

Research Article

Value chain analysis of Large Cardamom (*Amomum subulatum* Roxburg) in Bhojpur, Nepal

Dharmendra Kalauni^{1*} and Arati Joshi¹

¹Faculty of Agriculture, Agriculture and Forestry University, Rampur, Chitwan, Nepal

*Correspondence: kalauni.dharmendra@gmail.com ; ORCID: <https://orcid.org/0000-0001-8443-0101>

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ABSTRACT

Large Cardamom is a high value spice crop having substantial export potential. The study was conducted on Feb-May, 2019 in Arun rural municipality, Bhojpur municipality and Sadananda municipality with an objective to analyze existing value chain of Large Cardamom in Bhojpur district of Nepal. In total, 150 Large Cardamom growers were selected using purposive sampling technique. In addition to that, 17 traders from the Bhojpur, Khadbari and Birtamod were also selected for the study. Findings showed that farmers were interested in Large Cardamom industry due to good return and high profit margin per unit of commodity. The benefit-cost ratio was found higher in Arun village municipality (1.735), followed by Sadananda municipality (1.467) and Bhojpur municipality (1.263). Increasing disease and pest attack and low seasonal price are the major problem in production and marketing of Large Cardamom respectively. Harvested capsules of Large Cardamom were dried using traditional drier (bhatti) that make the dried capsules prone to quality degradation. Value addition practices such as grading, tail cutting were found poor in farmer level. Producer's share and marketing efficiency were found highest when farmers sell their product directly to exporter and lowest in domestic market channel. Demand and supply of Large Cardamom in Indian market was most determining factor for price fixation of Nepalese Large Cardamom. Thus from the study it is recommended to improve production process through appropriate mechanization, along with possible efforts in identification of potential international markets and possible ways for direct export to third countries which could help farmers to receive higher price.

Keywords: Large Cardamom, Production, Marketing, Price, Problems, Producer's share

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INTRODUCTION

Nepal has a total population of 26,494,504 with the population growth rate of 1.35% (CBS, 2018). Majority of the people (65.6%) are engaged in agriculture which provides food, income, and employment thus acting as the mainstay of their livelihood (GoN, 2018). In the country, production of 43 major agricultural commodities account for greater than 95% of agriculture gross domestic product (AGDP) and 60% of agricultural exports. Among those agricultural commodities, Large Cardamom is second most exported commodity that contributes 7% of total agriculture export (ADS, 2014).

Large Cardamom (*Amomum subulatum* Roxburg) is an export oriented high value spice crops, grown commonly in the mid-hill districts of eastern Nepal (Bhattarai *et al*, 2013). In the global market Nepal is also recognized as the leading producer and exporter of Large Cardamom (MoAD, 2015). However there is no consistency in production and export. Productivity of Large Cardamom in Nepal is 500kg/ha which is far below to average yield (Yadav *et al*, 2015). The total area under Large Cardamom cultivation is estimated to be about 17,002 ha in the country. Of the total area, only 12,805 ha are under productive stage and produced some 6521 tons with the productivity of 521 kg/ha in 2016/17. The area under LC plantation is growing slowly and steadily during last few years (MoALMC 2017; Shrestha and Shrestha, 2018; Shrestha *et al*, 2018a). Nepal is the largest producer of LC in the world, supplying over 50% of the world's market demand (Shrestha, 2018a; Kaini, 2018; Shrestha *et al*, 2018b). Singh and Pothula (2013) reported that about 84% of the cardamom harvest comes from the eastern region, including Ilam, Taplejung, Sankhuwasabha, Dhankuta, Bhojpur, Tehrathum, and Panchthar districts.

ITC (2017) reported that about 67,000 families are directly and indirectly involved in production of Large Cardamom. Due to comparative higher returns from the Large Cardamom, farmers are motivated and increase their efforts with expenses in term more labor, pesticides, etc. In the meantime, uncertain decline in price of Large Cardamom at the time marketing is becoming most disappointing factor for producer. Negative roles played by market agents to obtain lion's share in marketing of Large Cardamom has further deteriorated the situation (MoAD, 2015).

In this scenario research was designed to study different components of Large Cardamom industry such as input supply, production process, marketing and trade of Large Cardamom. Based on quantitative and qualitative information about trade flow, regulatory mechanism, roles and relationships among input suppliers, actors, and enablers value chain mapping is done. Therefore, study answers following research questions:

- What is the input supply situation in the Large Cardamom industry?
- How are the production process operated and what are the problems associated with production and marketing of Large Cardamom?
- How many different types of market channels exist and what is the producer's share, marketing efficiency in each market channels?
- What is the contribution of Large Cardamom in annual household income and total farm income?

- What are the possible factors behind the price determination of Nepalese Large Cardamom?

METHODOLOGY

Study Site

The site selected for the study were Arun rural Municipality (ward no. 02), Sadananda Municipality (ward no. 13 & 10), and Bhojpur Municipality (wards no. 04, 08, & 09) of Bhojpur district. District was selected since it had long history of growing Large Cardamom and also recognized as origin place of Dammersai cultivar (cultivar that is believed as originated in Nepal). All the study sites were located within command area of the Prime Minister Agriculture Modernization Project (PM-AMP), Project Implementation Unit (PIU), Cardamom Zone, Bhojpur. These municipalities were selected for the study because they are the major cardamom growing domain and had major contribution in total production of Large Cardamom in the district.

Sample and Sampling Technique

A list of Large Cardamom growing farmers from each research site was prepared separately, which was provided by Prime Minister Agriculture Modernization Project (PM-AMP), Project Implementation Unit (PIU), Cardamom zone, Bhojpur. A total of 150 respondents (Large Cardamom producer) were selected from Bhojpur district using purposive sampling technique (based on researcher's experience and knowledge). Additionally, 17 traders that include 5 traders from Bhojpur, 2 traders from Khadbari, 5 traders from Dhankuta and remaining 5 from Jhapa were interviewed for value chain mapping.

Research instruments/design

Primary data were obtained from scheduled interview. Based on the semi-structured questionnaire and checklist, questions were asked to individual household representative to obtain required information. Key informant interviews (KIIs) were carried out with leader farmers, traders and other concerned stakeholders to assess additional information about Large Cardamom production and trade. Three focus group discussions (FGDs) were held with people of similar interest for triangulation of obtained data through schedule interview. Large Cardamom producers were the major sources of primary data. Secondary information were collected from journals articles and departmental reports of Federation of Large Cardamom Entrepreneur Associations of Nepal (FLCEAN), International Centre for Integrated Mountain Development (ICIMOD), Ministry of Agriculture and Livestock Development (MoALD), Food and Agriculture Organization (FAO), Agribusiness Promotion and Marketing Development Directorate and Central Bureau of Statistics (CBS).

Data Analysis

Information collected from the field survey and secondary sources were coded and tabulated on Statistical Package for Social Science (SPSS) and Microsoft Excel. Analysis was done through SPSS, and MS- Excel. Descriptive statistics such as frequencies and percentage were calculated. ANOVA and Chi-square test were also used as means of inferential statistics.

Benefit cost analysis was estimated using the total cost of production (total fixed cost + total variable cost) of Large Cardamom and gross return from Large Cardamom production.

Mathematical expression for B: C ratio:

$$B: C \text{ ratio} = \text{Total return} / \text{Total cost}$$

For the analysis of gross margin, only the variable costs were considered. Gross margin was estimated as the difference between total return and variable cost involved in Large Cardamom production:

Mathematical expression for gross margin:

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

Where,

Gross return (NPR) = Price of cardamom (NPR per kg) × Total quantity produced (Kg) and

Total variable cost (NPR) = Summation of cost incurred in all the variable items (NPR)

Marketing cost, marketing margins, producer share and index of marketing efficiency were estimated as mentioned below:

$$\text{Producer Share (PS)} = \{ \text{Producer price (Pf)} / \text{Retailer's Price (Pr)} \} \times 100$$

Where,

Ps = Producer's share (%),

Pf = Producer's price (NPR) and,

Pr = Retailer's price (NPR)

Total Marketing Cost (MC) = Cost of (Weighing+Packing+Loading) +Transportation tax + other associated tax

Total Marketing Margin (MM) = Retailer's sale price-net price received by producer - marketing cost

Acharya's Index of marketing efficiency = [Retailer's price/ (Marketing cost + Marketing margin)] – 1 (Rane & Deorukhkar, 2007)

Indexing

Production and market related problems were ranked with the use of index. Scaling techniques, which provides the direction and extremity attitude of the respondent towards any preposition was used to construct index. The intensity of production and marketing problems being faced by the cardamom producers and traders, respectively were identified by using five-point scaling technique comparing most serious, serious, moderate and least serious at all using scores of 1.00, 0.80, 0.6, 0.4, and 0.2 respectively. The formula given below was used to find the index for the intensity of production and marketing problems faced by producers and traders respectively.

Mathematical Expression,

$$I \text{ prob} = \Sigma (Sifi/N)$$

Where,

I prob = Index value for an intensity of problem

Σ = Index value for an intensity of problem

Si = Scale value of ith intensity

fi = Frequency of ith response

N = Total number of respondents

Subedi *et al.* (2019a) used the scaling technique to identify the constraints associated with the potato production in Terai region of Nepal. This above formula was also applied by Shrestha and Shrestha (2017) to rank the problems associated with maize seed production. Subedi *et al.* (2019b) used this technique to explore the problems associated with wheat production.

RESULTS AND DISCUSSION

Socio- demographic characteristics of Large Cardamom grower

Study areas were dominated by ethnic group *Aadibasi/Janajati* (72%), followed by *Brahmin* (16%) and *Chhetri* (12%). Mean age of the respondents were found 47.49 ± 11.71 . None of the respondents had Pakki house (house with RCC or PCC floor/walls) which means all of them had Kacchi (stone, wood and mud mixed) house type. Majority of the respondents (87.3%) had agriculture as their primary occupation. While only 12% had government service and remaining 0.7% had business as primary occupation. Table 1 shows all other detailed information on socio-demographic characteristics.

Table 1. Socio-demographic characteristics of respondents

Variables	Category	Arun rural municipality (n=50)	Bhojpur Municipality (n=50)	Sadananda Municipality (n=50)	Full sample (N=150)	Chi-square
Gender	Male	35 (23.3)	37 (24.7)	33 (22)	105 (70)	0.762
	Female	15 (10)	13 (8.7)	17 (11.3)	45 (30)	
Education	Illiterate	5 (3.3)	6(4)	18(12)	29 (19.3)	54.45***
	Primary level	11(7.3)	16(10.7)	23 (15.3)	50(33.3)	
	Secondary	24(16)	15(10)	7(4.7)	46(30.7)	
	Higher secondary	10(6.7)	2(1.3)	1(0.7)	13(8.7)	
	Bachelor	0(0)	9(6)	1(0.7)	10(6.7)	
	Above	0(0)	2(1.3)	0(0)	2(1.3)	
Ethnicity	<i>Brahmin</i>	15(10)	8(5.3)	1(0.7)	24(16)	56.97***
	<i>Chhetri</i>	0(0)	18(12)	0(0)	18(12)	
	<i>Aadibasi</i>	35(23.3)	24(16)	49(32.7)	108(72)	
House type	Kacchi	50(33.3)	50(33.3)	50(33.3)	150(100)	
	Pakki	0(0)	0(0)	0(0)	0(0)	

Note: *** indicates significant difference at 1% level of significance and figures in parenthesis indicate percent
Source: Field Survey, 2019

Characteristics of Large Cardamom growers

Among the respondents, the average number of the active member involved in the Large Cardamom production was 2.38 and average number of years of experience in cardamom farming was 9.20 years. However, both variables were found higher in Arun rural municipality compared to other study area and are statistically significant at 5% and 1% level of significance as shown in Table 2. The average area under Large Cardamom cultivation was 12.61 ropani (20ropani =1 hectare) and area under Large Cardamom among three study site were statistically at par. The average annual production of Large Cardamom was 129.88 kg, which was higher and similar in Arun rural municipality (149.0 kg) and Sadananda municipality (168.70 kg) than Bhojpur municipality (71.9 kg) and statistically it is significant at 1% level of significance. Greater production in first two sites was mainly due to more

favorable land, good irrigation status and use of appropriate variety. Farmers of Arun rural municipality had adopted Dammersai cultivar ('Golsai' in some places) of Large Cardamom which was widely known for large sized capsule than other cultivar. Due to which it also fetched higher price. Average price per mon was 24471, which was higher and similar in Arun (NPR 26620) and Sadananda (NPR 24730) compared to Bhojpur (NPR 22064) and it is statistically significant at 1% level of significance.

Table 2. Characteristic of Large Cardamom growers in study area

Variable	Arun rural municipality (n=50)	Bhojpur municipality (n=50)	Sadananda municipality (n=50)	Overall (N=150)	F-test
Number of active member involved in Large Cardamom production	2.66 ^a	2.30 ^b	2.18 ^b	2.38	4.448**
Experience in cardamom farming (Years)	12.82 ^a	6.78 ^b	8.02 ^b	9.20	20.657***
Area under Large Cardamom cultivation (Ropani ¹)	12.24	12.02	13.56	12.61	0.350
Altitude (masl)	1228.50 ^b	1228.0 ^b	1420.38 ^a	1292.29	38.150***
Orchard establishment year (B.S.)	2056.8 ^b	2067.18 ^a	2066.12 ^a	2063.36	24.676***
Annual production of Large Cardamom (Kg)	149.00 ^a	71.96 ^b	168.70 ^a	129.88	10.311***
Price per mon ² (NPR)	26620 ^a	22064 ^b	24730 ^a	24471	7.119***

Note: *** & ** indicates significant difference at 1% & 5% level of significance

Household Income

Contribution of the total farm income was more than total off-farm income in total annual household income.

Table 3. Contribution of Large Cardamom to annual household income

S.N	Sources of income	Total average income (NPR)	Share on total household income (%)
1	Large Cardamom	85,080	42.93
2	Major Cereal crops	2,113.33	1.07
3	Vegetables	4,866.67	2.46
4	Fruits	933.33	0.47
5	Live animal sell	12,766.67	6.44
6	Milk and milk product sell	3,493.33	1.76
7	Service	44,486.67	22.45
8	Own Business	1,160	0.59
9	Off-Farm Wages	66.67	0.03
10	Remittance	43,200	21.80
Total Income		198,166.67	100.00
Total off-farm Income		88,913.33	44.87
Total Farm Income		109,253.33	55.13

Source: Field Survey, 2019

¹ 20 Ropani = 1 hectare

² 1mon = 40 kg

Similarly, contribution of Large Cardamom in total household income was highest (42.93%) among all kinds of farm and off-farm sources of income as shown in Table 3.

Large Cardamom cultivation

Source of seedling (Input supply)

Seedlings brought from other place are prone to transmission of disease and pest with them. So, source of seedling became important aspects of healthy orchard establishment. Most of the respondents (81.30%) in the study area reported that village nursery (other farmer’s field) was major source of Large Cardamom seedling. Only 14.70% had their own nursery and remaining 4% mentioned JT/JTA including DADO as source of their seedling as shown in the Figure 1

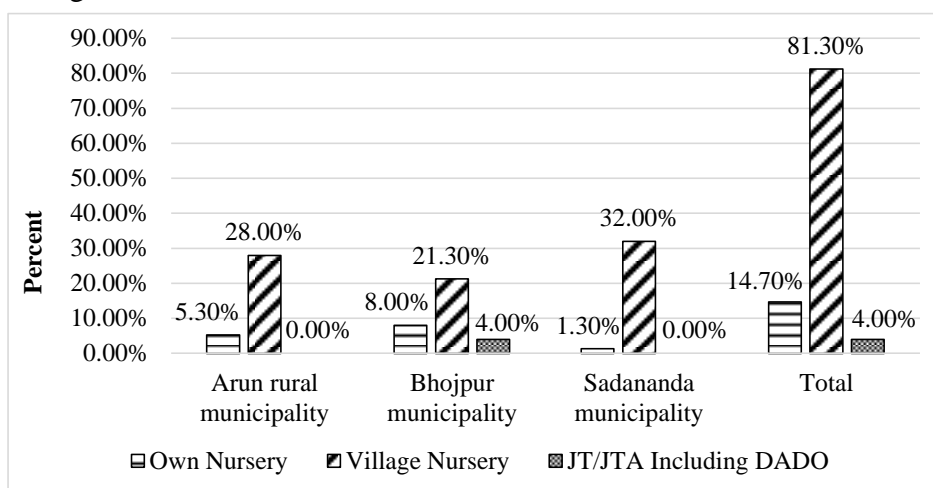


Figure 1. Source of seedling across the study site

Source: Field Survey, 2019

Area under Large Cardamom cultivation

ADS (2014) mentioned that rural population could be classified into three groups: 1. Small commercial farmers (with 1 to 5 ha of land) 2. Subsistence farmers (with 0.5 to 1 ha of land) 3. Landless and near landless (less than 0.25 ha). This information was taken as reference to categorize the land holding of respondents. Most of respondents (42.67%) fall in the category of landless or near landless. About 36.6% of the respondents were subsistence farmer and 20.67% were small commercial farmers. It was concluded from study that most of the Large Cardamom grown area was scattered since it belong to large number of small landholding Large Cardamom farmers (>4.9 ropani and 9.8-19.6 ropani).

Table 4. Area under Large Cardamom in the study site

Variable	Category	Arun rural municipality (n=50)	Bhojpur Municipality (n=50)	Sadananda Municipality (n=50)	Total (N=150)
Area under Large Cardamom cultivation	>4.9 ropani (>0.25ha)	16 (10.7)	30 (20)	18 (12)	64 (42.67)
	9.8-19.6 ropani (0.5-1ha)	26 (17.3)	11 (7.3)	18 (12)	55 (36.67)
	19.6-98 ropani (1-5ha)	8 (5.3)	9 (6)	14 (9.3)	31 (20.67)

Source: Field Survey, 2019,

Note: Figures in parentheses indicate percent

Altitude

Majority (70%) of the Large Cardamom orchards were at an altitude range of 1000-1400 meter above sea level (masl). Similarly, 24.7% of the orchards were located at range of 1400-1800 masl and remaining 5.3% orchards are located at altitude range of 600-1000 masl as shown in Table 5. Altitude was found to be one of the most important factors to be considered while selecting the cultivar of Large Cardamom. Shrestha et al. (2018) also reported that cultivars are more susceptible to viral diseases like *foorkey* and *chirke* especially if planted at lower altitudes due to high movement of vector (aphid).

Table 1: Altitude of orchard among the sampled respondent in the study site

Altitude in MASL	Arun rural municipality (n=50)	Bhojpur municipality (n=50)	Sadananda municipality (n=50)	Total (N=150)
600-1000masl	0 (0%)	8 (5.3%)	0 (0%)	8 (5.3%)
1000-1400masl	50 (33.3%)	35 (23.3%)	20 (13.3%)	105 (70%)
1400-1800masl	0 (0%)	7 (4.7%)	30 (20%)	37 (24.7%)

Source: Field Survey, 2019

Note: Figures in parentheses indicate percent

Variety Cultivated

Chibesai, Dambersai Golsai, Ramsai, and Jirmale were the five different types of the Large Cardamom variety grown in the study area. Most of the respondents were found growing Ramsai (37.3%), variety followed by Dammersai (23.3%), Golsai (5.3%), Jirmale (4%), and Chibesai (2.7%) as shown in Table 6.

Table 2. Variety cultivated among the sampled populations

S.N.	Type of variety cultivated	Frequency	Percent
1	Chibesai	4	2.7
2	Dambersai	35	23.3
3	Dambersai, Golsai	16	10.7
4	Dambersai, Golsai, Ramsai	3	2.0
5	Dambersai, Jirmale	2	1.3
6	Golsai	8	5.3
7	Jirmale	6	4.0
8	Ramsai	56	37.3
9	Ramsai , Chibesai	4	2.7
10	Ramsai , Dambersai	3	2.0
11	Ramsai , Golsai	5	3.3
12	Ramsai , Jirmale	8	5.3
Total		150	100.0

Source: Field Survey, 2019 ,

Note: Figures in parentheses indicate percent

Shade Tree

Large Cardamom was reported to grown well under shade so called shade loving plant (Timilsina & Paudel, 2016). Exposure to direct sunlight during the day was very harmful because it results sunburn on leaves and significantly reduces the content of soil moisture. So, proper management of the shade was considered key to maintaining yield for optimum productivity. In the study area majority of respondents were found growing Alder or Utis (*Alnus nepalensis*) as a shade tree.

Table 3: Different types of the shade tree grown in Large Cardamom orchard in the study site

Different type of Shade Tree	Frequency	Percent
Open field condition (Without shade tree)	3	2.0
Utis	87	58.0
Utis, Open field condition (Without shade tree)	37	24.67
Utis, Chilaune	8	5.3
Utis, Rudrakshya	3	2.0
Utis, Patle	6	4.0
Utis, Baas	2	1.3
Utis, Shiris	2	0.7
Utis, Patle, Chelaune	1	0.7
Utis, Saaj,	1	0.7
Total	150	100.0

Source: Field Survey, 2019,

Note: Figures in parentheses indicate percent

But farmers complained that, while using Alder as shade tree they are experiencing increased incidence of Aphid in the Large Cardamom orchard. So, they expressed the need of research to identify even more suitable multipurpose tree which could be more beneficial to grow as shade tree in Large Cardamom orchard. About 2% of the respondents were found growing Large Cardamom in open field without any shade tree. Similarly other trees such as Siris, Saaj, Rudrakshya were also found grown with Utis as shown in the Table 7.

Factor encouraging Large Cardamom production

Ranking of the different factors influencing production of Large Cardamom revealed that good return was the most encouraging factors for Large Cardamom farmers followed by

market demand, less time intensive, land suitability and neighbor influence as shown in the Table 8.

Table 8. Factor encouraging Large Cardamom production among respondents in study site

Factors		P1 (1)	P2 (0.8)	P3 (0.6)	P4 (0.4)	P5 (0.2)	Weightage	Index	Rank
Less Care or Time Intensive	Less	3	38.4	38.4	10	2	91.8	0.61	III
Good Return		143	2.4	0	1.6	0	147	0.98	I
Land Suitability		2	13.6	21.6	17.2	4.2	58.6	0.39	IV
Market Demand		0	61.6	25.8	8.4	1.8	97.6	0.657	II
Neighbor Influence		4	2.4	4.2	15.6	19.4	45.6	0.30	V

Source: Field Survey, 2019

Note: Figures in the parentheses indicate the score used and 'P' stands for priority (Ex. P1= Priority one and so on)

Major problems experienced in Large Cardamom production

Problem ranking of the different types of problems faced by the respondents showed that attack of pest and disease was the most severe problem followed by lack of knowledge about improved Large Cardamom production technology, poor irrigation facility, lack of quality seedling and farm labor as shown in Table 9. Increasing disease and pest incidence compelled farmers to use chemical pesticides in higher amounts.

Table 9. Major problem in Large Cardamom production among respondents in the study site

Problems		P1 (1)	P2 (0.8)	P3 (0.6)	P4 (0.4)	P5 (0.2)	Weightage	Index	Rank
Lack of Quality Seedling		9	39.2	15	16.4	5.2	84.8	0.57	IV
Lack of Knowledge on Improved Cardamom Cultivation Practice		40	20.8	37.2	8.4	0.2	106.6	0.71	II
Poor Rainfall and Irrigation Facility		3	52	24.6	10.4	3	93	0.62	III
Attack of Pest and Disease		98	4	7.2	1.6	6.2	117	0.78	I
Lack of Farm Labor		0	4	6.6	23.2	15.2	49	0.33	V

Source: Field Survey, 2019

Note: Figures in the parentheses indicate the scale used and 'P' stands for priority (Ex. P1= Priority one and so on)

Benefit cost analysis

The benefit cost analysis of Large Cardamom was calculated on the basis of cost occurred in last year verses gross return gained from Large Cardamom in the study area as presented in the Table 10. Overall b/c ratio was found greater than unity (1.49) which was more or less similar with findings of Kalauni & Joshi (2019). The benefit-cost analysis was higher in Arun village municipality (1.735), followed by Sadananda municipality (1.467) and Bhojpur municipality (1.263). The higher B/C ratio in Arun village municipality was mainly due to higher productivity of Large Cardamom, fewer incidences of diseases and pests as compared to other municipalities, which reduced the cost of production. Farmers supposed that less

disease and pest infestation was mostly due to adoption of Dammersai variety which they found more resistant to disease and pest infestation compared to other variety. Also, they claimed that, capsule of Dammersai was superior in size and quality so they received better price for their cardamom from collector.

Table 10. Benefit cost analysis of the Large Cardamom in the study site

Items	Arun Municipality (n=50)	Bhojpur Municipality (n=50)	Sadananda Municipality (n=50)	Total (N=150)
Average Return per household(NPR)	99495	77570.6	103830	93631.867
Average Cost per household (NPR)	36378.42	34277.77	42087.55	37581.25
B/C ratio	1.74	1.26	1.47	1.49

Source: Field Survey, 2019

Gross margin analysis

Gross margin per household was estimated by deducting the average variable cost from average gross return. The findings showed that the gross margin of the cardamom was highest Arun village municipality (NPR 63116.58) followed by Sadananda municipality (NPR 61742.45), followed by Bhojpur municipality (NPR 43292.9) as shown in Table 11. Difference in gross margin along the study sites was mainly due to difference in productivity of the cardamom. Higher and similar gross margin in Arun rural municipality and Sadananda municipality was due to the higher productivity of the Large Cardamom as compared with Bhojpur municipality.

Table 11. Gross margin analysis of the study site

Name of the Municipality	Gross margin (NPR)
Arun Rural Municipality	63116.58
Sadananda Municipality	61742.45
Bhojpur Municipality	43292.9
Total	56050.617

Source: Field Survey, 2019

Post-Harvest of Large Cardamom

Curing of the Large Cardamom

Most of the respondents (86%) were using wood fired oven or traditional bhatti for curing of Large Cardamom as shown in Table 12. MoAD (2015) also reported that 90% of the Large Cardamom farmers were using the traditional bhatti for curing of Large Cardamom. Recently half-improved (drum drum) drier were adopted by 8.7% of respondents while 1.30% of respondents adopted sun drying method of curing for harvested Large Cardamom. About 4% of the respondent did not practice curing activity since production was quiet low around 0.5 to 5 kg. So, they sold harvested green capsule to neighbor or other Large Cardamom producer in the village. The price of green capsule varied from NPR 150-400 per kg.

Table 12. Method of curing among the respondents in the study area

Types of drier	Arun rural municipality (n=50)	Bhojpur municipality (n=50)	Sadananda municipality (n=50)	Total (N=150)
Sun drying	0.00%	1.30%	0.00%	1.30%
Wood Fired Drier or Traditional Bhatti	24.70%	28.00%	33.30%	86.00%
Double Drum	8.70%	0.00%	0.00%	8.70%
No drying	0.00%	4.00%	0.00%	4.00%

Source: Field Survey, 2019

Use of traditional dryer for curing Large Cardamom reduces its quality since when capsule came in direct contact with smoke and fire than they are suspected to over-dry. ITC (2017) reported that, quality variation (inconsistency in moisture content and taste) were common between farmers using traditional bhatti for roasting cardamom and the use of inferior combustibles with traditional bhattis led to occurrence of biphenyl and PAHs, rendering the product unfit for export to international markets.

Material used for packaging and storage

According to MoAD (2015), 76% of farmers are using jute bags, 7% are using plastic bags and remaining 17% are using jute bags with plastic inside. However, our study showed that only 1.3% of the respondents were using jute sack and most of the respondents (96.7%) were using plastic sack for the packaging and storage of Large Cardamom as shown in Table 13. While, only 2% of the respondents were storing Large Cardamom in naked floor of the storage room in the house. Easy availability and cheap price might be the reason behind the popularity of plastic sack for storage.

Table 13. Material used for storing the Large Cardamom

Material used for storage of Large Cardamom	Arun rural municipality (n=50)	Bhojpur municipality (n=50)	Sadananda municipality (=50)	Total (N=100)
Air Tight jute sack	0.00%	1.30%	0.00%	1.30%
Spread on Naked floor	0.70%	1.30%	0.00%	2.00%
Plastic Sack	32.70%	30.70%	33.30%	96.70%

Source: Field Survey, 2019

Value addition activities

Majority of the respondents were practicing curing (96%), tail cutting in traditional way (massaging) (96%) and cleaning (98.7%). While none of them were adopting grading (0%) and polishing (0%) as shown in Figure 2. However, only 3.3% of the total respondents were practicing washing operation to remove soil particles. MoAD (2015) also reported that 90% of the farmers are value adding their cardamom by practicing tail cutting. Tail cutting was carried out in a traditional way (massaging while drying over oven) rather than by scissor in the study area.

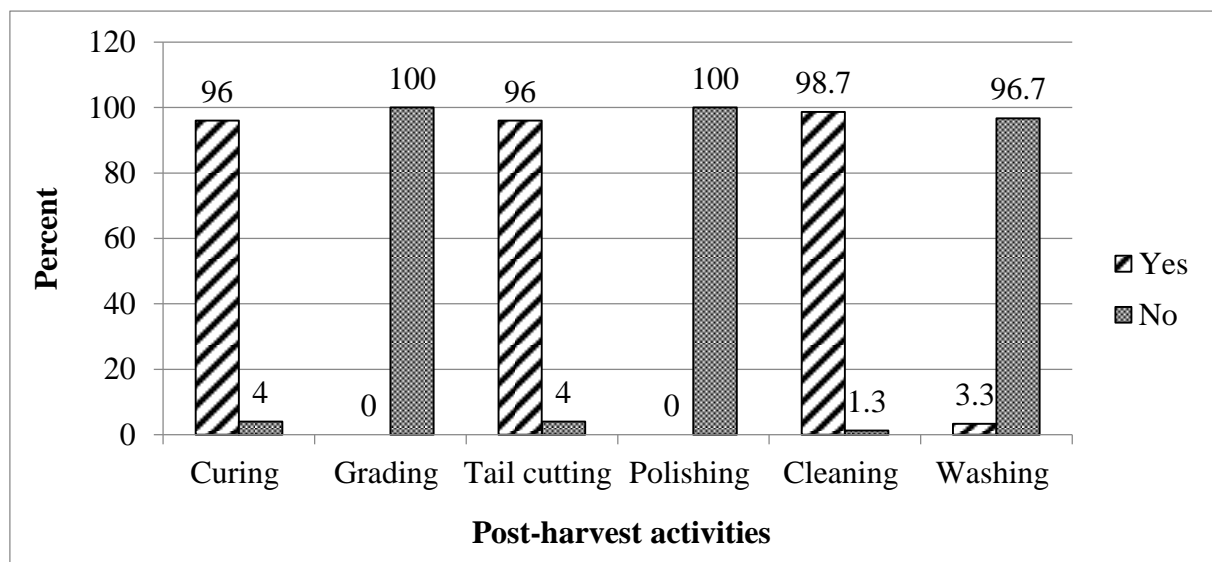


Figure 2. Different post-harvest activities that adds value to Large Cardamom

Source: Field Survey, 2019

Marketing of Large Cardamom

All of the respondents sold their produce from Bhojpur district. Majority of them (98.7%) sold Large Cardamom from their home while only 1.30% of total respondents sold their produce from district headquarter. Majority of the respondents (58%) reported that their Large Cardamom was collected by the village level collector while 42% of respondents reported that their produce was collected by district level collector. In case of agreement that takes between farmer and trader, it was found that all the respondent made oral agreement rather than written agreement as shown in Table 14.

Table 14. Marketing of Large Cardamom in the study site

Parameters	Category	Arun rural municipality (n=50)	Bhojpur municipality (n=50)	Sadananda municipality (n=50)	Total (N=100)
District to sell	Bhojpur	33.30%	33.30%	33.30%	100.00%
Place to sell	Home	33.30%	32.00%	33.30%	98.70%
	From District Headquarter	0.00%	1.30%	0.00%	1.30%
Collectors Involved	Village Level collector	33.30%	22.70%	2.00%	58.00%
	District level collector	0.00%	10.70%	31.30%	42.00%
Agreement	Oral Agreement	33.30%	33.30%	33.30%	100.00%
Payment mechanism	Advance Payment	0.00%	1.30%	0.00%	1.30%
	Cash Payment	31.30%	29.30%	32.00%	92.70%
	Payment after one week	2.00%	2.70%	0.70%	5.30%
	Payment within 1 month	0.00%	0.00%	0.70%	0.70%

Source: Field Survey, 2019

In case of mode of payment, majority of the respondent (92.70%) received cash payment. About 5.3% of respondents stated that they received full payment within one week duration, while 1.30% of respondents mentioned that they received advance payment for their produce and only 0.7% of respondents reported that they received payment within one month duration.

Problem in marketing of Large Cardamom

Ranking of the different problems related to marketing of Large Cardamom showed that, low seasonal price was the major problem followed by lack of marketing knowledge, distance market, decreasing demand and poor transport and connectivity as shown in Table 15.

Table 15. Problems experienced by producer in marketing of Large Cardamom in study area

Problems	P1 (1)	P2 (0.8)	P3 (0.6)	P4 (0.4)	P5 (0.2)	Weightage	Index	Rank
Low Seasonal Price	91	15.2	21.6	1.6	0	129.4	0.86	I
Lack of Marketing Knowledge	26	52.8	8.4	16.8	0.4	104.4	0.696	II
Poor Transport and Connectivity	0	4.8	18.6	22.4	11.4	57.2	0.38	V
Distance Market	42	14.4	33	12.4	0.8	102.6	0.68	III
Decreasing Demand	0	30.4	5.4	6.4	17.4	59.6	0.397	IV

Source: Field Survey, 2019

Note: Figure in the parentheses indicate score values and 'P' refers to priority

Marketing channels/Actors

Different marketing channel were observed in the study area. Kalauni & Joshi (2019) also reported similar market channels in Bhojpur district. Mostly farmers sell their product to the village based agent. Marketing channels identified in the study were as follow:

- 1) Farmers-----Local traders (Village/District based)-----Large traders (Hile/Khadbari/Dharan)-----Exporter(Birtamod)
- 2) Farmers-----Local trader (Village/District based) -----Exporter (Birtamod)
- 3) Farmers--Medium Traders (Hile)--Exporter (Birtamod)
- 4) Farmers--Exporter (Birtamod)
- 5) Farmers—District Trader—National Retailers—Consumer

Producer share's and marketing efficiency

Producer share's was an important indicator to estimate the price received by the farmers (producer) compared to that paid off by consumer while buying it. Highest producer share's (88.57%) and index of marketing efficiency (7.75) was found when farmers provide their cardamom in exporters hand while lowest producer's share (65.92%) and index of marketing efficiency (1.93) was found in domestic market channel. Cardamom value chain analysis showed that the marketing efficiency and producer's share on consumer rupees was decreasing with the increase in the number of the intermediaries as shown in Table 16.

Table 16. Estimation of producer share's and index of marketing efficiency in different identified marketing channels in the study area

Particulars	Marketing Channel				
	1*	2*	3*	4*	5*
Net Price received by the producer (FP)	643.75	668.75	688.13	775.00	626.25
Total marketing cost (MC)	50.15	38.65	36.65	30.65	48.15
Total marketing margins (MM)	181.10	167.60	150.23	69.35	275.60
Retailer's sale price (RP)	875.00**	875.00**	875.00**	875.00**	950.00**
Producer's share (PS)%	73.57	76.43	78.64	88.57	65.92
Index of marketing efficiency (MME)	2.78	3.24	3.01	7.75	1.93

Source: Field survey, 2019

*indicates the five different types of marketing channel identified in study area

**indicate price at Birtamod which was considered as the final price to reach end consumer.

Factor affecting the price of Large Cardamom

Among different factors contributing to price determination, demand and supply of Large Cardamom in Indian market ranked first with index value of 0.96. Quality of Large Cardamom ranked second with index value of 0.82 as shown in Table 17.

Table 17. Ranking of the factors determining the price of Large Cardamom

Determinants of price	P1 (1)	P2 (0.8)	P3 (0.6)	P4 (0.4)	P5 (0.2)	Weightage	Index	Rank
Demand and supply of Large Cardamom in Indian Market	15	0.8	0.6	0	0	16.4	0.96	I
Production of Large Cardamom in the year	1	1.6	7.2	0.4	0	10.2	0.60	III
Quality of the Large Cardamom	3	10.4	0.6	0	0	14	0.82	II
Competitors in International Market	2	0.8	1.8	4	0.2	8.8	0.52	IV
Time of selling	0	0.8	1.8	2	1.6	6.2	0.36	V

Source: Field Survey, 2019

Note: Figures in the parentheses indicate the score given to each priority (P)

Adoption of the different strategies to cope risk and uncertainty

Majority of the respondents (87%) had not adopted any strategy for minimizing risk and uncertainty while 9.30% had practiced marketing contracts with the village level collector or district level collectors. Only 3% had adopted share cropping and rest 0.7% had done insurance as shown in Figure 3.

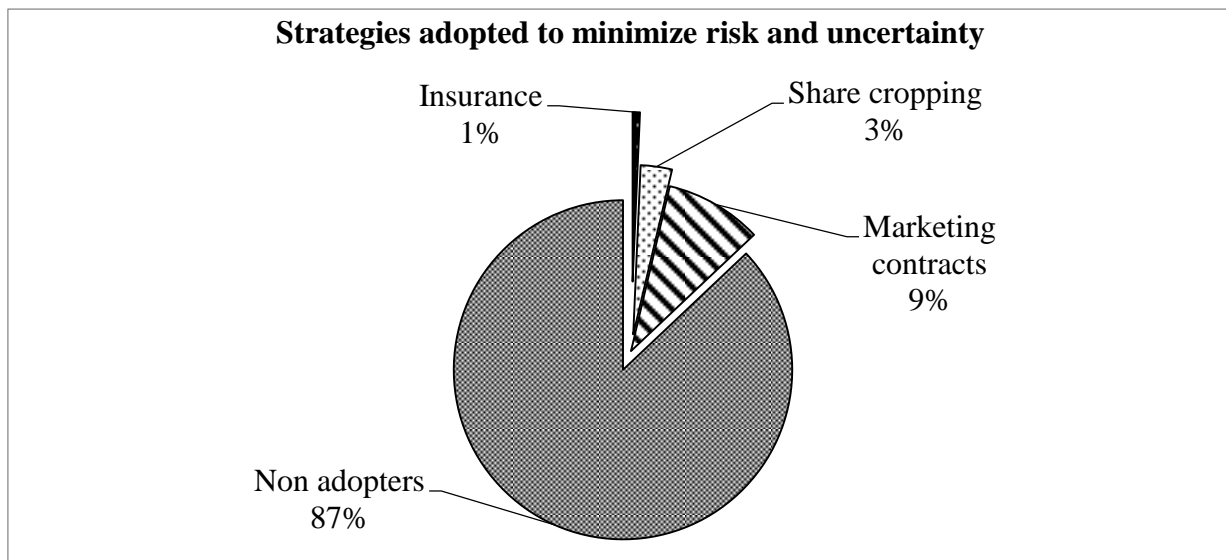


Figure 3. Strategies adopted to minimize risk and uncertainty in Large Cardamom enterprise
Source: Field Survey, 2019

Services and Support

In overall, results showed that, respondents of Bhojpur municipality had relatively more access to training, technical assistance and subsidy compared to other study area as shown in the Figure 4. Localization of government body like AKC, and Cardamom zone in headquarter of district may had resulted such biased distribution.

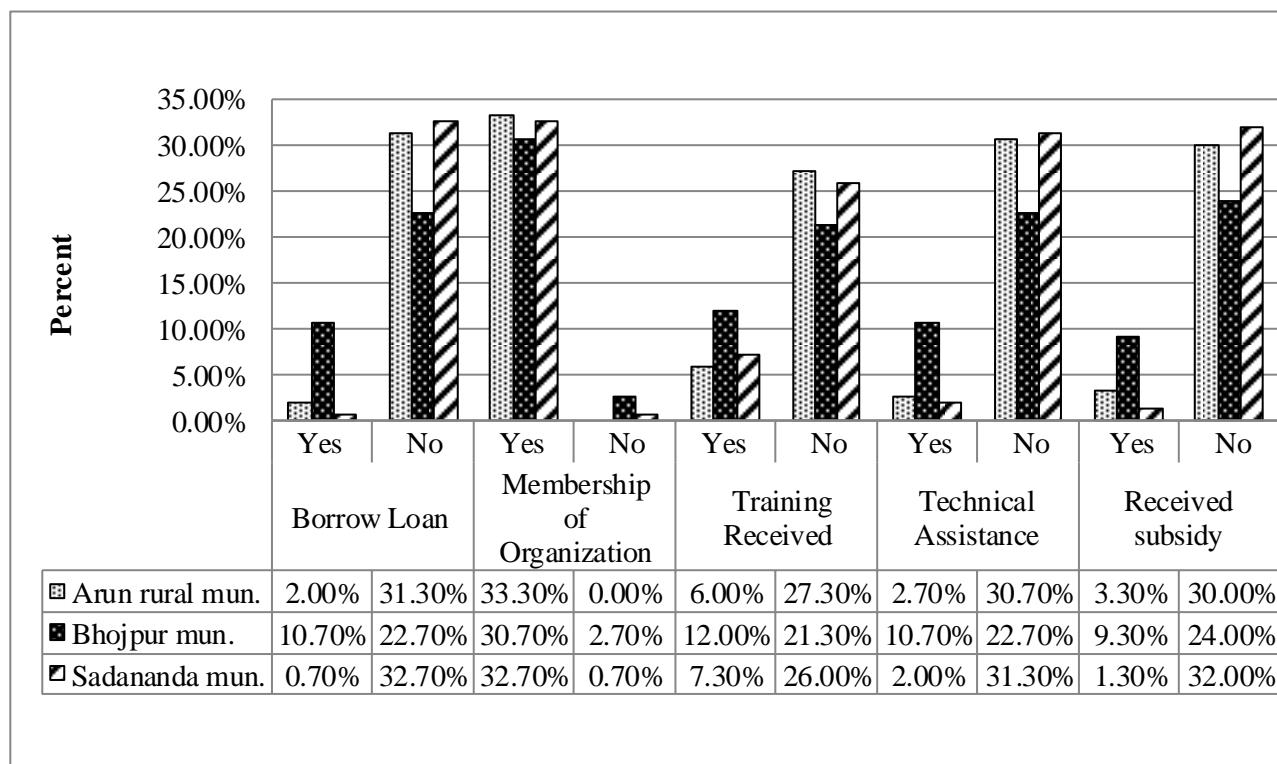


Figure 4. Distribution different services, support and resources among study site

Source: Field Survey, 2019

Value chain mapping

Actors and their functions:

Value chain map of the Large Cardamom in Bhojpur was traced as shown in Figure 5. Small land holding farmers (landless or nearly landless + subsistence farmer) shared 72.2 % of the total production reported among the surveyed household. Only 27.8% of total production among the surveyed household was contributed by small commercial farmers (having land holding more than 1 hectare). From this volume map we concluded that small farmers had cumulatively more contribution in the total production of the district. Local agro-vets were found as the instant suppliers especially for chemical pesticides, some bio-pesticide, mask, and sprayer. However, availability of heavy equipment like electrical dryer, saw cutter, driller, etc. was quiet low or not at all. So either farmer had to order and wait or travel regional market (Dharan) of the province to buy such expensive and heavy machinery items. In case of seed or seedling, village based nursery or separation of rhizome from previously grown Large Cardamom plant was common source. There was a high demand and need of healthy seedlings (seedlings obtained through tissue culture) but there were no such facilities available. Chemical fertilizers were barely used in Large Cardamom orchard.

Large Cardamom growers (producers) of different category based on land holdings were observed as shown in the Figure 5. Producers were engaged in plantation, care & management, harvesting, separation of capsule, curing and cleaning. Collectors are such

individuals that were involved in collection of Large Cardamom. It was found that sometime producers themselves act as collectors in their respective village or neighboring village. Village level or district level collectors are found most commonly while in rare cases farmers directly transport his/her cardamom to the exporters (market channel 4) without any sort of involvement of collectors. Commission agents were found existed in some cases. They took the responsibility of taking the produce to the market in return for some percentage of commission on the goods sold. They are found both supporting in transport or collection of Large Cardamom from their own and neighbor village. Wholesalers (or exporters) were found selling large quantity of Large Cardamom to retailers, hotels, restaurants and Indian traders. These wholesalers were mainly involved in value addition activities like grading, tail cutting, cleaning and packaging. In study area, none of the producers practiced grading of dried capsule and tail cutting by scissors. Retailers were engaged in selling of the Large Cardamom capsule in small quantity to the end consumers.

Enablers and facilitators:

Some of the government institutions working in Large Cardamom subsector that were identified during this study were Ministry of Agriculture and Livestock Development (MoALD), Prime Minister Agriculture Modernization Project (Zone Programs), Agriculture Knowledge Center (Block & Pocket programs), Cardamom Development Center (CDC), Commercial Crop Division (CCD), National Spice Crop Development Program (NSCDP) and Nepal Agricultural Research Council (NARC). Mostly of the activities of these institutions were concentrated on production side with very few investment in research related to Large Cardamom. While non-government institutions working in Large Cardamom subsector were International Centre for Integrated Mountain Development (ICIMOD), Asia Network for Sustainable Agriculture and Bio-resources (ANSAB), Federation of Large Cardamom Entrepreneur Association of Nepal (FLCEAN) and Mercy Corps. Illustrative value chain map of Large Cardamom in Bhojpur district was shown in Figure 5.

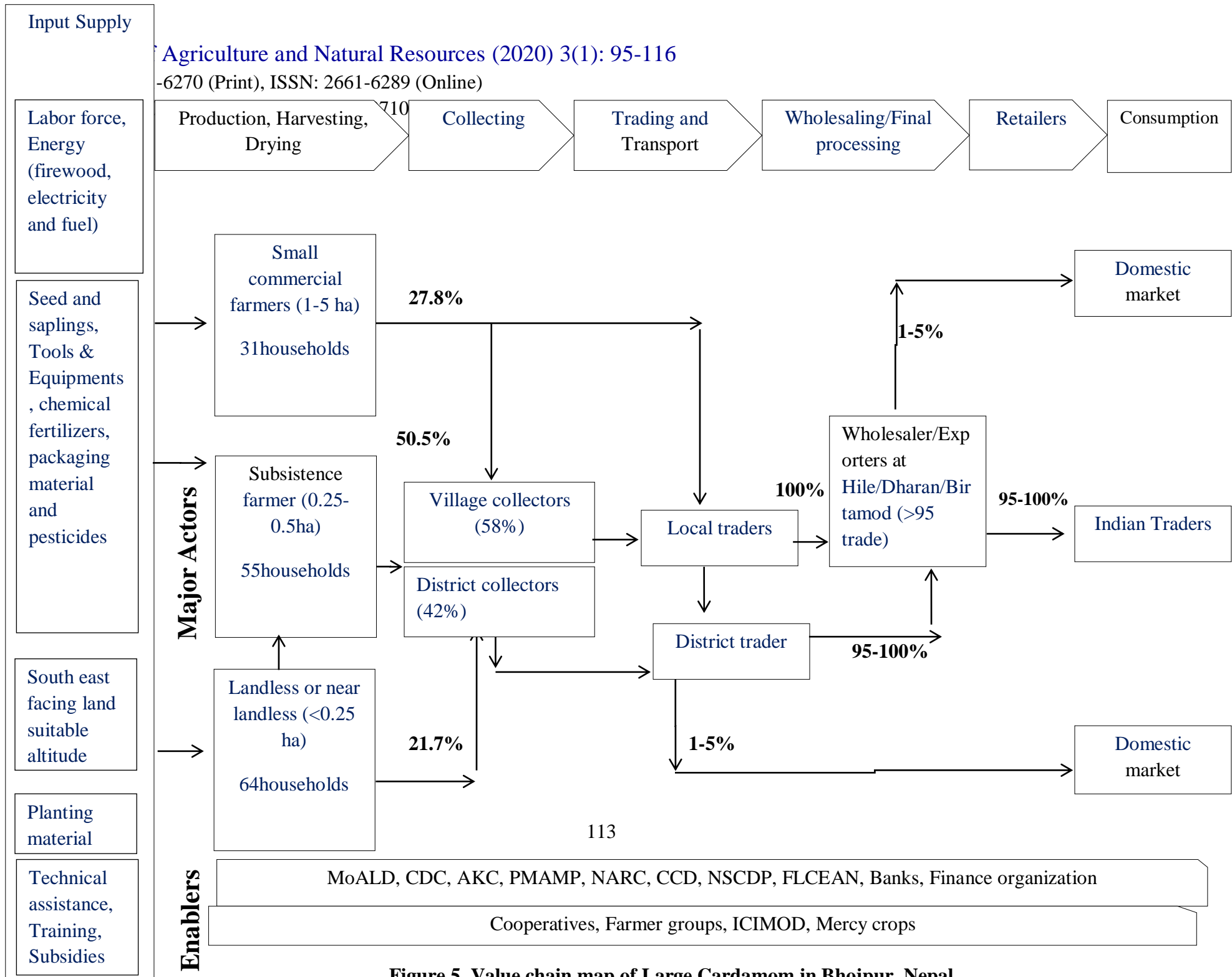


Figure 5. Value chain map of Large Cardamom in Bhojpur, Nepal

CONCLUSION

Good returns and profit margin per unit commodity is major factor influencing farmers and youth in this industry. Findings show that Large Cardamom enterprise in Bhojpur district is profitable with b/c ratio 1.49. However, farmers are unable to take adequate benefit from enterprise. This can be inferred from the fact that though large cardamom is high value cash crop but it has b/c ratio less than 2. Benefit-cost analysis among different study site reveals that Arun village municipality (1.735) has higher b/c ratio compared to Sadananda municipality (1.467) and Bhojpur municipality (1.263). Positive gross margin denotes that the returns obtained from the Large Cardamom are adequate to cover the operating variable cost. Large cardamom alone contributes 42.9% of total annual household income. So, this shows that it is the major source of income for the rural mid-hill large cardamom growers.

Production related problem ranking suggest that, attack of pest and disease is the most severe problem followed by lack of knowledge about improved Large Cardamom production technology, poor irrigation facility, lack of quality seedling and lack of farm labor. Utis (*Alnus nepalensis*) is the major shade tree adopted by the large cardamom growers. Input supply situation is not satisfactory. Machinery items are sparsely found and there is clear lack of healthy seedlings obtained from tissue culture. None of the farmers uses chemical fertilizer. Most of the farmers use traditional driers for curing the harvest capsule and modern driers are not available in the district market. Grading practice is not known by majority of the farmers and none of them perform the grading of dried capsule before marketing. Though most of the farmers know about tail cutting but none of them practice tail cutting by scissor. They use traditional practice of massaging while drying for removing the tail. This shows that the value addition activities at farmer level are not satisfactory.

Ranking of the different problems related to marketing of Large Cardamom showed that, low seasonal price is the major problem followed by lack of marketing knowledge, distance market, decreasing demand and poor transport and connectivity. Most of the growers sell their cardamom from home to either village level collector or district level collector. Altogether five market channels are identified in the study areas. Estimation of marketing efficiencies in each marketing channel concluded that large number of the middleman or intermediaries involved in the market channel of Large Cardamom has attributed to medium range producer share and marketing efficiency. There is need to improve the coordination among concerned stakeholders. Study shows that Nepalese large cardamom market is India centered. Value chain mapping also showed that India is the major destination for export. Therefore, price of Nepalese large cardamom is also widely dependent upon Indian market. In overall, there seems the strong need of intervention in both production and marketing side from government to make the production process more mechanized, productive and marketing process more fair & reliable.

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AUTHOR CONTRIBUTIONS

- D.K and A.J both are involved literature review, preparation of questionnaire and checklist and data collections.
- D.K has carried out the data analysis
- D.K has written manuscript
- A.K and D.K both are involved in publication process

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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