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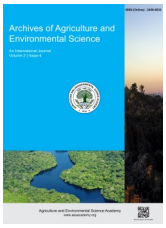

REVIEW ARTICLE

Status of large cardamom in Nepal: Trend of production, marketing, challenges and prospects

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ABSTRACT

Large cardamom (*Amomum subulatum*) grown mainly in the hilly regions of Nepal, is a valuable export commodity that fetch higher prices compared to other agricultural products. Its cultivation which was once restricted to country's eastern regions has now spread to 53 districts of Nepal. There is an increasing trend in both the acreage and production of large cardamom over the past 12 years in Nepal with peak production and productivity recorded in the year 2019 and 2020 which were 9545 Mt. and 0.58 t/ha, respectively. However, various challenges such as diseases and insects has reduced the potential of its production. Thus, the study focuses on identifying the requirements for improving large cardamom production, including disease management, suitable cultivars, and orchard management techniques. The problems associated with the marketing system and challenges related to price instability of large cardamom are also discussed, along with potential solutions. Also, the study proposes future goals to enhance productivity and evaluates the strengths, weaknesses, opportunities, and threats (SWOT) of the large cardamom production and marketing in Nepal.

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INTRODUCTION

The term 'cardamom' is assigned to the perennial herbs within two genera of the family Zingiberaceae namely, *Amomum* (large cardamom) and *Elettaria* (small cardamom). The large cardamom is often known as the 'queen of spices' or 'grain of paradise,' or 'black gold' and locally called as 'alaichi' in Nepal. It is a perennial, herbaceous, evergreen monocot plant. This spice crop is one of the oldest species in the world belonging to the order Scitaminae (Khatiwada *et al*., 2019a). Large Cardamom is the most popular cash crop, bringing in significant profits all over the world. It successfully adapts to altitudes ranging from 600-2000 masl. It requires an average precipitation of 3000-3500 mm spread over about 200 days and an average temperature range from 6-30°C (Kattel *et al*., 2020). Only the eastern Himalayan countries: Nepal, northeast India, and Bhutan grow *A. subulatum* (Bohara & Dahal, 2023). The total production volume of this spice throughout the globe is projected to be equal to the sum of production in these three nations. Introduced to Nepal many years ago from Sikkim, it is a low-volume high-value crop with medicinal properties. The revenue from large cardamom is three to four times that of typical crops.

Large cardamom is a climate sensitive crop that requires moist soil with filtered sunlight. Indigenous to the Eastern Himalayas, large cardamom is a sciophyte grown near the mountains, in a cool and humid area of Nepal. Trees like Uttis (*Alnus nepalensis*), Phaledo (*Erythrina indica*), Chilaunae (*Schima wallichii*), and Siris (*Albizia lebbeck)* are widely planted to provide shade in the orchard (Pun, 2019). Not only shade, Uttis trees supply nitrogen from root nodules to large cardamom when young and also provide a considerable amount of litter from twigs and leaves (Maharjan *et al*., 2019). Large cardamom is a bisexual; cross-pollinated crop whose flower buds develop from the base of the dull, red-colored underground part called "rhizomes". Flowering takes place in the spring, with a small peduncle and bud wrapped in tight red bracts. The 20-25 mm long, viscous sugar

pulp containing oval to globular capsules bears 45-50 small seeds held together inside the spike (Singh & Pothula, 2013). The plant is 1.5 to 2.5m tall, whose economic yield starts with the growth of capsule three year after its plantation. The optimal yield time for large cardamom is 8 to 10 year and the total life span is around 20-25 years (Nepal *et al.*, 2022). These dried large cardamom capsules are used as a spice in various dish preparations, perfumes, and medicines. It is identified as a spice crop possessing Ayurveda importance for many centuries. Likewise, the essential volatile oil derived from large cardamom is reported to have antimicrobial properties towards fruit fly activity due to having 1,8-cineole, α-terpineol, α-pinene, β-pinene, and allo-aromadendren.

It is the most important cash crop in Nepal. It has been the primary source of income for the majority of farmers indigenous to the eastern hills of Nepal. Nepal is the largest producer of large cardamom, contributing about 68% of the global supply (Khanal *et al.*, 2024). According to Khatiwada *et al.* (2019), Taplejung, Panchthar, Ilam, and Sankhuwasabha alone account for about 80% of the national production of large cardamom. As it can be grown on barren slopes with minimal incorporation of chemical fertilizers, its cultivation has expanded to the districts of western Nepal. Ilam being a pioneer district, its commercial cultivation has now spread over 53 districts throughout Nepal (Shrestha *et al.*, 2018). MoALD (2021/22) suggests that the following districts are the most important cardamom production area in Nepal: Taplejung, Sankhuwasabha, Solukhumbu, Panchthar, Ilam, Tehrathum, Dhankuta, Bhojpur, Khotang, Okaldhunga, Udaypur, Jhapa, Morang, Sunsari, Dolakha, Sindhupa-Large cardamomhowk, Rasuwa, Ramechap, Sindhuli, Kavre, Bhaktapur, Lalitpur, Kathmandu, Nuwakot, Dhading, Makawanpur, Manang, Gorkha, Lamjung, Tanahun, Kaski, Parbat, Syangja, Palpa, Myagdi, Baglung, Nawalparasi East, Gulmi, Arghakhachi, Pyuthan, Rolpa, Kalikot, Rukum West, Salyan, Jajarkot, Dailekh, Surkhet, Bajhura Bajhang, Darchula, Achham, Doti, Baitadi, Daduldhura, Kailali and Kanchanpur which includes the districts of all the Provinces of Nepal excluding the Madhesh Province. The production of this spice crop in Madhesh province is nil. The reasons may be due to having comparatively high temperature throughout the year which is undesirable for its production. Large Cardamom Development Center in Pandam, Ilam reported that, among the fourteen grown varieties of large cardamom in Nepal, five varieties namely, Ramsai, Golsai, Dambarsai, Jirmale, and Bharlange have been registered recently (Basnet *et al.*, 2021a). The farmers who grow the registered varieties are eligible for subsidies on fertilizer, high-quality planting supplies, and irrigation system maintenance according to Ministry of Agriculture. According to Basnet *et al.* (2021b), different varieties of large cardamom are generally grown by the farmers across the large cardamom growing areas of Nepal (Table 1).

Apart from being the greatest producer, the yield of large cardamom has been declining since 2010 due to several factors that have affected the production in many direct and indirect ways. Out of several factors, the direct and indirect effects of significant meteorological elements, such as temperature, rainfall, and humidity play a significant role. A study conducted in Sankhuwasabha district of Nepal suggests that there exists a direct relation between productivity and temperature, rainfall as well as humidity (Nepal *et al.*, 2022). The yield relies on the distribution of the rainfall and irrigation that we provide in the dry month. Similarly, the microclimate of the orchard should be maintained with enough shade letting intermittent light pass to the plants. Exposure to higher temperatures will not only reduce the yield but also increase the chance of disease and pest incidence. Furthermore, the failure to choose specific cultivars based on climatic requirements is not an exception to diminishing yield. Further, the incidence of several insect-pests and diseases, mainly viral infections including the invasion of destructive diseases such as chirke, foorkey and clump/rhizome rot and wilting, insect pests has caused decline in the production of large cardamom. Moreover, inadequate research and studies about the improved varieties, lack of healthy planting material and knowledge on re-transplantation, incidence of draught due to remarkable change in climate, soil erosion, improper infrastructure, and lack of migratory labor are considered to be the major aspect which could wipe out the large cardamom cultivation.

METHODOLOGY

This study has considered several authentic sources such as scientific journals published by Elsevier, PubMed, Springer and other publications for the collection of relevant information on large cardamom, its status, trend, marketing and future prospects. This study has analyzed data from the MoALD of different years and other publications to track the trends in large cardamom acreage and production over the past 12 years. Thus, this study reviews different aspects of large cardamom as suggested by the aforementioned topic.

Table 1. Varieties of large cardamom commonly grown by farmers in Nepal.

Name of varieties	Altitude (m.a.s.l.)
Ramsai	1500-2000
Golsai	1200-1600
Saune	1000-1600
Bharlange	1200-2200
Chibesai	700-1200
Jirmale	600-1200
Dambarsai	600-1200
Ramala	1000-1500
Serimna	1200-1800
Madhusai	1200-1600
Sikkim	1500-1700

PRODUCTION STATISTICS OF LARGE CARDAMOM IN NEPAL

According to MoALD (2022/23), the total large cardamom production accounts to be 8,674 Mt. and the yield accounts to be 0.54 Mt./ha. The total area cultivated and the total productive area were accounted to be 18,175 ha and 15,975 ha, respectively. Figure 1 presents the plot of area (ha) and production (Mt) of large cardamom in Nepal on the y-axis against time (in yearly intervals) on the x-axis. These parameters are the key indicators that measure and help to compare the trend statistics of large cardamom cultivation.

The productive area (ha) on the y-axis plotted against time (in year) on the x-axis signifies that there was a slight fall in the area over the year 2011/12 to 2013/14. Then, the productive area began to increase at a slow rate up to the year 2017/18. However, the productive area reached its peak in the year 2019/20 which was 29.7% greater than in the year 2017/18. The expansion of commercial production of large cardamom beyond Nepal's eastern reason may be the cause of this increment.

The production (Mt.) on the y-axis plotted against time (in year) on the x-axis signifies that there was a slight increase in the production during the year 2011/12 to 2012/13 followed by decrease in the production during the years from 2012/13 to 2013/14. Then, the production happened to increase reaching its peak with annual production of 9545 Mt in the year 2019/20. The possible reason may be the area-wise increment in the commercial production of large cardamom. However, the production of large cardamom in the year 2020/21 shows declination. The possible reason for this may be decrease in the sale price over the years which accounts to be by more than 50%. Additionally, inadequate technical skills, poor planting materials, outdated curing methods, and the large cardamom orchard's vulnerability to viral diseases affect production.

Looking at the latest stat, the area under production and the productivity of the commodity is somewhat stable over past few years suggesting the continued attraction of the farmers in the commercial production of this high value commodity with export potential.

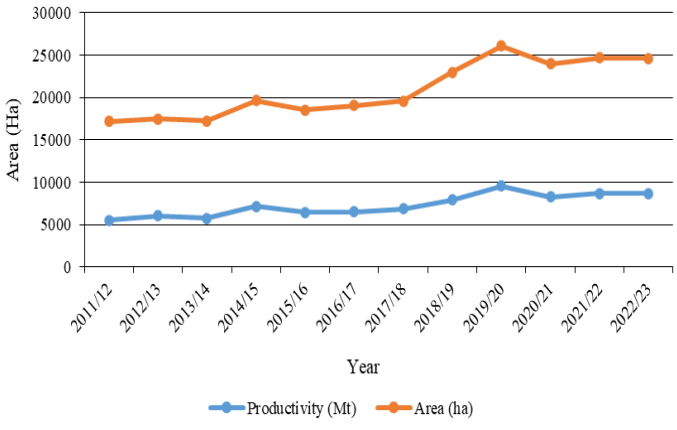

Figure 1. *Trends of productive area (ha) and production (Mt) of large cardamom (in last 12 years).*

MAJOR CONSTRAINTS OF LARGE CARDAMOM PRODUCTION IN NEPAL

In Nepal, the large cardamom cultivating farmers face several constraints. Out of these several factors, Sharma & Katoch (2019) identified the following reasons to have affected the production volume of large cardamom:

- Incidence of disease and pest.
- Farmers relying on poor- quality planting materials as a result of improper research and development of improved varieties.
- Farmers relying on the traditional way of plantation and no preference for replantation of old orchards.
- Problems with pollination and post-harvest as a consequence of climate change.
- Soil erosion.
- Poor infrastructure.
- Winter drought.
- Labor crisis as a consequence of brain-drain.
- Overall management problems.

Farmers have always encountered the situation of a lack of disease-free sapling. However, several surveys reported that the spread of the diseases and pests is greater due to the farmers' ignorance and lack of control mechanisms once there is an infestation. Similarly, the environmental abnormalities resulted from climate change, drought, and soil loss have aggravated the incidence of these diseases and pests. Paudyal & Rai (2020) identified these factors to affect the overall performance of large cardamom in terms of its production, harvesting, drying, curing, and storing. Prolonged infestation caused by several insect pests and damages resulted from several diseases causes a drastic reduction in the quality and the yield. Likewise, the lack of the concept of sterilization of the harvesting tools has been a potential reason for the transmission of disease from the infected ones to the healthier ones. Similarly, the techniques of large cardamom processing have always been a problem for the farmers including relying in the sun drying or the local dryers, known as 'Bhattis' in Nepal. The produce dried in these Bhattis gives the typical smoky odour resulting from produced smoke reaching the drying capsules. This is non-preferable to the one dried over electric or solar dryers that omits the smoke. The capsules dried over the electric or solar dryers are highly preferable due to the decent color and optimum quality parameters including the moisture content, due to which they find good market value. Further, the major problems associated with large cardamom are highlighted as follows.

Major insect pests of large cardamom

Despite the crop's great importance, producers suffer financial losses as a result of insect-pest outbreaks. There have been reports of 21 different insect species causing minor to significant damage to large cardamom plants (Raj *et al.*, 2021). However, the most serious pests that attack this crops are stem borer (*Glyphipterix* spp., Lepidoptera: Glyphiperidae) and leaf eating

caterpillar (*Artona chorista Jordon*, Lepidoptera: Zygaenidae) (Gudade, 2018). The other important pest of the crop is White Grub.

Leaf eating caterpillar of cardamom

Causal agent: *Artona chorista* (Zygaenidae: Lepidoptera).

Nature of damage: Initially, the moth's caterpillar which is gregarious and ravenous by nature feeds on the chlorophyll content of the underside of the leaf leaving behind a papery, thin layer of skin (cuticle), that is known as skeletonization.

Occurrence: The most heavily affected areas of Nepal are Bhojpur; Dhankuta; Illam; Baglung; Sankhuwasava (Basnet *et al.*, 2021c). Their occurrence is noted between May and July and between October and March.

Management: Identifying and collecting the infected leaves with caterpillar and destroying them by burning gives best result. The caterpillars are sluggish and live in colony, thus large number of them can be destroyed together.

Stem borer of cardamom

Causal agent: *Glyphetera* spp.

Nature of damage: The symptom is also known as 'dead heart' where the larvae bore and feed on the central part of pseudo-stem resulting in drying of central leaves (Rockwood *et al.*, 2020).

Occurrence: The incidence of stem borer is observed all year round. However, their abundance is greater during the December –January, March–April, May–June, and September–October.

Management: Removing and burning the affected plant parts gives the best result.

White grub

The adults are typical chafer beetles, mostly brown, and 19-20 mm long and live for 95 days in average.

Causal agent: *Holotrichia* spp. The white grub infestation is severe during September to December.

Nature of damage: The grubs feed on plant roots in the soil. The pseudo stem and rhizome portion are the major site of damage. The severe attack results yellowing leading the whole plant to wilt.

Management: Collecting the beetles (white grub adult) using hand and killing them in their peak period of emergence i.e., during April- May is the best way for minimizing their incidence. Similarly, there are aphids which are the vectors of viral diseases. They help in transmitting the viral diseases namely chirke and foorkey in large cardamom.

Root knot nematode

It is a microscopic soil dwelling parasitic organism that has a relatively simple life cycle consisting of the egg, four larval stages and the adult male and female. Its development is generally most rapid within an optimal soil temperature range of 70 to 80°F.

Causal agent: *Meloidogyne incognita*

Nature of damage: They pose serious problems in nurseries and also in plantations. The root of the infected plant shows excessive branching with galls. Similarly, major aerial symptoms include stunting, narrowing of leaves, and poor tillering. The nematode infection significantly reduces germination of seed (up to 50%), hence prevent them establishing after transplantation.

Management: Bio-control practice in large cardamom nurseries with *Paecilomyces lilacinus* and *Trichoderma* spp. are tested to lessen root knot nematode issues (Ramana & Eapen, 1995). Nematicides should be applied twice a year to the nursery infested by nematodes using Carbofuran or Phorate at a rate of 5 g a.i. per bed. But above mentioned pesticides had comparatively larger residual effect. So, nowadays IPM practices for the management have been found beneficial (Sigdel *et al.*, 2022).

Major diseases of large cardamom

Major viral diseases

The major viral diseases infecting the large cardamom orchard namely, chirke and foorkey are transmitted by aphids. These two persistent viral infections have an impact on commercial production of large cardamom (Vijayanandraj *et al.*, 2013). Chirke and Foorkey provide severe risks in terms of yield loss and rate of spread, respectively (Paudel *et al.*, 2018).

Chirke disease

Causal agent: Large Cardamom Chirke Virus (LCCV).

Symptoms: Mainly symptoms appear on leaves and pseudo stem. Streaks distinguish the chirke disease symptoms. It is characterized by mosaic on the delicate leaves, with dark green streak on a light green lamina. Less flowers are produced by the damaged clumps, which significantly reduces yield with estimated loss ranged from 80 to 85 percent (Shrestha *et al.*, 2018).

Foorkey disease

Causative agent: Nanovirus (Family: Nanoviridae)

Symptoms: It exhibits symptoms in newly emerging pseudo stems and suckers. It is spread by *Pentalonia nigronervosa*, a banana aphid (Paudel *et al.*, 2018).The infected plants shows

stunting growth, formation of numerous tiny tillers which fail to produce inflorescence. The tillers appear bushy and only attain a height of a few inches. This is serious disease that reduces yield with estimated loss up to 94% (Shrestha *et al*., 2018).

Management of viral diseases: Phytosanitization and use of healthy planting material, spraying metasystox once in three weeks to check the movement of the disease vector can be done to control the diseases. Moreover, to kill the aphids, systemic herbicides can be used. Spraying oil onto the vector colony give an effective control.

Major fungal diseases

Leaf spot/Blight

Causal agents: *Colletotrichum gloeosporiodes*, *Fusarium oxysporium*, *Cepalosporium* spp., *Verticillium solani*, etc.

Symptoms: There is the appearance of the water-soaked types of lesions on leaf tips or margins followed by enlargement of the lesion to cover the entire leaf blade with blighted appearance. Finally, the infected areas undergo necrosis and the leaf dries. The symptoms are visible after the monsoon rain.

Management: Cultural practice is commonly practiced to manage these disorders, where they simply gather and burn the plant fragments and unproductive bearers from the base of the clumps after harvesting. It is recommended to spray Bordeaux mixture (1%) @ 500 ml and a mixture of carbendazim & mancozeb (0.1%) or carbendazim (0.2%) @ 500-750 ml per plant covering the full foliar section 2-3 times in the interval of 30 days just after the disease appears in the field as a prophylactic measure.

Rhizome rot of large cardamom

Causal agent: Fungus viz. *Fusarium oxysporum*, *Cephalosporium sp. and Verticillium solani.*

Symptoms: Appearance of soft and brown rots are seen in the collar area, where they eventually cause the aerial shoots to fall.

Management: Proper drainage management, provision of irrigation at critical stages of the crop, drenching of the soil with copper oxychloride @1g/L water after germination of seedlings is practiced.

Leaf rust

Causal agent: *Phakopsora elettariae*

Symptoms: Numerous reddish rusty pustules are spread over the lower surface of leaves. They stick to our fingers when touched. At an advanced stage, the rust cover the whole leaf causing premature drying of leaves (Srivastava, 1995).

Management: Spraying 700–800 ml/ plant of indofil M-45 or mancozeb at a rate of 0.2–2 gram per liter of water has been effective.

Phoma leaf spot

Causal agent: *Phoma hedericola* (Saju *et al*., 2011)

Symptoms: This disease usually appears in the seedling stage during the continuous rain. It is distinguished by a circular water -soaked lesion on younger leaves, the center of which initially turns grey and then progressively turns yellow, brown, and sometimes black. Subsequently, a big patch of similar spots forms on the leaf lamina, like a blighted leaf, and sometimes the entire plant is infected (Sharma *et al*., 2016; Saju *et al*., 2011). Locally, it is called as "Paheley" in Nepal.

Management: Using diverse phytosanitary methods, gathering and burning the diseased and dead leaves, and using various bio pesticides can all be successful.

Sooty mould

Causal agent: *Triposporiopsis spp.*

Symptoms: The dark brown to black mycelium infects and spreads throughout the lamina and petioles, eventually reaching the tillers (Thomas & Suseela Bhai, 1995).

Management: Check new succulent plant growth for sucking insects that secrete honeydew and apply phytosanitary methods. Besides, several biological and environmental phenomena, poor infrastructure has resulted the massive decline in the yield and economic return. This includes inaccessibility of the orchard to road and proper irrigation management, poor drying, grading, packaging and processing facilities. The farmers still rely on traditional type dryers locally known as 'Bhattis' where the capsules are piled up and are dried over fire for 24-28 hours resulting non uniformly dried poor quality capsules with undesirable smoky odor (*Shrestha et al*., 2018).

MARKETING OF LARGE CARDAMOM IN NEPAL

Marketing refers to the exchange of the produce with money at a fixed place (market) and at a fixed time. Marketing of large cardamom is quite complex phenomenon as it is a spice crop whose consumption is lower than that of other daily consumed crops. On the other hand, Nepal is the top producer of the large cardamom but the market is not bigger enough to hold all the produce. So, Nepal have to export around 99% of its total production to India alone (Acharya, 2019). Table 2 shows the Swot analysis of large cardamom production in Nepal.

Marketing channels

Two market chains are observed, one within the country and other to the potential exporting countries. After proper curing,

Table 2. Swot analysis of large cardamom production in Nepal.

Strength (S)	**Opportunities (O)**
Favorable altitude and topography. Comparatively better profit margin than cereal crops (Kalauni & Joshi, 2019). Offers a good return. Higher export potential. Utilization of steep and marginal lands. High demand in international market (Bhusal *et al.*, 2020). Simple and efficient post-harvest longevity technique. It is a low volume high value crop.	Marginal and vacant lands can be utilized for cultivation of large cardamom. Direct export to third country. Link with other business entrepreneurs. Easy grant and subsidy. Large cardamom gives plant pathologist scopes to identify solutions to many diseases. Possibility of introducing contemporary technology such as smoke-less driers (Kandel, 2019).
Weakness (W)	**Threats (T)**
Insufficient knowledge about improved large cardamom production practices i.e. Electric dryer, irrigation techniques. Less accessible healthy seedlings (Tissue culture seedlings) (Bhusal *et al.*, 2020). Inadequate price information mechanism and price instability (Bhusal *et al.*, 2020). Inadequate manpower during peak hours i.e. transplantation and harvesting. Insufficient of technical manpower in disease diagnosis. Insufficient knowledge on integrated nutrient and pest management.	Price determined by demand in Indian market. Incidence of drought specially at the critical stage i.e. flowering stage) in the area relaying in rainfed irrigation. Increasing disease incidence like chirke, foorkey and clump/rhizome rot. Loss due to natural phenomena i.e. drought, hailstorms and landslides Danger from wild animals locally known as Kala, Bhyalse, Ant, Porcupine. Due to the Indian market's monopoly, there are trade and marketing issues with cardamom Increasing brain drain.

the large cardamom capsules are ready for marketing. For proper storage and transportation of the capsules, there must be sufficient drying of the capsule. The well-dried capsules reach the local merchants who then transport it to the district level and regional dealers. Finally, regional dealers sell the commodity to exporter who finally export it to India across the border. It should be emphasized that various intermediaries, including several organizations, wholesalers, and local/district collectors, make their way through this path. Figure 2 showing the marketing channel of Large cardamom as reported by Bhusal *et al.* (2020).

Export channels for large cardamom

Nepal has established itself as the world's leading producer of large cardamom, followed by India and Bhutan (Khatiwada *et al.*, 2019b). Large cardamom is most important export of Nepal. Nepal is the third-largest exporter of large cardamom after India and Guatemala, the top exporter of the large cardamom (Ghimire *et al.*, 2021). According to Ministry of Industry, Commerce and Supplies, a total of NRs. 6.36 billion was obtained on export of large cardamom during the first nine months of fiscal year 2022/23 i.e. from Mid July 2022 to Mid-April 2023. The study on market channel of large cardamom in Nepal by Acharya *et al.* (2021) suggests that about 99% of the total cardamom produced is exported from the eastern border i.e. Jhapa to India where several exporter companies are located. These export companies collect the produce from all across the nation and in turn supply the bulk volume to India. Making an excellent study on the reason why the Nepalese large cardamom doesn't reach world market, a study found that restriction in access to transportation facilities by India has reduced the ability of large cardamom to compete globally. This has ultimately inhibited the export of Nepalese large cardamom to other nations including Pakistan and Bangladesh which are the promising markets for large cardamom of Nepal.

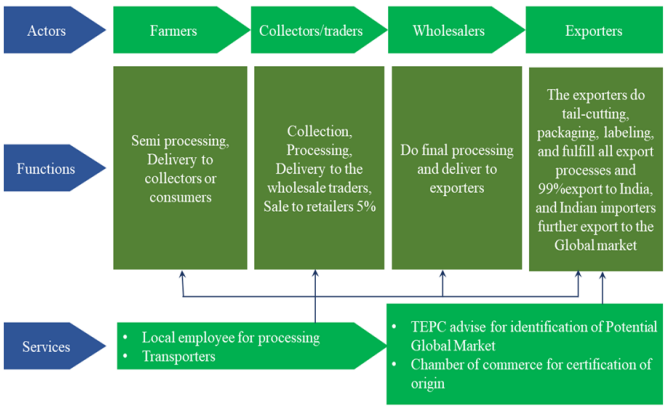

Figure 2. *Marketing channel of large cardamom in Nepal.*

Constraints in marketing of large cardamom

India is the largest market for large cardamom of Nepal. At the same time, it is also one of the top producer. Thus, India's production and market of large cardamom have a significant impact on its price volatility in Nepal (Bist & Bhatt, 2021). Nearly 90% of the product is exported to India, and nearly no other country experiences a direct route (Thapa & Dhimal, 2018). Unfortunately, due to this monopolistic market, Nepal's export potential in the Indian market is not particularly attractive (Sharma *et al.*, 2017). This clear dependency on the Indian market has greatly discouraged the large cardamom farmers of Nepal. However, it has left a great scope for brainstorming the best potential exporter of this black gold. Besides India, China, France, Bangladesh, UAE and Germany have been established as potential exporting countries of large cardamom (Zhuang *et al.*, 2021).

Conclusion

Large cardamom is the major source of cash income for farmers in the eastern Himalayan countries: Nepal, northeast India, and Bhutan. Nepal is the biggest producer of large cardamom in the world, with a 52% share of the global production followed by India and Bhutan. The farmers of Nepal usually grow registered varieties viz. Ramsai, Golsai, Dambarsai, Jirmale and Bharlange. The commercial cultivation of large cardamom which was limited to the eastern districts of Nepal has now widened throughout the total of 53 districts of Nepal. Today, Nepalese farmers are making substantial profits with its export. Despite being the world's top producer, Nepal's large cardamom yield is still insufficient in term of the productivity potential. A number of factors have contributed to this situation, including the employment of traditional farming techniques, insufficient access to new technologies, the occurrence of disease & pests and most importantly the consequences of climate change. Several management practices including cultural, biological and chemical methods of the control of the disease and pests are undertaken by the large cardamom cultivating farmers for its higher quantity and market desirable quality. However, the crop suffers huge loss due to the detrimental effects of climate change over the years. There still is a need of proper adaptation strategies and climate mitigation approaches that incorporate local and indigenous knowledge. There is huge potential of large cardamom production in most of the districts of Nepal. Realizing this, the government may enhance its programs and subsidies to encourage farmers to commercialize farming and cultivate large quantities of large cardamom. Finally, large cardamom has huge potential of global commerce for Nepal, thus we must pay close attention to its production, processing, and marketing for its better market value.

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DECLARATIONS

Author contribution statement

Conceptualization: K.H.T and B.N.K; Methodology: K.H.T; Software and validation: B.S., N.K.R; Formal analysis and investigation: K.H.T; Resources: N.K.R.; Data curation: B.N.K.; Writing-original draft preparation: K.H.T.; Writing-review and editing: K.H.T; Visualization: B.S.; Supervision: A.K.S.; Project administration: K.H.T.; Funding acquisition: B.S. All authors have read and agreed to the published version of the manuscript.

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