated summing up the receipts from main product and by-product produced.

Net Returns

Net return is the income received after deducting all expenses from the gross income generated by the investment. It is calculated after subtracting all the expenses from the gross return.

Net Returns = Total Return/Gross Return - Total Expense /Total Cost

Financial Analysis

As large cardamom is a perennial crop, discounted analytical tools were used to evaluate the investment and figure out the feasibility and economic viability of investment (Borah, 2017). The tools and techniques operated are as follows:

Benefit-Cost Ratio (B-C Ratio)

Benefit-Cost Ratio (B-C Ratio) is also commonly referred to as the Profitability Index (Gerald Shively, 2012). It is the ratio between discounted benefits and discounted costs. The benefit cost ratio was computed at 7% discount rate. Institutional agencies are giving loan to this sector with an interest rate of 7 per cent per year.

Therefore, Benefit-Cost Ratio (B-C Ratio) = Discounted value of benefits/ discounted value of costs.

Net Present Value (NPV)

Net present value (NPV) of an investment is the simple difference between the discounted present value of sequence of inflow (returns) and outflows (costs) over the economic life period of large cardamom plantation. Positive NPV indicates that investment is worthwhile and can be accepted.

Net Present Value (NPV): Discounted Benefit – Discounted costs

Constraints in production of large cardamom

The production performance is far below the desired level and therefore, the study attempts to understand the constraints in production of large cardamom in this area. Following analytical methods are followed in understanding that:

Garrett's Ranking Technique

To identify and rank the preference designated by the respondents on various factors of production in the study area Garrett's ranking technique was followed (Ao and Jamir, 2020)

$$Percent\ position\ =\ 100\ (Rij - 0.5)/\ Nj$$

Where,

Rij = Rank given for the ith variable by jth respondents

Nj = Number of variable ranked by jth individual

Using the help of Garrett's Table, the percent position which was calculated is converted into scores. After that for every single factor, the scores given by each respondent are added and a total number of scores and its mean values are calculated. The components having the maximum or highest mean value is considered to be the most crucial factor.

Results and Discussion

General Characteristics of Large Cardamom Growing Sample Households

Majority of the respondent farmers belonged to the age category of 50 and above, followed by the age category between 35-50years. The least respondents were found to be under the age category of 25-35 years. The educational status indicated that the large cardamom cultivators were literates; majority of the respondents had acquired education up to higher secondary level followed by college graduates. The average land holding of farmers in the study area was found to be 0.91 hectares. The average area under cardamom cultivation was 0.45 hectares. Different varieties of large cardamom were found to be grown in the study area namely Bharlangey, Ramsai, Seremma and Golsey. Out of which Bharlangey was found to be the most dominant cultivar grown in the study area because of its timely availability, bigger capsule size and higher yield.

Cost of Cultivation of Cardamom

Fixed cost in large cardamom cultivation

Both fixed costs and variable costs have been studied on per hectare basis. Cost incurred for irrigation equipments (water tank and pipe), agriculture equipments (sickle, elaichi- churi etc.) and the wear & tear and maintenance cost of equipments incurred for establishment of cardamom was included in the fixed costs.

Once the establishment of crop is done, it will give service for nearly ten years. Thus, apportionment of this cost per year was taken for calculation of cost of production. The apportionment of the cost was estimated by following straight line method of depreciation i.e., the total establishment cost was divided by ten. Accordingly, total apportioned establishment costs were estimated to be ₹2645.5 ha-1 per year.

Variable cost in large cardamom cultivation

While calculating the labor costs for various operations, the hired labor were taken and were converted into man-hours. The prevailing marketing wage rate in the study area was taken into consideration for computation. It was found that major operations carried out by human labor were land preparation, sowing, weeding, and manure application, mulching, harvesting and curing.

The labor cost was calculated to be ₹13,710 ha^{-1} per year for the 1st year which was recorded to be the highest, because during the 1st year the required

human labor use were more for land preparation, sowing, weeding, manure application and mulching. Replanting, harvesting and curing practices started from 3rd year onward.

The study observed that replanting is done in the 3rd, 6th and 9th year. Labor cost per hectare for each i.e. for 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th year was calculated and was found to be ₹ 4,950, ₹12,043.75, ₹6,712.5, ₹ 7,850, ₹8,268.7, ₹ 8,487.5, ₹7,862.5,₹ 9,250 and ₹8,000 ha^{-1} per year respectively.

It was calculated and remarked that the costs of materials during the 1st year is recorded to be the highest, as the cost incurred on planting material is maximum in the first year. Application of organic manure was done every alternate year at the rate of 5 tones/ hectare. Due to attack of pests & disease and losses due to natural calamities etc. replanting of the suckers were done during the 3rd, 6th and 9th year.

The total variable cost for the 1st year was evaluated to be ₹38,710 ha-1. Likewise, Total Variable Cost for the following 2nd, 3rd,4th, 5th,6th,7th,8th,9th and 10th year was calculated and found to be ₹4950, ₹22,043.75, ₹6712.54, ₹12,850, ₹ 13,268.7,₹ 13,487.5,₹ 7862.5, ₹10,250 and ₹8000 per hectare.

After the estimation of both establishment cost (fixed cost) and operation & maintenance cost (variable cost), total cost of cultivation have been calculated. It was discovered that, the per hectare total cost incurred in the 1st year (₹41,355.5) was found to be the highest followed by the 3rd year (₹24,689.25).

The total cost of cultivation is recorded to be higher in the 3rd, 5th, 6th and 9th years, reason being expenditure incurred in planting material (suckers) for replanting, labor costs incurred for operational practices, application of agricultural inputs like organic manure etc. The year wise total cost of cultivation for the consecutive 2nd, 3rd, 4th, 5th, 6th, 7th,8th, 9th and 10th years were estimated to be ₹7,595.5, ₹24,689.25,₹ 9,358.04,₹ 15,495.5,₹ 15,914.2,₹ 16,133,₹ 10,508,₹ 12,895.5 and ₹10,645.5 per hectare.

Costs and Returns

Both Gross Returns and Net Returns were estimated. A large cardamom plantation starts giving returns from 3rd year onwards. The yield was remarked to increase with age of the plantation up to the 6th year after which there showed a decline in the yield due to various reasons like attack of pests and disease, old plantations, inadequate moisture to the plants resulting in yellowing of leaves etc. The yield and net return was found to be at peak during the duration of 4th to 7th year.

During the 6th year, yield and returns was observed and calculated to be optimum i.e. ₹71,485.8 ha-1 with an average yield of ₹ 380kgs ha-1. The net returns for the 3rd, 4th, 5th, 6th, 7th,8th, 9th and 10th year were estimated to be ₹12,626.75, ₹ 58,851.96, ₹ 56,955.3, ₹ 71,485.8, ₹ 39,597.8, ₹ 36,346, ₹ 30,234.5 and ₹31,770.1 per hectare respectively. The total return and the net return in the entire economic life span of large cardamom i.e. 10 years are depicted in the table below.

Financial feasibility of investment in large cardamom cultivation

Benefit Cost Ratio (BCR)

The benefit cost ratio was computed at 7% discount rate. Institutional agencies are giving loan to this sector with an interest rate of 7 per cent per year. The estimated value of benefit-cost ratio is 3.01%, implying that the benefit is higher than the cost. This implies that cardamom cultivation is a profitable business and it is also a viable enterprise. Farmers may invest more in bigger size of cardamom plantation to have more financial advantages in future.

Table.1 Costs and Returns for entire economic life span of large cardamom (Unit: ₹/ha)

Particulars	
Total return	4,53,507.2
Total cost	1,64,589.99
Total Net Return	2,88,917.21

Table.2 Estimation of Discounted Benefit –Cost Ratio (BCR) (Cost: Rs/ha)

Year	Discounting Factor @7%	Total Cost	Discounted Total cost	Benefit	Discounted benefit	Benefit – Cost Ratio
1	0.9346	16355.5	15285.85			
2	0.8734	7595.5	6633.91			
3	0.8163	24689.25	20153.83	37316	30461.05	
4	0.7629	9358.04	7139.25	68210	52,037.40	
5	0.7130	15,495.5	11048.29	72450.8	51,657.42	
6	0.6663	15914.2	10603.63	87400	58234.62	3.01
7	0.6227	16133	10046.01	55730.8	34,703.56	
8	0.5820	10508	6115.66	46854	27269.02	
9	0.5439	12895.5	7013.86	43130	23458.40	
10	0.5083	10645.5	5411.10	42415.6	21559.84	
Total			99451.39		299381.31	

Table.3

Financial Appraisal Technique		Remarks
Benefit Cost Ratio (BCR)	3.1%	Financially viable
Net Present Value (NPV)	1,99,929.92	

Table.4 Farmers perception on constraints in production of large cardamom

Sl. No	Factor	Sum of the Scores	Mean	Rank
1	Non-availability of planting materials	3102	51.7	IV
2	High rate of suckers	4140	69	II
3	Damage due to natural calamities	1645	27.41	VII
4	Attack of pest and disease	4480	74.66	I
5	Lack of technical guidance and knowhow	3288	54.8	III
6	High cost of maintenance	2409	40.15	V
7	Scarcity of water during dry season	1671	27.85	VI
Sl. No	Factor	Sum of the Scores	Mean	Rank

Net Present Value (NPV)

Net present value (NPV) of an investment is the difference between the discounted present value of series of inflow (returns) and outflows (costs) over the economic life period of the large cardamom plantation. The Net present value (NPV) has been calculated at ₹ 1, 99,929.92 per hectare confirming that the returns are higher than the costs which reconfirms the financially viability of the large cardamom crop.

Constraints in Production of Large Cardamom

Analysis of problems associated with production of cardamom through Garrett Ranking is shown in the Table 3. Seven factors were considered in the analysis of the production problems faced by the growers. The factors were non-availability of planting materials, high rate of suckers, damage caused due to natural calamities, attack of pest and viral disease, lack of technical guidance and know-how, high cost of maintenance and scarcity of water during dry season. Out of the seven factors attack of pest and disease was the major problem expressed by highest number of respondents which caused enormous damage to the crop.
wed by high rate of suckers (II rank), lack of technical guidance and knowhow (III rank), non-availability of planting materials (IV rank), high cost of maintenance (V rank) and damage due to natural calamities (VI rank).

Large cardamom crop is significantly known for its economic importance in the hilly region of Kalimpong and Darjeeling districts. It has a huge impact on elevating the rural economy of the farm families in the region. The glory of this spice crop should continue in the future as it has great opportunities for the farming community.

Declining production of this spice crop in the region needs to be given special attention. Hence, for better production healthy, diseased free planting material should be opted at all costs. Farmers should receive more training, initiatives and subsidies which will encourage farmers to grow cardamom. There may be need for additional research into cardamom diseases, factors that influence cardamom producers and the insurance status of cardamom fields.

References

Agarwal P. K., Yadav P and Mondal S. 2018. Economic analysis cost and return structure of paddy cultivation under traditional and SRI method: A comparative study. *International Journal of Agriculture Sciences* 10 (8) 5890-5893.

Annual report 2021-2022, Spice Board of India.

Ao W, Jamir BK.2020. Application of garret ranking technique in studying the problems of bamboo cultivation: A case study of Mokokchung district. Nagaland. Indian Journal of Hill Farming 33(2) s311-315

Bisht V. K., Purohit V.,Negi G.S., Bhandari A.K. 2010.Introduction and advancement in cultivation of large cardamom (Ammomum Roxb.) in Uttarakhand, India.Research Journal of Agricultural Science 1(3):205-208

Borah. 2017. Pattern of marketing and disposal of potato in lower Brahmaputra valley zone of Assam. *International Journal of Agricultural Science and Research (IJASR)* 7(5): 219-226. https://doi.org/10.24247/ijasroct201727

Gerald Shively.2012. An Overview of Benefit-Cost Analysis

Sharma.G., Pratap U., Dahal. D.R., Sharma D.P and Sharma .E.2008.Declining large cardamom production systems in the Sikkim Himalayas. International Mountain Society (IMS)

Sharma.G., Sharma R., Sharma E. 2009. Traditional knowledge system in large cardamom farming: biophysical and management diversity in Indian mountainous region. Indian Journal of traditional knowledge. 8(1) 17-22

Singh. A.I. and Pothula A.K.2013. Postharvest processing of large cardamom in the Eastern Himalaya.

Singh R., Singh G. P., Sahu P. K and Singh A. K. 2017. A Study on Constraints in Production

and Marketing of Pulses and Suggest Suitable Policy Measures. *International Journal of Current Microbiology and Applied Sciences* 6 (8):762-768 https://doi.org/10.20546/ijcmas.2017.608.097

Spice Board of India, Annual Report 2018

Subedi, S., Ghimire, Y.N., Adhikari, S.P., Devkota, D., Shrestha, J., Poudel, H.K., & Sapkota, B.K. (2019). Adoption of certain improved varieties of wheat (Triticum aestivum L.) in seven different provinces of Nepal. Archives of Agriculture and Environmental Science, 4(4) 404-409.

Tarafder H.K., Roy .K., and Rai. B. 2018. Large cardamom production scenario in mountaineous region of West Bengal: Constrains, issues and strategies. An Asian Journal of Soil science. 13(2) 153-156