

ECONOMIC ANALYSIS ON THE PRODUCTION OF LARGE CARDAMOM IN PANCHTHAR, NEPAL

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ABSTRACT

Nepal is one of the largest producers of Large Cardamom, Amomum subulatum Roxb. in the world. This research on the production analysis of Large Cardamom was conducted in Panchthar district of Nepal. The district has 12,805 hectares of land under Large Cardamom cultivation. We selected three major Large Cardamom producing are as namely Yangwarak-5, Phidim-14 and Falgunananda-6 representing temperate, warm temperate and sub-tropical climatic regions of Panchthar, respectively. Total variable cost of production of Large Cardamom per hectare was Rs.277421, Rs.257358 and Rs. 23896 with gross returns of Rs. 382800, Rs. 313500 and Rs.156750 per hectare resulting benefit-cost ratio of Large Cardamom for first four years to be 1.37, 1.21 and 0.66 in high, mid and low altitudes, respectively signifying economic feasibility of Large Cardamom cultivation in Panchthar at higher altitude regions. We found problems of diseases, irrigation and price instability.

Keywords: Benefit-cost ratio, gross margin, large cardamom.

INTRODUCTION

Nepal is the world's top producer of Large Cardamom (*Amomum subulatum* Roxb.) (Singh and Pothula, 2013). United States International Trade Centre (ITC), 2017 reports that Nepal and Bhutan are the main producers and exporters accounting for 90% of the exported production in the world market. The annual production in Nepal has been exceeding 6,600 tons and many farmers have been motivated to cultivate Large Cardamom which will increase its production every year (Adhikari and Sigdel, 2015). The total area occupied by Large Cardamom in Nepal was 12,511 ha with the production of 6,528 tons in 2016/17 (MoAD, 2017). In Panchthar it is cultivated in almost all parts of the district which makes 5.02% of total area under Large Cardamom cultivation in Nepal concentrating largely in its northern and eastern parts at the elevations between 500 and 2000 meters above sea level. Out of total hectares of land in

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Panchthar, 88.76% is agriculturally productive area, whereas, area under Large cultivation is 34.20% (MoAD, 2015/16).

Large Cardamom is a high-value cash crop grown in 37 hilly and mountainous districts of Nepal (Bhandari and Bhandari, 2018). It is valued for its exceptional taste, flavor and aroma (Parthasarathy *et al.*, 2008). There are sixteen cultivars of Large Cardamom in the world (ANSAB, 2005). There are many local varieties that are currently cultivated by Nepalese farmers; some of those are Seremna, Bharlangey, Chibesai, Ramsai and Ramla (Shrestha *et al.*, 2018). These varieties can be grown at 400 - 2300 m above sea level. Among them six cultivars of Large Cardamom are cultivated across Nepal – Ramsey, Golsey, Sawney, Chibesey Kantidaar and Dammersey. Large Cardamom seedlings on an average start bearing fruits at the age of three and the economic life of Large Cardamom is assumed to be 10 years (Varghese, 2007).

Two viral diseases, Chirke and Foorke have adversely affected the Large Cardamom production. Being a high value crop, the production of Large Cardamom provides employment to thousands of people from farm to the market and contributes to increasing peoples' livelihoods.

OBJECTIVES

The objectives of this research were to identify the current situation of Large Cardamom production in relation to various farm based and socio-economic variables at different altitude and geographical location of Panchthar, and to analyze the economics of Large Cardamom production and marketing in Panchthar.

METHODOLOGY

All the Large Cardamom growing farmers of Panchthar district were the target population of this study. Three Large Cardamom growing areas as namely Yangwarak-5 (27.26°N 87.81°E), Phidim-14 (27.10°N 87.82°E) and Falgunananda-6 (27.04°N, 87.70°E) representing temperate, warm temperate and sub-tropical climatic regions of Panchthar district, respectively were selected in consultation with District Agriculture Development Office, Panchthar and Federation of Large Cardamom Entrepreneurs of Nepal (FLCEN), Panchthar. Total of 160 households (HH) were surveyed including 55 HH each from Yangwarak-5 and Phidim-14 and 50 HH from Falgunananda-6. They were selected randomly using simple random sampling technique.

PRELIMINARY DATA COLLECTION

Field visit was carried out to collect preliminary information of the study areas. The information regarding socio-economic condition, demographic situation and topographical setting of the target areas were gathered for further processing. During the field visit, meeting and interaction were conducted with some key persons and leader farmers.

FIELD SURVEY

After preparing final interview schedule, field visit was conducted with well oriented enumerators. The pretested structured and open ended interview schedule was then administered to collect the information from the sample households. Field survey was carried out. Respondents were interviewed at their home and data were collected in accordance with the objective of the research. This was the primary data and comprised the main research portion in the field.

FOCUS GROUP DISCUSSION

Focus group discussions (FGD) were organized in all three study areas using participatory method. Information obtained from the interview was cross checked during FGD. Key Large Cardamom growing farmers, government officials and members of FLCEN, Panchthar were invited in the discussion.

DISEASE AND INSECT

Farmers were asked about the incidence of chirke, foorke, collar rot, blight and infestation by insects. Based on farmers' experience on incidence of disease and insect each was ranked. Value 1, 0.8, 0.6, 0.4 and 0.2 was assigned to the first, second, third, fourth and fifth most problematic diseases or insect faced by the farmers. The cumulative score of each determined the overall ranking of disease and insect in the study area. Category having highest score value represent the major disease or insect in the study area.

FARMER'S PROBLEM

The major problems related to Large Cardamom cultivation include disease/insect incidence, lack of technical support, poor irrigation facility, poor market and lack of training. In this study farmers were asked to rank their problem in priority order and 1st ranked problem was assigned valued 1, 2nd ranked problem was valued 0.8, 3rd ranked problem was assigned value 0.6, 4th ranked problem as value 0.4 and 5th ranked problem as value 0.2. The total score of each category determines the major problems as ranked by first,

second, third, fourth and fifth. The first ranked category represents major problem in the study area.

SECONDARY INFORMATION

Secondary information was mainly collected from District Agriculture Development Office, Panchthar, Prime Minister Agriculture Modernization Project (PMAMP), Ministry of Agriculture Development (MOAD), and Central Bureau of Statistics. Secondary information related to Large Cardamom production performance, livelihood and other socio-economic information of country and study area was collected from various published materials and reports of different National and International organization.

STATISTICAL ANALYSIS

The data were analyzed using computer software package; STATA 12, Statistical Package for Social Science (SPSS 16 version) and Microsoft Excel 2010. Both the descriptive and inferential statistical tools were used for data analysis.

The gross margin of Large Cardamom growers in the study was calculated as:

$$\text{Gross margin} = \text{Gross return} - \text{Total variable cost}$$

$$\text{Gross return (NRS)} = \text{Cardamom sold (kg)} * \text{per unit price of Cardamom (NRS/kg)}$$

Total variable cost = Summation of all variable cost items

The B/C ratio is used to compare and contrast the profitability of cardamom cultivation (Varghese, 2007)

$$\text{Benefit-cost ratio} = \text{Gross return} / \text{Total variable cost}$$

RESULTS AND DISCUSSION

LAND HOLDING AND USE

Based on field survey, we found that 76.72% land in Yangwarak-5, 44.53% land in Phidim-14 and 18.77% land in Falgunananda-6 were under Large Cardamom cultivation (Table 1). There were some areas unused due to geographical and technical barrier in the study areas. Most of the farmers were cultivating Large Cardamom in small scale.

During FGD we learnt that the farmers had decreased Large Cardamom cultivation area in recent years due to disease and pest infestation in Phidim-14 and Falgunananda-6. In Yangwarak-5 farmers generally grow vegetables, kiwi, citrus, cereals, potato, ginger, millet, mustard etc. Similarly, in Phidim-14 farmers grow potato and vegetables in their fields. The farmers of Falgunananda-6 grow rice, maize, millet, etc.

Wide ranges of crops were grown in Yangwarak-5 as compared to Phidim-14 and Falgunananda-6 because of comparative advantage of Yangwarak-5 and availability of better irrigation option there.

Table 1: Land holding and use

Study area	Total land area (hectare)	Area under cardamom (hectare)	Area for other enterprise
Yangwarak-5	164.1	125.9 (76.72%)	28.7 (17.48)
Phidim-14	81.5	36.3 (44.53%)	38.75 (47.54%)
Falgunananda-6	78.55	14.6 (18.77%)	63.3 (80.58%)

DISEASE AND INSECT INCIDENCE

We found that all the farmers faced problem of various diseases and insects and suffered heavy losses in the past. Diseases like chirke, foorke, collar rot and bacterial blight and insects like mites, borer and caterpillar are common problems in Large Cardamom. Five major diseases and pest in the Large Cardamom farming were mentioned in an earlier report (Yadav, 2013). We found that in Yangwarak-5 and Phidim-14 collar rot was major problem followed by foorke and chirke. We also found that in those areas insect infestation and bacterial blight was 4th and 5th major problems, respectively. There was huge damage due to collar rot five years ago in Phidim-14 which is the main reason for low area coverage by Large Cardamom today. Similarly, in Falgunananda-6 major problem was bacterial blight followed by foorke and collar rot. Chirke was not serious in this area as compared to other areas. Large Cardamom was heavily damaged by bacterial blight few years ago in Falgunananda-6 (Table 2).

Table 2: Farmers' experience on disease and pest incidence indicated by ranked value

Study area	Chirke	Foorke	Collar rot	Blight	Insects
Yangwarak-5	0.56 (III)	0.87(II)	0.88(I)	0.2 (V)	0.48 (IV)
Phidim-14	0.56 (III)	0.76(II)	0.98 (I)	0.2 (V)	0.47 (IV)
Falgunanada-6	0.2 (V)	0.85 (II)	0.65 (III)	0.86 (I)	0.43(IV)

The roman numbers inside parenthesis (I), (II), (III), (IV) and (V) in Table 2 represent first, second, third, fourth and fifth rank of the problems, respectively in the study areas.

AVERAGE VARIABLE COST OF PRODUCTION OF CARDAMOM

The average variable cost of Large Cardamom cultivation per hectare of land is presented in Table 3. We found that in the first year for land preparation Rs. 30240, Rs. 26435 and Rs. 24320 were incurred in Yangwarak-5, Phidim-14 and Falgunananda-6, respectively. About 6000 seedlings were required per hectare with the price of each seedling Rs.7. Thus, cost of seedling per hectare was Rs. 42000. We found that Rs.41345, Rs.36036 and Rs.36320 were incurred in Yangwarak-5, Phidim-14 and Falgunananda-6, respectively on the purchase of seedling.

From FGD we learnt that on average 30 laborers are required per hectare for plantation of Large Cardamom seedling. Thus, cost of plantation is on average Rs.15000 as labor charge per day is Rs.500. We found that Rs.14550, Rs.13430 and Rs.13240 were incurred for plantation in study areas.

The Large Cardamom farmers of all three study areas don't use any chemical fertilizers instead they depend upon compost and Farm yard manure (FYM). Farmers incurred Rs.15000, Rs.15400 and Rs.13500 in Yangwarak-5, Phidim-14 and Falgunananda-6 respectively for irrigation and compost in first year of plantation. The cost varies in all three areas because of different rates of compost and different levels of accessibility of irrigation in all three areas.

Similarly, in the second and the third years, various costs were incurred in intercultural operation, irrigation and compost (Table 3). Harvesting is done only after the third year of plantation using sickles manually and Rs.30000, Rs.28560 and Rs.25567 were spent in Yangwarak-5, Phidim-14 and Falgunananda-6, respectively on harvesting. Generally, 160 laborers are required for harvesting Large Cardamom per hectare.

After harvesting, the Large Cardamom is separated from the clump and then subjected to drying over fire. Drying is done over oven in which heat is generated by burning firewood. Both traditional type and modern type ovens were found used in the study areas. Farmers using modern type of oven were 4%, 1% and 1% at Yangwarak-5, Phidim-14 and Falgunananda-6, respectively.

One laborer and firewood worth Rs.2000 are required to dry Large Cardamom in each lot. We found that Rs.15468, Rs.14352 and Rs.12320 were spent on drying and processing purposes. After proper drying, tail (calyx) removing operation is done by rubbing against rough surface and later processed Large Cardamom is transported to local market and sold to wholesalers. Generally, transportation is done on pick-up or tractor and cost incurred in marketing varies from place to place as Rs.13818, Rs.10940 and Rs. 17600 in Yangwarak-5, Phidim-14 and

Falgunananda-6 including local taxes. We found that farmers had to pay Rs.5/kg to transport Large Cardamom from site of production to district headquarter. While marketing to other districts there is provision of tax of Rs.2/kg on keeping it for more than 24 hours in district border. Thus, unit cost of marketing is increased by Rs.7/kg on trading outside the district. Average variable cost of production of Large Cardamom per hectare excluding the rent of land and depreciation on fixed cost was Rs.277421, Rs. 257358 and Rs. 238967 in Yangwarak-5, Phidim-14 and Falgunananda-6, respectively.

Table 3: Average variable cost of production

Activities	Yangwarak-5	Phidim-14	Falgunananda-6
First year			
Land preparation	30240	26435	24320
Seedling	41345	36036	36320
Labor for plantation	14550	13430	13240
Compost and Irrigation	15000	15400	13500
Intercultural operation	18000	16500	13900
Second year			
Irrigation and Compost	15000	15400	13500
Intercultural operation	18000	16500	13900
Third year			
Irrigation and compost	15000	15400	13500
Intercultural operation	18000	16500	13900
Fourth year			
Irrigation and compost	15000	15400	13500
Intercultural operation	18000	16500	13900
Harvesting	30000	28560	25567
Drying and processing	15468	14352	12320
Marketing	13818	10945	17600
Total	277421	257358	238967

AVERAGE PRODUCTION PER HECTARE

We found that 232 kg in Yangwarak-5, 190 kg in Phidim-14 and 95kg Large Cardamom in Falgunananda-6 were produced per hectare (Figure1). The yield ranged from 60kg to 362.2kg per hectare in Sankhuwasabha (Yadav, 2013). The average production per hectare of Large Cardamom in Tehrathum was 232 kg/ha (Bhandari and Bhandari, 2018). Also these data were cross checked through focus group discussion in study areas. The difference could be due to differences

in size of plantation area, varieties, age of the plants, climatic conditions, and method of plantation or incidence of diseases and pests. The management and weather condition of Yangwarak-5 is the reason for its highest production and incidence of diseases, lack of irrigation facilities and lack of technical know how and service are the reasons for low production in Phidim-14 and Falgunananda-6.

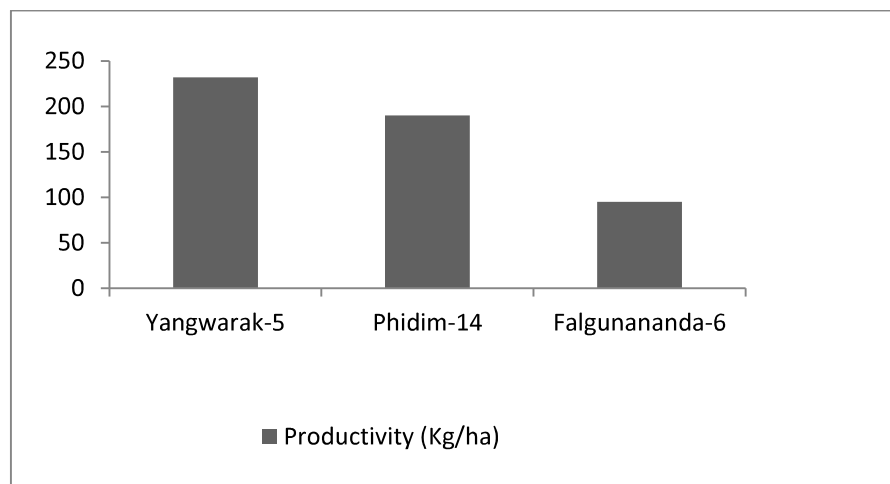


Figure 1. Average annual production per hectare

AVERAGE PRICE OF LARGE CARDAMOM

Farmers generally sell their product either in local market or to broker or to wholesalers. We found that the price of Large Cardamom was highly elastic in past few years. Farmers experienced price fluctuation as Rs. 2800, Rs. 2000, Rs. 1600, Rs. 1050 and Rs. Rs.800 per kg in last 5-year period. Considering the prices of last 5 years we found the average price Rs.1650 per kg received by the farmers. Price changes are due to demand and supply factors in Indian market, lack of certification of Nepalese Large Cardamom and poor marketing strategy.

GROSS MARGIN

In the study areas we found that higher altitude is better for Large Cardamom cultivation as Yangwarak-5 has profit of Rs. 105379 per hectare whereas Phidim-14 has profit of only Rs. 56142 per hectare and Falgunananda-6 bears loss of Rs.82817 per hectare (Table 4). In Falgunananda-6 farmers are in loss in this enterprise so most of the farmers are shifting from Large Cardamom farming to other crops. As the altitude decreases coupled with poor management, Large Cardamom cultivation becomes less profitable. Thus, in lower altitude region, vegetables cultivation and livestock rearing would be better options. We also found that 7.59 % of households' annual income ranged from Rs. 120000-240000

while 16.45 percent of HH annual income from Large Cardamom cultivation ranged just from Rs.2500 to 9750, which shows the variation in earnings from Large Cardamom cultivation.

Table 4: Gross margin per hectare

Study area	Total variable cost	Gross return	Gross margin
Yangwarak-5	277421	382800	105379
Phidim-14	257358	313500	56142
Falgunananda-6	238967	156750	-82817
Total	773746	853050	79304

BENEFIT COST RATIO OF LARGE CARDAMOM IN PANCHTHAR

The B:C of Yangwarak-5, Phidim-14 and Falgunananda-6 were found to be 1.37, 1.21 and 0.66, respectively and overall B:C of Panchthar was estimated to be 1.01 (Table 5). B:C was two in Tehrathum district of Nepal (Bhandari and Bhandari, 2018). This implies that Large Cardamom cultivation is profitable enterprise in high and mid hills of Panchthar too.

Table 5: The B:C ratio of cardamom cultivation in Panchthar

Study area	B :C
Yangwarak-5	1.37
Phidim-14	1.21
Falgunanda-6	0.66
Panchthar (Estimated)	1.01

MARKETING CHANNEL USED BY LARGE CARDAMOM GROWERS

We found that farmers either sell their product to broker or in local market and some of them sell to wholesaler. From the local markets and brokers the products are sold to wholesalers and finally to trading center at Birtamod and later exported to India and other countries (Figure 3). The local market of Yangwarak-5, Phidim-14 and Falgunananda-6 are Phidim, Pauwabhanjan and Ranijung, respectively.

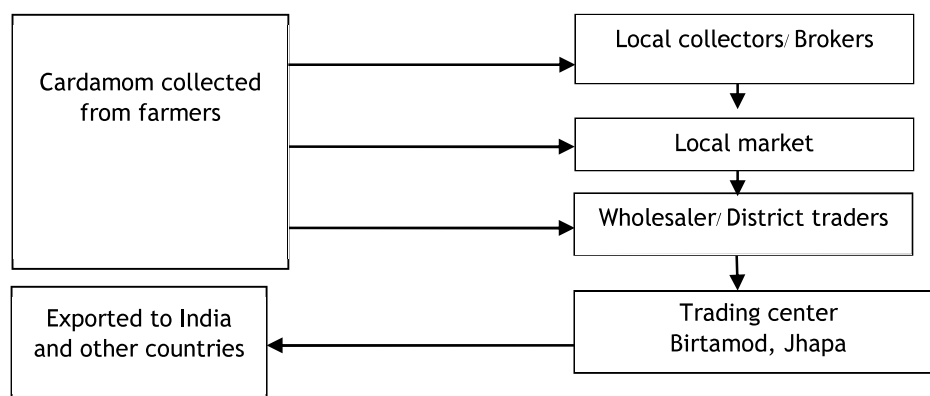


Figure 2. Marketing channel of Large Cardamom

PRICE FIXATION OF LARGE CARDAMOM

Price of Large Cardamom is very elastic in nature. Farmers have great problem of price fixation. They have received maximum of Rs.2800/kg and minimum of Rs.800/kg. Farmers informed us that the Large Cardamom producers have no control on price. In most of cases brokers fix the price and in some cases business committee fix the price and some farmers said that some other stakeholders fix the price (Table 6). Generally, variation in Nepalese Large Cardamom price is due to Indian Large Cardamom demand and supply.

Table6: The role of stakeholders (%) on the price fixation of Large Cardamom

Study area	Large Cardamom producer	Broker	Business committee	Others
Yangwarak-5	0	20 (36.4%)	18(32.7%)	17(30.9%)
Phidim-14	0	34(61.8%)	14(25.5%)	7(12.7%)
Falgunananda-6	0	30(60%)	18(36%)	2(4%)

TRAINING ON LARGE CARDAMOM CULTIVATION

Training on Large Cardamom cultivation for effective technology transfer and adaptation is an important method to improve the production and quality assurance. Farmers of research site hadn't received any training related to Large Cardamom cultivation from DADO, Panchthar whereas it was found that Cardamom super zone, PMAMP, Panchthar had organized a 3 days training to farmers of Yangwarak-5 and some local Cooperative had also organized similar type of trainings in the past and only 58 % farmers of Yangwarak-5 were found to be trained related to Large Cardamom cultivation (Table 7). There is need

of training on the improved method of Large Cardamom production and processing in the study areas.

Table7: Training on Large Cardamom cultivation

Study area	Training received	No training
Yangwarak-5	32(58.2%)	23(41.8%)
Phidim-14	0	55(100%)
Falgunananda-6	0	50(100%)

FARMERS' PROBLEM RANKING AS RANKED VALUE

In the study we found that disease and pest infestation were major problems of Yangwarak-5 and Phidim-14, whereas lack of irrigation facility was major problem of Falgunananda-6 and lack of irrigation facility was second major problem of Yangwarak-5 and Phidim-14. Similarly, proper market was third major problem of all three areas and lack of technical services was fourth and lack of training was the fifth problem of the study areas (Table 8).

Table8: Farmer's problem ranking as ranked value

Study area	Disease/ pest	Technical support	Irrigation	market	Lack of training
Yangwarak-5	0.95(I)	0.51 (IV)	0.75 (II)	0.52 (III)	0.25 (V)
Phidim-14	0.90 (I)	0.50 (IV)	0.72 (II)	0.56 (III)	0.21 (V)
Falgunananda-6	0.85 (II)	0.47(IV)	0.91 (I)	0.56 (III)	0.2 (V)

The roman numbers inside parenthesis (I), (II), (III), (IV) and (V) in Table 8 represent first, second, third, fourth and fifth rank of the problems, respectively in the study areas.

CONCLUSION

The research was conducted with the aim of determining the production aspects, marketing strategies and challenges in the cultivation of Large Cardamom in Panchthar. We found that there is a great production potential in the higher altitude areas and could be exported in larger quantity as per the increasing international demand of the Nepalese Large Cardamom world wide. Large Cardamom farming can be the major source of earning foreign currencies in higher altitude areas of Panchthar like in other eastern hilly regions of Nepal. The benefit-cost ratio of Large Cardamom at higher altitude is high which helps to improve the economic status of rural people of eastern hills. The existing problems related to this enterprise are diseases, price instability and lack of technical support. Both the eighth and ninth five year plans have declared Large Cardamom as one of the major agro-commercials for the economic

development of the Nepal. Realizing the market potential of this cash crop, the farmers across the country are adopting the cultivation. There is need for organizing frequent trainings to the farmers for efficient technology transfer for Large Cardamom cultivation, value addition to the products and marketing for reaping the benefits of their hard work.

REFERENCES

- Adhikari, P. P., and Sigdel, K., 2015. Activities of cardamom development center and DoA in Large Cardamom development. Nepal Agriculture Research Council Publication serial no. 00225-135/2014/015, Nepal Agriculture Research Council, Nepal.
- ANSAB, 2005. Market information system for NTFP/HVC. Asia Network for Sustainable Agriculture and Bioresources, Kathmandu, Nepal.
- Bhandari, N. and Bhandari, T., 2018. Marketing and socio-economics of Large Cardamom production in Tehrathum, Nepal. Nepal Agriculture Research Council 4: 81-84.
- MoAD, 2015/16. Statistical Information on Nepalese Agriculture 2015-16. Agri-Business Promotion and Statistical Division, Kathmandu, Nepal.
- MoAD, 2016/17. Krishi Diary. Agriculture Information and Communication Center, Harihar Bhawan, Lalitpur.
- Parthasarathy, V.A., Chempakam, B. and Zachariah, T.J., 2008. Chemistry of Spices. Wallingford, United Kingdom: CAB International, pp 60-69.
- Shrestha, J., Prasai, H. K., Timsina, K. P., Shrestha, K. P., Pokheral, D., Poudel, K. and Yadav, M., 2018. Large Cardamom in Nepal: Production practice and economics, processing and marketing: National Commercial Agriculture Research Program, Nepal Agriculture Research Council, Nepal.
- Singh, A.I. and Pothula, A.K., 2013. Postharvest processing of Large Cardamom in the Eastern Himalaya. Mountain Research and Development 33: 453-462.
- United States International Trade Centre (ITC), 2017. Nepal National Sector export strategy of Large Cardamom 2017- 2021. <http://www.moc.gov.np>.
- Varghese, P. K., 2007. Economics of Large Cardamom Cultivation in Kerala. Indian Journal of Agricultural Economics 62: 1-14.
- Yadav, S., 2013. Cardamom cultivation, its effect in rural livelihoods and its importance in international market. Msc thesis, University I Norland.