

Annexure- 2

Statement of Case

Sikkim Large Cardamom

Contents

1. Background	1
1.1. Agro-Climatic Zones of Sikkim and Horticulture Products Grown in the Zone	1
1.2. Sikkim Economy	2
1.3. Sikkim Large Cardamom	4
2. Applicant organization	4
2.1. The Objectives of NERAMAC	5
3. Specification	8
4. Description of Goods	9
4.1. Characteristics of Various Varieties of Large Cardamom	10
5. Origin and Historical References	11
6. Geographical Area of Production	12
6.1. Production	12
6.2. Area & Production of Large Cardamom in Sikkim and All India (Source Spice Board) ⁹	13
6.3. Map of Sikkim Large cardamom cultivation area	14
7. Methods of Production ^{2, 3, 8, 9}	15
7.1. Climate and soil	15
7.2. Cultivars	15
7.3. Propagation	15
7.4. Planting	17
7.5. Land preparation	17
7.6. Manuring	17
7.7. Weeding	17
7.8. Soil and moisture conservation	18
7.9. Irrigation	18
7.10. Shade Management	18
7.11. Pests	19
7.12. Diseases	19
7.13. Harvesting	20
7.14. Curing	20
7.15. Packaging	21
8. Specialties of Sikkim Large Cardamom	21
9. Impact of climatic conditions and human skills	22
10. Marketing Chain System Study	23
10.1. Value Chain for Sikkim Large Cardamom	23
11. Future Potential and Scope of GI	24
11.1. The Export Scenario	24
11.2. Export of Cardamom from India (Source – Spice Board) ⁹	25
11.3. Organic Farming	26
11.4. Value Addition through Processing	26
11.5. SWOT Analysis for Sikkim with Respect to GI Registration of Sikkim Large Cardamom	27
References	29
Annexure	30

1. Background

Sikkim lies between 27° 04' 46" and 28° 07' 48" North latitude and 88° 00' 58" and 88° 55' 25" East longitude on the southern slope of the Eastern Himalayas with an area of 7,096 sq km in the Northeast zone. Sikkim constitutes 0.22% of the total geographical area and 0.05% of the total population with 540,851 persons (2001 Census) of India.⁷

Only 12.3% of the land in Sikkim is available for cultivation, including currently used and fallow land. Forested areas account for 41.9%, while a large portion of the land—25.4% is barren and uninhabited. Climatic conditions in Sikkim, ranging from subtropical to alpine, are diverse enough to be conducive to cultivation of a large number of crops.¹

The soils are mostly loams with varying amounts of coarse material. Consequently the soils are well drained. Their pH ranges from 4.0 to 6.5. They are rich in organic matters but tend to be deficient in nitrogen. Phosphors levels are moderate and there is reasonable availability of potassium.²

The developmental measures of the "green revolution" implemented in other Indian states were not successful in the Himalayan region because adequate fertilizers were never available on time, irrigation could not be developed, and soils are very fragile.^{3, 13}

However, the fact that the 'Green Revolution' sidestepped Sikkim has to a certain extent helped the state, insofar as the high usage of associated pesticides and fertiliser is concerned. This has encouraged the state to set a target of making itself an entirely organic state – the first to do so in the country⁵

Area (sq. km)	7096
Population 2001	540851
Urban Population (%)	11.1
Rural Population (%)	88.9
Population density (per sq. km)	76
Districts (no.)	4

1.1. Agro-Climatic Zones of Sikkim and Horticulture Products Grown in the Zone

The Agro-Ecosystem Zones of Sikkim are not clear-cut at their boundaries but merge into one another, often showing considerable local encroachments and recessions above and below the line

depending upon physical configuration and exposure of the terrain and the resulting ecological factors. The table below shows captures the detail ⁵

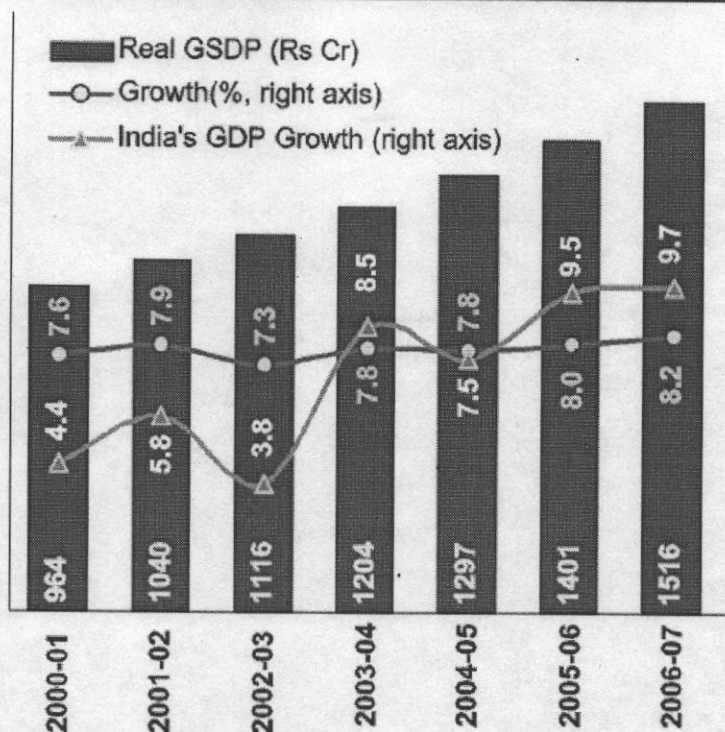
AGRO-ECOSYSTEM ZONES OF SIKKIM			
Area	Climate (Altitude meter)	Ecological adaptation	Agricultural, horticultural crops and livestock
Lower hills	Tropical (300-1200)	Wet and rainfed agriculture, sedentary farming, horticulture, livestock.	Rice, maize, millet, wheat, pulses, oilseeds, vegetables, potato, guava, lime, lemon, mandarin, orange, ginger.
Mid hills	Sub-tropical (1800-3000)	Wet and rainfed agriculture, livestock, horticulture and minor forest produce.	Rice, maize, millet, wheat, pulses, oilseeds, vegetables, potato, mandarin orange, large cardamom.
High hills	Temperate (3000-4000)	Rainfed agriculture, transhumance.	Maize, barley, vegetables, potato, plum, peach, pear, peas.
Higher hills	Sub-alpine (4000-4500)	Yak herding, horticulture, pastoral economy (wool, cheese, butter, hides), potato.	Mainly used for pasturage, seed potato and vegetables.
Very High hills	Alpine (>4500)	Transhumance groups visit the area.	Mainly used for pasturage, seed potato and vegetables.
SOURCE: Adapted from "Indigenous Farming System of Sikkim Hills and Perspective Planning," J.R. Subba. & N.D. Verma; National Biodiversity Strategy and Action Plan, Sikkim			

1.2. Sikkim Economy

Agriculture has been largely at subsistence level rather than being commercial. The significance of the sector can be gauged by the fact that almost two-thirds of the population of Sikkim depends upon agriculture and related activities for their livelihood. Rain-fed agriculture is a predominant feature and only about 15 percent area is under irrigation. Only minor irrigation is feasible in Sikkim as the agriculture lands are available in small patches and in between the rugged terrains and at the foothills. Further, because of steep slopes, agriculture is practiced on terraced lands. Agricultural holdings are well spread although marginal and small holdings together comprise about 50 percent of all operational holdings and occupy 41 percent of the total area. ⁵

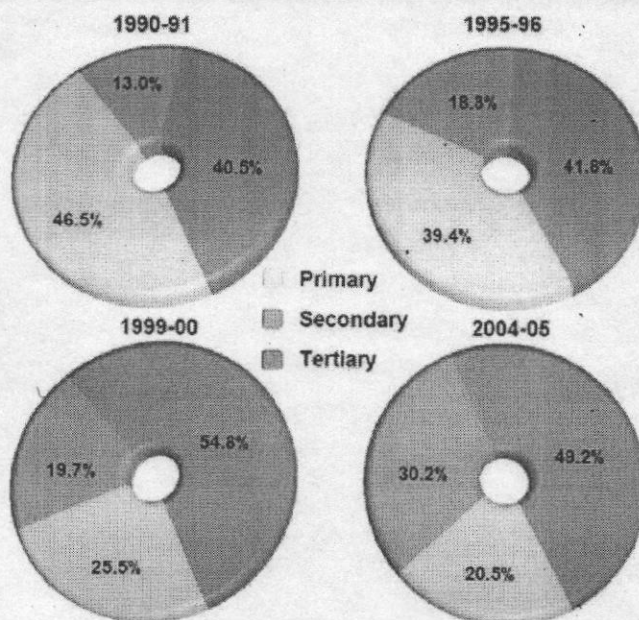
In terms of sectoral contribution to state's GDP, the significance of the primary sector has declined over the past three decades. Unlike this, the shares of secondary and tertiary sectors have gained importance in the overall macroeconomic environment of the state. As is evident from Exhibit 1.2, the share of the primary sector has witnessed a progressive decline – from 46.5 percent in 1990-91 to 25.5 percent in 1999-2000 and further down to 20.5 percent in 2004-05. ⁵

SIKKIM REAL GROSS DOMESTIC PRODUCT



SOURCE: Sikkim Statistical Profile 2006-07, Exim Bank Analysis

CHANGING PATTERN OF SIKKIM ECONOMY



SOURCE: Sikkim Economic Survey 2006-07

1.3. Sikkim Large Cardamom

In the typical agro – climatic scenario of the state, a cash crop, large cardamom (*Amomum subulatum*), has been a boon to the mountain people of the area. Large cardamom is a perennial cash crop grown beneath the forest cover on marginal lands. Its cultivation is an example of how a local mountain niche can be utilized in sustainable manner.¹

Sikkim Himalayas are the natives of this crop, and the state boost for being the highest producer of Large Cardamom in India. Apart from India only Nepal and Bhutan are the other two countries where Large Cardamom is grown. Large cardamom based agroforestry has been an adaptive system in the mountain landscapes for ecosystem services and human well being but recently, some irresistible problems on crop management, disease and pest control and lack of market intelligence have caused serious setbacks on livelihoods of people. The most worrying factor in large cardamom farming is the decrease in yield per ha by 30-40% recorded in recent years.⁶

In addition to this, with introduction of the crop to other states, market competition is also suppose to increase, which calls for a need of safeguarding the interests of aboriginal cultivators. The superior quality of produce from Sikkim, which the farmers have achieved after a long history of development of traditional knowledge, need to be separately identified and recognised.

Geographical Indication (GI) registration for Sikkim Large Cardamom can be a mean to help safeguard the interest of various stake holders involved in the value chain of Large Cardamom by giving it a distinctive identity.

2. **Applicant organization**

North Eastern Regional Agricultural Marketing Corporation Ltd (NERAMAC) has been assigned the responsibility of registration and supervision of GI by North East Council, Ministry of Development of North Eastern Region (DoNER) in consultation with the Horticulture & Cash Crops Development Department, Government of Sikkim.

North Eastern Regional Agricultural Marketing Corporation Ltd (NERAMAC) was incorporated at 31st March 1982 to support farmers/producers of north east getting remunerative prices for their produce and thereby bridge the gap between the farmers and the market and also to enhance the agricultural, procurement, processing and marketing infrastructure of the North eastern Region of India.

The Authorised Capital of the Corporation is Rs.10.00 Cr and the Paid-up Capital is Rupees Rs 7.62 Cr. Presently it is under the administrative control of the Ministry of Development of North Eastern

Region (DoNER), Government of India, New Delhi, with its registered office at 9 Rajbari Path, Ganeshguri, Guwahati.

Following is the constitution and list of directors of NERAMAC

Name of Individual	Designations at NERAMAC and other govt. organizations
Shri Arvind Madhav Singh, IFS	Joint Secretary, Ministry of Development of North Eastern Region & Chairman, NERAMAC Ltd.
Shri Vinod H Kalbande	Managing Director, NERAMAC Ltd.
Prof. Charu Lata Mahanta	Professor Department of Food Processing Technology, Tezpur University & Director NERAMAC Ltd.
Shri Rohtash Singh	Director, Ministry of Development of North Eastern Region & Director NERAMAC Ltd.
Dr. Bidyut Chandra Deka	Joint Director, ICAR, Jharnapani (Nagaland) & Director NERAMAC Ltd.
Shri Rajen Lohia	Businessman, Dibrugarh (Assam) & Director NERAMAC Ltd.
Shri R. P. Gurug	CEO, Ecotourism & Conservation Society of Sikkim Gangtok (Sikkim) & Director NERAMAC Ltd.
Shri Hage Kojeen	Commissioner (Agriculture) Government of Arunachal Pradesh & Director NERAMAC Ltd.
Shri I. Meitei	Advisor (Horticulture), North Eastern Council & Director NERAMAC Ltd.
Shri Samuel Rosanglura	Director (Horticulture), Dept. of Agriculture, Govt. of Mizoram & Director NERAMAC Ltd.

2.1. The Objectives of NERAMAC

- To undertake development and marketing of horticultural products within and outside the north eastern region and the supply of inputs, tools, equipment etc. required for the development of horticulture and agro-based industries whether own or run by the Government, statutory body, company, firm, co-operative or individual.
- To undertake, establish, acquire, purchase, sell and manage the projects for the development of horticultural products such as establishment of nurseries and commercial orchards, seed stations etc. and function as agent for the distribution of seeds, plants,

processed food and other such products connected with the development of horticultural products.

- To manage, promote, aid and expedite the export of raw and finished horticultural produce and equipment and also to import raw and finished horticultural produce and equipment in furtherance of the company's business

NERAMAC is offering helping hand in sourcing and procuring cash crops of the producers by intervening in the market and provide them remunerative prices. It also helps processing units by providing raw materials and arranging packaging materials. NERAMAC has a few retail outlets within the North East region which directly sell various processed and value added products produced locally in the region. GI registration is a historical initiative to preserve and promote the bio diversity of region and one more step to help the farmers of geographical location to secure better remuneration.

In line with the set organizational objective, NERAMAC established a branch office at **Sikkim** located at **Tadong Bazar, Gangtok, Sikkim - 737 102** and has been working for the betterment of local farming community.

NERAMAC has been involved in setting up of large cardamom auction centre at Rangpo, Sikkim on 16th November 2010 which is first of its kind in the country. Prior to its existence there was no organized market of large cardamom in India which was totally controlled by a few private groups and the farmers were being given a meager price for their produce. After functioning of the Large Cardamom Centre of NERAMAC, it has created an abandon scope for the farmers.

The sales figure (in terms of value) of Large Cardamom Auction Centre for financial year 2010 – 2011 is Rs. 33,36,043.00

NERAMAC is also involved in the procurement and marketing of the Large Cardamom in the state of Sikkim. The sales figure of the Large Cardamom of the three financial years in terms of value is given below:

1. 2008 – 2009	Rs. 85,840.00
2. 2009 – 2010	Rs. 8,850.00
3. 2010 – 2011	Rs. 38,25,513.00

NERAMAC at a glance

Incorporation: 31st March 1982	Administrative Ministry:
---------------------------------------	---------------------------------

Promoter: North Eastern Council, Govt. of India, Shillong-793 001	Ministry of Development of North Eastern Region (DoNER), Govt. Of India, Vigyan Bhavan Annexe Maulana Azad Road, New Delhi – 110 011
Registered/Head Office: 9 Rajbari Path, Ganeshguri G S Road, Guwahati – 781 005 Phone: (0361) 2341427/28 Fax: (0361) 2341428 Email: neramac@gmail.com ; info@neramac.com	Zonal Offices: <ul style="list-style-type: none"> • Arunachal Pradesh • Assam • Manipur • Meghalaya • Mizoram • Nagaland

3. Specification

Sikkim Large Cardamom is the most important commercial crop for the state with about 16,949 cardamom recorded holdings, covering the total 23,679 ha under cultivation. ^{1, 5, 9} The state also boasts for a superior quality, which the farmers have achieved after a long history of development of traditional knowledge, and it needs to be separately identified and recognised.

Given below are the quality parameters for Sikkim Large Cardamom:-

Shoot height	: 1.7 to 2.6 m
No. of tillers per shoot	: 9 to 13 leave in each tiller
No. of fruits per spike	: 10 to 15 fruits
Colour of capsule	: Brown to Dark Brown colour, uniformity of colour
Moisture %	: 8 to 10% Maximum
Capsule shape and size	: Average about 2 cm, Bold and uniform size
Essential oil %	: About 1.97 percent, rich in 1, 8-cineol and alpha-terpineol

The finished product contains original flavour and aroma and there is no smoky smell.

Given below is the result of tests conducted for Sikkim Large Cardamom by National Collateral Management Services Limited (NCMSL) laboratory, Hyderabad ¹⁶

Attribute	Result
Capsule Shape and Size	2.08
Color of Capsule	Brown
Moisture %	7.45%
Protein %	7.34%
Total Ash	6.16%
Starch	41.09%
Crude Fiber	15.87%
Non - volatile ether extract	1.02%
Alcohol extract	5.90%
Water soluble ash	3.50%
Alkalinity of water-soluble ash	2.73%
Ash Insoluble in acid	0.09%
Volatile Oil	1.97%
Volatile extract	1.97%
Volatile ether extract	2.11%

4. Description of Goods

Family name Zingiberaceae

Botanical name *Amomum subulatum* Roxb.



Large cardamom belongs to Zingiberaceae family under the order Scitaminae [Biswas et al. 1986]. It is a perennial herb with subterranean rhizomes and a pseudostem of leafy shoots. Flowering commences in the third year after plantings. Flowers appear during April and May depending on the altitudes and the vigour of the plant. The capsules mature in September and October.² Each shoot has height of 1.7 to 2.6 m and possess 9 to 13 leaves in each tiller. Leaves are glabrous on both sides with a prominent mid-rib. Inflorescence is a condensed spike with yellowish perianth. Each spike has 10-15 fruits. Fruit is round or oval shape, capsule with reddish brown colour. Each capsule is trilocular with many seeds.⁹ It is essentially a cross-pollinated crop, although it is capable of self-fertilization. The harvested capsules are cured in traditional kilns.¹

It is a shade loving plant and requires high moisture and is usually cultivated in areas where mean annual rainfall varies between 150-350 cm. Since the cultivation requires tree shades, its farming supports conservation of tree biodiversity. Given this agro climatic requirements, the state of Sikkim is best suited for its cultivation.⁵ Apart from its high-income value and low demand in labour, large cardamom is also a low value and non-perishable crop. This is a great advantage in an area where accessibility and transportation are restricted.¹³

Large cardamom has a pleasant aromatic odour, due to which it is extensively used for flavouring vegetables and many food preparations in India. It is also used as an essential ingredient in mixed spices preparation.³ It is mainly used as food flavouring in the preparation of curries, soups, sausages and other meat preparations [Gupta et al., 1984]. The essential oil distilled from the fruit of large cardamom has an odour very similar to that of the oil of *Elettaria cardamom*, which is highly prized for flavouring food [Gupta et al., 1984]. The seed of large cardamom contains 2.0-3.2 percent oil of which 77-89 percent is cineole.²

Greater cardamom or large cardamom is one of the spices commonly used in Ayurvedic, Yunani, Chinese and Tibs medical system to treat various ailments. In Ayurveda it is commonly used for

dyspepsia, cough, nausea, vomiting and itching. It is also used as preventive as well as curative for throat troubles, congestion of lungs, inflammation of eyelids, digestive disorders and in the treatment of pulmonary tuberculosis. The seeds contain 2-5 percent of essential oil rich in 1,8-cineol and alpha-terpineol, and have antifungal, and antioxidant, activities. The pericarp of the fruits is reported to contain steroids, terpenoids, flavanoids, tannins and saponins. Interestingly, the seeds also have antioxidant activity as studied on hepatic and cardiac antioxidant enzymes, glutathione content and lipid conjugated dienes in rats fed high fat diet. The antioxidant activity of the seeds was attributed to their ability to activate antioxidant enzymes that catalyze the reduction of antioxidants.⁴ The decoction of seeds is used as a gargle in infection of teeth and gums. Large cardamom seeds are considered as an antidote to either snake venom or scorpion venom.³ In South India, large cardamom is used in the preparation of snuff and agarbatties.¹¹

4.1. *Characteristics of Various Varieties of Large Cardamom*

Ramsey, Golsey and Sawney are the most common cultivars of large cardamom grown in plantations. Ramsey is suitable for sites above 1500 metres whereas Golsey and Sawney are growing at 600-1000 metres and 1000-1500 metres, respectively.²

Characteristics of Various Varieties of Large Cardamom⁸

Character/variety	Ramsey	Golsey	Sawney
Altitude	High	Low to middle	Middle
Extent of cultivation (%)	60	30	7
Status	Tall, vigorous wide clump growth	Less vigorous with erect leafy stem bearing stout upright leaves, clumps medium	Tall, vigorous, bent downwards
Stem colour	Maroonish with dense foliage	Greenish to maroonish	Pinkish with dark green foliage
Flowers	Yellowish and small, corolla tip with pink tinge at base	Yellowish-orange	Yellowish with pink tinge at base of corolla
Capsules	Smaller (16-30 seeds)	Bold to round (40-50 seeds)	Medium bold (30-40 seeds)
Essential oil (%)	1-8	2.3-5.0	1.8-2.5
Shade requirement	Deep shade	Less shade	Moderate to deep shade
Susceptibility to diseases	Susceptible to Chirkey and Foorkey at lower altitudes	Tolerant to Chirkey and Foorkey but susceptible to leaf spots	Susceptible to viral diseases

Source: Rao *et al.* (1993a).

5. Origin and Historical References

Cardamom is probably one of the oldest spices known to mankind. In India, it was used as early as the 6th century BC in Ayurvedic preparations, as mentioned by Susruta.¹

Sikkim was first inhabited by the aboriginal bands from the Archaic Period of human migration (c. 38,000 – 2,500 BC). For the hunter-gatherers of the world, agriculture was not even a conscious choice between food production and hunting gathering. The indigenous people of Sikkim were at that stage of go-between as late as the middle of the nineteenth century when Dr JD Hooker visited Sikkim in 1849. Only in the last decade of nineteenth century (1890s AD), the Colonial British Administration started settlement of the ethnic people of *Lepchas*, *Bhutias* and *Nepalese* by clearing the forest and started settled agriculture on permanent basis. The people of Sikkim before 1890s were shifting cultivators. They were not allowed permanent settlement by the chiefdoms. Settled agriculture in Sikkim was initiated by British Administration's political officer, Sir JC White in Sikkim in 1889.⁷

The first inhabitants of Sikkim, the Lepchas, collected capsules of large cardamom from natural forests, but these forests eventually passed into village ownership and the crop was domesticated. However, 1316 ha of reserved forest in Sikkim are still being used for under canopy large cardamom cultivation. Farmers lease the land but have no rights to cut trees.^{1, 2} Seven wild species of *Amomum subulatum* can still be found in the region, which is a proof for the crop being a native to this place.¹

For centuries people of Sikkim Practised Jhum Cultivation or Shifting Cultivation during the rule of Namgyal Dynasty before 1890s and large cardamom was one of their major spice crop.⁷

The cropping pattern changed radically after Sikkim's merger with India in 1975. The change in the area under cultivation of various crops has been tabulated below, which shows large cardamom has always been a major cultivated crop in the state. Currently about 23,679 ha is under large cardamom cultivation in the state. (spice board)^{1, 5}

Changes in the size of areas (x 10³ ha) under different crop cultivation in Sikkim (source:

Department of Agriculture, Government of Sikkim).¹

Crops	1975-1976 (area × 10 ³ ha)	1985-1986 (area × 10 ³ ha)	1995-1996 (area × 10 ³ ha)
Common crops			
Cereals	47.25	69.70	72.57
Pulses	1.70	5.50	6.73
Oil Seeds	1.50	6.70	9.73
Vegetables/fruits/tubers	2.60	8.67	10.00
Cash crops			
Mandarin oranges	1.40	4.60	6.60
Potatoes	2.40	5.00	5.50
Ginger	0.50	2.30	4.50
Large cardamom	10.00	20.90	23.50
Total cash crops	14.30	32.80	40.10
Total cropped area	67.35	123.37	139.13

6. Geographical Area of Production

6.1. Production

Sikkim is by far the largest producer of large cardamoms, not just in India but globally. As per the spice board data, the state produced 3310 metric tonnes (MT) of large cardamom, of the overall Indian production of 3918 MT in 2010 -11, thereby accounting for 84.5 percent of the country's production.^{5,9}

Large cardamom is grown where the mean annual rainfall is in the range of 1500-3500 mm and the maximum and minimum temperatures are 33 °C and 6 °C, respectively. The species is cultivated between altitudes of 600 to 2000 metres, the higher the altitudes the greater is the intensity of cultivation. Frost and hail storms are injurious at the plants flowering stage. Cardamom plantings are established mostly on undulating and untterraced sites with little disturbance of the soil and flora. The slope on these sites varies from 35 to 81 percent. On gentle slopes planting is directly done into pits but on medium and steep slopes terraced beds are used. Yields are greatest on the gentle slopes. North and north east aspects are preferred to reduce exposure to direct sunlight.²

About 16,949 cardamom holdings have been recorded in Sikkim, covering the total 23,679 ha under cultivation out of which the area that gives agronomic yield is about 16148 ha (Year 2010-11). About 30 percent of area under cultivation is holdings that are 1 to 3 hectares in size.^{2,5,9}

Sixty five percent of the plantation holdings cover less than 1 hectare and make up only 18.2 percent of the total area under large cardamom. The largest holdings are 15-20 hectares in size and contribute 14 percent of the total plantations area. Most of the plantations (90.6 percent) are

owned by Bhutia and Lepcha land lords. A large area of old plantations is without shade of trees and crossed the productive plantation life of 20-25 years.²

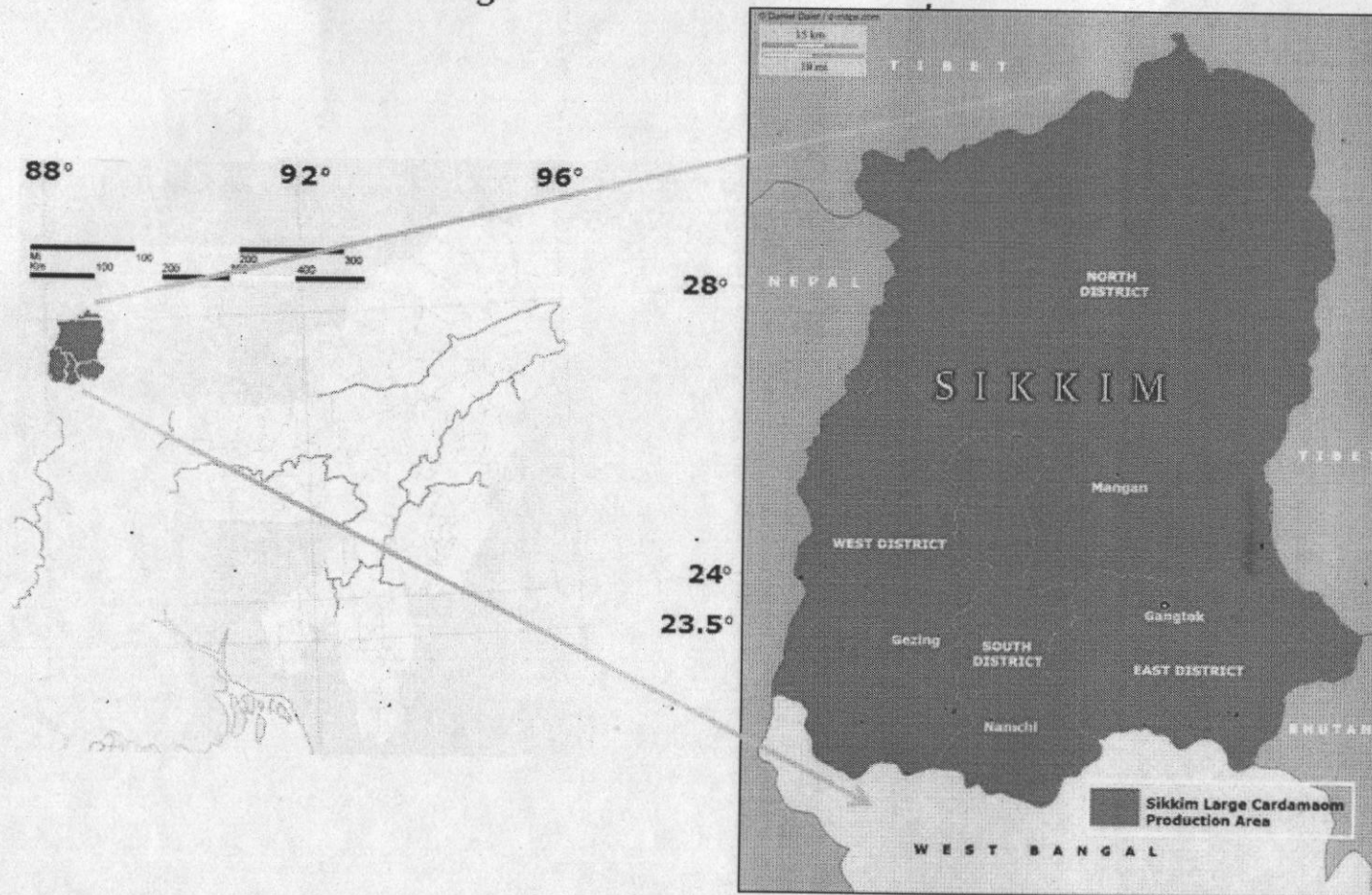
6.2. *Area & Production of Large Cardamom in Sikkim and All India (Source Spice Board)*⁹

(Area in Ha, Production in Tonnes)									
States	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
	Prodn	Prodn	Prodn	Prodn	Prodn	Prodn	Prodn	Prodn	Prodn
Sikkim	4650	5401	4980	4477	3910	4305	3678	3541	3310
All India	5300	6154	5773	5185	4480	4919	4305	4179	3918
States	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
	Area	Area	Area	Area	Area	Area	Area	Area	Area
Sikkim	26734	26734	26734	26734	26734	NA	NA	NA	23679
All India	30008	30039	30039	30039	30039	3305	3305	3305	26984

About 17,000 farmers in Sikkim cultivate large cardamom but more than a lakh are dependent on it for their livelihoods. However, the situation of the crop over the last few years has not been encouraging. After reaching a peak production of 5401 MT in 2003-04, the state's production has continuously declined. This has happened in spite of the area under cultivation for large cardamom remaining more or less the same during these years.⁵

Most cardamom plantations in Sikkim are at least three decades old resulting in declining yields. However, new plantations are now replacing the older ones. The decline in yield has been further accentuated by disease and pest infestation, mainly two viral diseases, Chirkey and Foorkey. Management of these pests and diseases is of utmost importance to increase productivity.⁵

6.3. Map of Sikkim Large cardamom cultivation area



Sikkim Large Cardamom production area lies between 27° 04' North to 28° 07' North Latitude and 88° 00' East to 88° 55' East Longitude.

7. Methods of Production ^{2, 3, 8, 9}

7.1. Climate and soil

The crop grows well under the shade of forest trees at altitudes ranging from 1000-2000 metres with a rainfall of 3000-3500 mm per annum. Deep and well drained soils with a loamy texture are best suited for cardamom. The soil in Sikkim is generally rich in organic matter and nitrogen, medium in available phosphorus and medium to high in available potash. The soils have a pH range from 4.5 to 6.0. Even though the crop can be grown in undulating and steep terrains, land with a more moderate slope is preferred.

7.2. Cultivars

There are mainly five popular cultivars of large cardamom, viz., Ramsey, Sawney, Golsey, Varlangey and Seremna. Ramsey, Golsey and Sawney are the most common cultivars of large cardamom grown in plantations. Ramsey is suitable for sites above 1500 metres whereas Golsey and Sawney are growing at 600-1000 metres and 1000-1500 metres, respectively. According to an estimated almost 60% of the cultivations is of Ramsey variety, whereas Golsey is the second most popular variety with about 30% of share.

7.3. Propagation

Propagation of large cardamom is done through seeds and suckers. Propagation through seeds enables the production of a large number of seedlings. Virus diseases are not transmitted through seeds and therefore the seedlings are free from viral diseases, if adequate care is taken to isolate and protect the nursery from fresh infection. Plants raised from seeds need not necessarily be high yielder even if they are collected from very productive plants due to cross-pollination. The major pollination is done by bumble bees and the rest by honey bees. Planting suckers on the other hand ensures true to type and high productivity if they are collected from high yielding plants.

Primary nursery

Cardamom seeds are generally sown in September-October. Seed beds are prepared in well drained soil dug to a depth of 30 cm and left for weathering. Raised beds with 15 to 25 cm height, 1 metre width and convenient length, preferably 6 metres, are prepared. Well decomposed cattle manure is mixed with the soil and the surface of the bed is made to a fine tilth. 80-100 gm of seeds are sown per bed in lines spaced 10 cm apart. The seeds are then covered with fine soil and mulched with paddy straw/dry grass (10-15 cm thick). Watering is done at regular intervals to keep the surface of the bed moist. Germination of acid treated seeds commences after 25- 30 days of sowing. When

average germination is noticed the mulch materials are removed. The inter space between rows is then mulched again with chopped paddy straw. Shade *pandals* are immediately erected by using bamboo mats/reed mats or agro-shade nets. The beds are watered regularly and weeding is done as and when required. When the seedlings attain 3-4 leaf stage, they are transplanted to secondary beds.

Poly bag nurseries

Polythene bags of 15 cm x 15 cm with perforations at the base are used for planting the seedlings. The bags are filled with a potting mixture of soil, sand and cow dung in the ratio of 4:1:1. The bags filled with the mixture are arranged in rows of one metre width and of convenient length under shade *pandals*. Seedlings with 3-4 leaves are planted in the bags in April-May and watered regularly. They become ready for field planting in 10- 12 months.

Secondary nursery

Beds of size 15 cm in height and 100 cm in width with convenient length are prepared and well-decomposed cattle manure is mixed with the soil and an even surface is formed. Seedlings with 3-4 leaves are transplanted to the beds in May-June at spacing of 15 cm between them. An overhead *pandal* is erected for providing shade and the soil is kept moist with irrigation. When the seedlings attain a growth of 45-60 cm in height with 2-3 tillers, they are planted in the main field during June-July of the subsequent year.

Sucker multiplication nursery

As mentioned earlier, suckers should be generated only in sucker multiplication nursery where adequate precautions are taken to ensure that viral diseases are not transmitted through the suckers produced. The site for such a nursery should be located at least 500 metres away from large cardamom plantations. They are established either under the shade of forest trees or under shade *pandals* with 50% shade using black agro shade nets. Trenches of 30x30 cm are prepared at convenient lengths with an inter space of 30 cm. Well decomposed cattle manure or compost is mixed with the soil and the trenches are filled to the brim. Then the suckers from high yielding disease free plantations, with one grown up shoot with an emerging bud are planted at 30 cm apart in the trenches. The time for planting is May-June. After planting, the plant base is mulched with dried forest leaves. The multiplication rate in this method is about 1:8 in one year's time. The grown up tillers are split into units of one tiller with an emerging bud and planted in the main field during June-July.

7.4. Planting

Large cardamom grows well in forest loamy soils with gentle to medium slopes. Water logged conditions are detrimental to the growth of the plants. It performs well under shade. *Utis* (*alnus nepalensis*) is the most common and preferred shade tree for large cardamom. The other species of shade trees are *panisai* (*terminalia myriocarpa*), *pipli* (*bucklandia* spp.), *malito* (*macaranga denticulate*), *argeli* (*edgeworthes gardneri*), *asare* (*viburnus eruberens*), *bilaune* (*maesa cheria*), *kharane* (*symplocos* spp.), *siris* (*albizzia lebbeck*), *dhurpis* and Khasi cherry, *katuse*, *faledo* (*erythrina indica*), *jhingani* (*euria tapanica*) and *chillowne* (*schima wallichii*).

7.5. Land preparation

Planting is done during June-July when there is enough moisture in the soil. The land selected for planting is cleared of all undergrowth, weeds, etc., for new planting, or if it is replanting, old plants may be removed. Pits of size 30x30x30 cm are prepared on the contour of the hill at a spacing of 1.5 x 1.5 m after the onset of monsoon showers. A wider spacing of 1.8x1.8 m is recommended for robust cultivars like Sawney, Varlangey, Ramsey, etc. The pits are left for weathering for a fortnight and then filled with topsoil mixed with cow dung or compost at the rate of 1-3 kg. /pit. Seedlings/suckers are planted in the middle of the pit. Care should be taken not to plant the seedlings/rhizomes very deep in the pit. After planting the seedling/suckers may be staked and the base of the plant is mulched with dry leaves.

7.6. Manuring

For a sustained production the soil fertility should be maintained at its optimum. Well decomposed cattle manure or compost and oil cakes may be applied at the rate of 2 kg per plant at least once in two years in April-May. If all the crop residues are recycled in the plantation, application of inorganic fertilizers may not be necessary.

7.7. Weeding

Weed control in the plantations is important for the maximum utilization of the available soil moisture and nutrients by the plant. Three rounds of weeding are required for effective control of the weed growth in the initial two to three years. Weeding can either be hand weeding or sickle weeding depending upon the intensity of weed growth. From around the plant base the weeds can be pulled out by hand and the weeds in the inter space need only be slashed with a sickle. While weeding, dried shoots and other trashed materials can be used as mulch around the plant base to conserve moisture in the ensuing dry months, and to prevent weed growth around the plant base.

7.8. Soil and moisture conservation

Cardamom is mainly grown in hilly terrain. The topography and the wet climate of Sikkim permits soil erosion to a considerable extent. Intensive operations which loosen and expose the soil will increase soil erosion and therefore only minimum tillage operations should be followed. As far as possible, contour terraces may be made well before taking up planting operations. This helps in reducing soil erosion and soil moisture conservation. Though contour terracing is expensive and requires high initial investment, the long term benefit will compensate the initial extra expenditure.

7.9. Irrigation

In some of the large cardamom plantations, water sources are available which can be exploited to irrigate the crop by gravity flow, either through pipes, sprinklers or flood irrigation through open channels. It is observed that productivity is higher in plantations where irrigation is provided. For sustainable and better yield the plants may be watered during the dry months. Depending on the availability of water sources, hose, or sprinkler or flood irrigation through channels can be adopted. Hose irrigation can be done at the rate of 40-50 litres per plant at fortnightly intervals. In case of sprinkler, irrigation equivalent to 35-45 mm of rain at fortnightly intervals is recommended.

7.10. Shade Management

Shade plays a vital role in the cultivation of large cardamom [Dandin, 1980]. The shade trees also serve as a fuel wood source for curing the cardamom, as well as yielding fodder and timber. Quantitative information on the shade requirement is lacking. However, it is recorded that the maximum yields are obtained under moderate to deep shade but excessive shade reduces plant vigour and cardamom yield.

About 30 shade trees species are found in large cardamom plantations (Refer Annexure for list). *Alnus nepalensis*, *Schima wallichii*, *Maesa chesia*, *Ficus cunia*, *F. benjamina*, *Saurauvia nepalensis*, *Maehilus edulis* and *Melia composita* are the most abundant. *A. nepalensis* is the most common species. It is a fast growing, deciduous and nitrogen fixing, although it is not a legume. Therefore, it provides shade quickly, fertilizes the cardamom and yields fuel wood for cardamom curing and other domestic needs. It is essential that old trees are cut to release young natural regeneration. Because, the thick roots of old trees tend to life the cardamom plants, which reduces cardamom yield. It has been experienced that *A. nepalensis* should be cut when its basal diameter reaches 16 cm.

7.11. Pests

Large cardamom is by and large free from the attack of any major pests except for the sporadic incidence of leaf eating caterpillars. Aphids are found in most of the areas which transmit the viral diseases chirke and foorkey.

Leaf eating caterpillar

Initially the caterpillar of the moth *Artana Chorista* feeds on the leaf lamina from under the surface of the leaf and finally defoliates the leaf completely leaving only the midribs. Their incidence is noticed in May-July and October-March. At present these insects are kept under control by their natural enemies. If insecticides are used to control them, then their natural enemies will also disappear which may lead to an outbreak of these pests in epidemic form. The best method of control is to inspect the plantations during May-July and October-March, to handpick the infected leaves along with the caterpillars and destroy them by burning.

7.12. Diseases

Fungal or bacterial diseases are seldom reported in large cardamom. Only minor diseases like leaf streak or rot diseases are found in isolated areas. The major threat to large cardamom is the widespread occurrence of viral diseases, viz., chirke and foorkey. These diseases are seen throughout the large cardamom growing tracts of Sikkim and Darjeeling and cause considerable crop loss. These diseases have spread due to drastic change in the ecosystem, inadequate rain in dry months and absence of good agricultural practices by the farmers. Many cardamom farmers failed to plant varieties suitable to their altitude.

Chirke

The symptoms are characterized by mosaic appearance on the tender leaves with pale streaks, which slowly turns into brown, resulting in withering and drying of the plants. Growth and yield of the affected plants gradually declines and ultimately they perish. The disease is transmitted by aphids. It also spreads by planting infected suckers. Transporting of infected suckers from one area to another leads to the spread of this disease. The disease is also transmitted mechanically through the knife used for harvesting.

Foorkey

Numerous small tillers appear at the base of the affected plants which become stunted and fail to give any yield. Even the inflorescence is noticed to produce unproductive spikes.

Management of viral diseases

- Plants affected by the viral diseases cannot be cured but the losses can be minimized by adopting appropriate management practices.
- Keep a constant vigil to detect disease affected parts.
- Uproot and destroy affected plants as soon as symptoms appear. Repeat detection and uprooting at regular intervals.
- Use seedlings produced in certified nurseries.
- Propagation through suckers is recommended only through certified multiplication nurseries.

7.13. Harvesting

The indication of the time of harvest is when the seeds of the topmost capsules turn brown. To enhance maturity, bearing tillers are cut to a height of 30-45 cm and left for another 10-15 days for full maturity. The spikes are harvested using special knives. The harvested spikes are heaped and capsules are separated and dried.

7.14. Curing

Large cardamom is cured in bhattis, with controlled heat to ensure proper and uniform drying. The cured capsules are rubbed on a wire mesh for clearing and removal of the calyx (tail). The harvested fresh cardamom contains 72-85% moisture. The colour of the fresh capsule may be light pinkish, brownish pink or dark pinkish depending on the variety and becomes darker after curing. The retention of natural colour in the courses of curing is a positive index of quality. The flavour constituents are highly volatile and easily lost when subjected to direct heat and high temperature.

The postharvest technology continues to be largely traditional. Farmers have devised indigenous ways of processing cardamom. The capsules are dried in traditional kiln as given in the figure. Fuelwood is consumed in the ratio of 4:1 for cured cardamom; about 800 kg/ha of wood are required to cure 200 kg/ha of the finished product.



Consumers prefer bold capsules with uniform size having its original dark pink colour. The produce should be free from fungal growth, dust particles or any foreign materials. The cardamom should be dried properly. There should not be any Smokey smell and charred appearance. In general, clean and hygienic products with good appearance are preferred in the market. The natural colour, flavour and its aroma are lost due to mismanagement and defective ways of handling during the course of harvesting, curing, packing and storing.

7.15. Packaging

The properly dried capsules should be allowed to cool and then packed in polythene lined jute bags. The bags may be stored on a wooden platform to avoid absorption of moisture, which may result in fungus growth damaging the stored produce.

8. Specialties of Sikkim Large Cardamom

The finished product of Large cardamom is commercially graded as Badadana (big capsules) and Chotadana (small capsules), Kainchi-cut (capsules for which the tails have been removed by cutting it with a scissors to give it a finished look) or non-Kainchi-cut (capsule tails not removed). For a good commercial finished product the cardamom capsules should retain its brownish colour, minimum moisture and bold sizes containing original flavour and aroma.

This quality not only depends upon a suitable climate and cultivation but also proper post harvest drying of capsules, which is called curing. Sikkim Large Cardamom has a superior quality in comparison to other locations not only because of native environment but also the traditional knowledge of curing which has developed along with the long history of cultivation. Large cardamom is cured in bhattis, with controlled heat to ensure proper and uniform drying. The process is highly skilled manoeuvre mastered only after long continuous practice.

In addition to this, large cardamom is by and large produced organically in Sikkim and the state is on its way to becoming a totally organic state soon. The present status of fertilizer consumption in Sikkim is 20.38 kg per hectare in terms of materials or 10.26 kg per hectare in terms of nutrients, whilst the present consumption rate of pesticides is 24 grams per hectare only, which is far lower than national average.

9. Impact of climatic conditions and human skills

The State receives an Annual Rainfall of 2000mm to 4000mm and consequently the soils are well drained. The temperature in the state stays relatively cool. The soils are mostly loams with varying amounts of coarse material and their pH ranges from 4.3 to 6.4. They are rich in organic matters but tend to be deficient in nitrogen where are Phosphors levels are moderate and there is reasonable availability of potassium.

Brief Characteristics of Soil:

Texture:	Loamy sand silty clay loam
Depth:	From few inches and in some places practically nil several feet deep depending upon the weathering processes it underwent.
Soil Reaction:	All acidic, having PH ranging from 4.3 to 6.4 with mean value 5.37
Organic Matter Content:	High, between 0.36% to 5.61% with mean value 2.74%
Available Nitrogen:	10-280 p.p.m with mean value 99.21 p.p.m.
Available Phosphorous:	4.0-175 p.p.m. with mean value 46.87 p.p.m.
Available Potash:	45 to 490 p.p.m. with mean value 184.71 p.p.m.
Lime Requirement	Most between 2.0 tonnes per acre but various from 0 to 16 tonnes per acre.

Source: NEDFi Databank

In the typical agro – climatic scenario of the state, a cash crop, large cardamom (*Amomum subulatum*), has been a boon to the mountain people of the area. Large cardamom is a perennial cash crop grown beneath the forest cover on marginal lands. Its cultivation is an example of how a local mountain niche can be utilized in sustainable manner.

The crop grows well under the shade of forest trees at altitudes ranging from 1000-2000 metres with a rainfall of 3000-3500 mm per annum. Even though the crop can be grown in undulating and steep terrains, land with a more moderate slope is preferred.

Sikkim Himalayas are the natives of this crop, and the state boost for being the highest producer of Large Cardamom in India. Deep and well drained soils with a loamy texture are best suited for cardamom. The soils in Sikkim have a pH range from 4.5 to 6.0 and they are generally rich in organic matter and nitrogen, medium in available phosphorus and medium to high in available potash which suits well for the cultivation of Sikkim Large Cardamom.

Large cardamom is a shade loving plant and shade plays a vital role in its cultivation. There are about 30 shade trees species found in large cardamom plantations out of them *Alnus nepalensis* is the most common species. It is a fast growing, deciduous and nitrogen fixing, although it is not a

legume. Therefore, it provides shade quickly, fertilizes the cardamom and yields fuel wood for cardamom curing and other domestic needs. During the last 5-6 decades, a large area of agricultural lands such as rice terraces were converted to *Alnus*-cardamom agroforestry using monocultures of N₂-fixing *Alnus nepalensis* as shade tree. About 70% of the cardamom based agroforestry practices in Sikkim are under N₂-fixing *Alnus nepalensis* while 30% are under the mixed-tree agroforestry species. The productivity potential, soil nutrient dynamics, stand energy efficiencies and relative ecological and economic performances of large cardamom grown under *Alnus* trees are better than grown under mix forest tree species.

Large cardamom is cured in bhattis, with controlled heat to ensure proper and uniform drying. The cured capsules are rubbed on a wire mesh for clearing and removal of the calyx (tail). The harvested fresh cardamom contains 72-85% moisture. The colour of the fresh capsule may be light pinkish, brownish pink or dark pinkish depending on the variety and becomes darker after curing. The retention of natural colour in the course of curing is a positive index of quality. The flavour constituents are highly volatile and easily lost when subjected to direct heat and high temperature.

The developmental measures of the "green revolution" implemented in other Indian states were not successful in the Himalayan region because adequate fertilizers were never available on time, irrigation could not be developed, and soils are very fragile. However, the fact that the 'Green Revolution' sidestepped Sikkim has to a certain extent helped the state, insofar as the high usage of associated pesticides and fertiliser is concerned. This has encouraged the state to set a target of making itself an entirely organic state – the first to do so in the country. The cultivation of Sikkim Large Cardamom is also mostly under organic farming.

10. Marketing Chain System Study

10.1. Value Chain for Sikkim Large Cardamom

The Supply Chain in Sikkim The supply chain of large cardamom in Sikkim is quite fragmented and reaches the retail level only after passing through a number of middlemen. Since it is not an essential item of the local diet or a staple food, almost the entire produce from the state is sent for marketing primarily to northern Indian cities and to a lesser extent, to international boundaries directly. The traders purchase cardamom from the producers and grade them according to size and quality and pack them, after which they are sent to commission agents of principal markets such as Delhi, Kolkata, Mumbai, Amritsar, Kanpur, Varanasi and Lucknow. Important market handling large cardamom in Sikkim are Singtam (52 percent of the produce is handled at this market), Gangtok (10 percent), Jorethang (10 percent), Gyalshing (9 percent), Mangan (7 percent), Rongli (4 percent) and

Nayabazar (3 percent). Most of the produce is sold by the traders to the various markets in the country. Delhi is the major consumer of large cardamom (55 percent) followed by Uttar Pradesh (27 percent), Punjab (9 percent), Maharashtra (8 percent) and West Bengal (1 percent).⁵

Major District wise Markets in Sikkim¹⁵

- East – Gangtok, Singtam, Rangli, Pkayang, Dikchu
- South – Ravongla, Jhorethang
- North – Mangel, Phodong
- West – Gyezing, Soreng

The finished product of Large cardamom is commercially graded as *Badadana* (big capsules) and *Chotadana* (small capsules), *Kainchi-cut* (capsules tails removed) or non-*Kainchi-cut* (capsule tails not removed). Pakistan is the single largest export market of large cardamom. Other importing countries are UAE, UK, South Africa, USA, Canada and Australia.^{6,9}

Exports from Sikkim currently occur indirectly, wherein cardamoms are sold to outside traders in dried form and exported to the Middle East and Pakistan through Amritsar.⁵

11. Future Potential and Scope of GI

11.1. The Export Scenario

The decline in production has also spilled over to the external front with total exports from the country falling from 1504 MT in 2006-07 to an estimated 775 MT for the year 2010. However, in terms of value, exports have shown a relative consistence during the period 2006- 07 – from Rs. 17.00 crore to an estimated Rs. 44.62 crore for year 2010-11. This also suggests that the price realisation from exports has increased from an average of Rs. 113/kg to Rs. 576/kg during this period.⁵

However, if trends in export markets is analysed, Middle East and Pakistan appear to be the region exhibiting maximum growth and future potential. A plausible reasoning could be that cuisines in these countries are similar to Indian cuisines comprising a larger proportion of spices as compared to other parts of the world.⁵

11.2. Export of Cardamom from India (Source – Spice Board)⁹

MAJOR ITEM-COUNTRY	MAJOR ITEM-COUNTRY WISE EXPORT OF SPICES FROM INDIA									
	2006-07		2007-08		2008-09		2009-10		2010-11(E)	
	QTY (MT)	VALUE (Rs. LAKHS)	QTY (MT)	VALUE (Rs. LAKHS)	QTY (MT)	VALUE (Rs. LAKHS)	QTY (MT)	VALUE (Rs. LAKHS)	QTY (MT)	VALUE (Rs. LAKHS)
CARDAMOM(LARGE)										
PAKISTAN	1199	1254.08	1082	1106.44	1482	1642.36	758	1195.68	581	3231.58
U.A.E	146	195.41	97	134.66	159	225.99	58	129.30	46	379.88
U.K	81	125.55	67	115.15	92	160.67	79	191.26	39	247.60
SOUTH AFRICA	12	17.80	11	17.44	19	31.91	16	39.11	21	189.81
U.S.A	18	37.88	13	27.85	22	54.05	18	53.99	33	119.29
CANADA	17	23.07	10	19.23	7	12.93	16	36.97	7	42.34
AUSTRALIA	3	7.44	3	5.07	2	5.02	8	21.58	9	24.22
ITEM TOTAL (Incl. Others)	1504	1700.06	1325	1500.01	1875	2280.74	1000	1788.72	775	4462.46

Consolidated year wise export from India over the period of 1995 -96 to 2005 -06⁸

Table 4.1. Export of large cardamom from India.

Year	Quantity (t)	Value (US\$)
1995/96	1677	291.42
1996/97	1628	288.09
1997/98	1648	300.95
1998/99	1288	302.14
1999/2000	1185	419.52
2000/01	1506	583.57
2001/02	1577	569.52
2002/03	1450	489.76
2003/04	924	293.81
2004/05	950	270.00
2005/06	1025	252.38

Source: Spices Board, Cochin, India.

Over the last couple of decades, India has increasingly integrated into the world economy. This has opened up a lot of opportunities for exports from the country. It is this that the state of Sikkim needs to take advantage of, more so in light of the following generic factors:

- Relatively small population resulting in surplus production of high value horticulture and floriculture products
- Nearness to Kolkata port
- Thrust being given by the state government to promote high value low volume products
- Look East policy being adopted by the Government of India in order to diversify the geographical spread of India's international trade as also seize the opportunities in that part of the world.

11.3. Organic Farming

Sikkim has a great potential in organic farming since extent of chemical consumption in farming is far less than the national average. Sikkim with a per hectare fertiliser consumption of 5.8 kg is the least fertiliser using state in the whole of North East except Arunachal Pradesh and Nagaland. In fact, the Government has declared to convert Sikkim into a fully organic state by 2015. Considering that the radical use of chemical inputs for cultivation was virtually absent in Sikkim, the state's objective of turning organic does not appear to be all that difficult. The objective gains increased importance if seen in the light of the fact that world demand for organically produced foods is growing rapidly, particularly in developed markets like Europe, USA, Japan and Australia. In fact, the global organic food market grew by 10.9 percent in 2007 to reach a value of US\$ 43.5 bn and is forecast to reach US\$ 67 bn by 2012.⁵

This movement towards 'sustainable' agriculture has manifested itself in two main movements, namely sustainability through environmental protection by way of organic farming, and or sustainability for the farmers themselves and their livelihood. There can't be a better example for this other than the Large Cardamom cultivation at Sikkim, which has not only conserved the environment and soil of the state but also supported the farmer livelihood better than any other crop.

11.4. Value Addition through Processing

There is a need to move up the value chain through a two step process for drying and extraction of essential oils and oleoresins. A processing cum extraction plant for the purpose of deriving essential oils and oleoresins from large cardamom could greatly enhance the value of exports. Oil extraction and improved drying technique can open new avenues for marketing large cardamom. Oleoresin is one of the most value added products that can be obtained from the large cardamom by the solvent extraction method. Oleoresins can be used in cooking, soft drinks, pharmaceuticals, carminative and antacid preparations in aroma therapy, and in cosmetics as a fragrance component. There appears to be a very good international market for large cardamom oleoresins, which calls for setting up a processing unit in Sikkim – hitherto absent. Exports of cardamom oleoresins from India more than trebled during the period 2005 to 2008 – from US\$ 17 mn to US\$ 54 mn. The major markets for cardamom oleoresins are Russia, Denmark, Germany, France and Egypt. An additional benefit of large cardamom oleoresin production is that after removal of oleoresins from the dry cardamom spices, the residue can be used as an ingredient for animal feed.⁵

11.5. *SWOT Analysis for Sikkim with Respect to GI Registration of Sikkim Large Cardamom*

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> • Availability of a wide variety of agro-climatic conditions facilitating sustainable cultivation of large cardamom • Production of superior quality of Large cardamom because of the long evolved tradition knowledge system • Low volume and high value realization of large cardamom and a long shelf life. • History of organic farming by default (through minimal chemical inputs) for cultivation resulting in maintenance of rich soil nutrients • Proximity to Kolkata port and international markets including Singapore, Bangladesh and Southeast Asia 	<ul style="list-style-type: none"> • Limited cropland resources which are far less productive compared to the plain areas • Dependency of farmers on external sources of improved and hybrid seeds, and planting materials • More than 80 percent of the farmers are small and marginal with fragmented holdings (average less than 0.4 ha) and the per capita availability is too small to promote economies of scale • Inadequate infrastructure – poor accessibility to good quality roads and communication are bottlenecks for marketing of highly perishable horticultural products. Lack of infrastructure for post-harvest management, transport, cooling facilities, processing and value addition and weak extension support • Farm products are marketed without value addition in the state and obtain less • Non availability of airport or rail network implying that the only mode of transport is through road
OPPORTUNITY	THREATS
<ul style="list-style-type: none"> • Opportunity of GI registration and marketing the quality produce to get better share of value chain for the farmers • Availability of cropland is the greatest constraint in mountainous Sikkim. However, the sloping marginal lands could be suitably diversified for large cardamom-forestry systems to meet the farmers' requirement of cash, timber, fuel wood, and sustainable environment, avoiding soil degradation and soil erosion • Increasing international demand for organic horticulture products • Growing popularity among the international community for traditional systems of medicine, which provides an opportunity to explore upon the medicinal properties of Large Cardamom • "Look East Policy" of the Government of India along with the various Regional Trade 	<ul style="list-style-type: none"> • Heavy rainfall and flood during monsoon season washes away roads and bridges, which hampers transportation for marketing • Disease infestation of large cardamom over the last few years • Decreasing productivity of old plantations which are more than 30 year age • Increasing competition from other Large cardamom growing regions within and outside the country • Price fluctuations during the glut-season have farmers selling their produce at low prices

References

- 1 A Boon for Mountain Populations – Eklabya Sharma, Rita Sharma, K. K. Singh, and G. Sharma
GB Pant Institute of Himalayan Environment and Development, Sikkim Unit, PO Tadong, Sikkim-737 102, India. Published By: International Mountain Society
- 2 Large cardamom (*Amomum subulatum* Roxb.) plantation - An age old agroforestry system in Eastern Himalayas – K.A. SINGH, R.N. RAI, PATIRAM and D.T. BHUTIA
ICAR Research Complex for NEH Region, Sikkim centre Tadong (Gangtok), 737102 India
- 3 Cultivation of Large Cardamom in Sikkim - Dr. Anjali Pathak
Organic farming consultant & social activist
- 4 GREATER CARDAMOM (*AMOMUM SUBULATUM* ROXB.) – A CARDIO-ADAPTOGEN AGAINST PHYSICAL STRESS - S.K. Verma, V. Rajeevan, A. Bordia and V. Jain - June, 2010
Indigenous Drug Research Center, Department of Medicine, RNT Medical College, Udaipur-313001, Rajasthan, India, Society for Microvita Research and Integrated Medicine (SMRIM), Udaipur-313001, Rajasthan, India,
- 5 SIKKIM: EXPORT POTENTIAL AND PROSPECTS - OCCASIONAL PAPER NO. 134
EXPORT-IMPORT BANK OF INDIA
- 6 Traditional knowledge systems in large cardamom farming: biophysical and management diversity in Indian mountainous regions - Ghanashyam Sharma, Rita Sharma & Eklabya Sharma, Indian Journal of Traditional Knowledge - Vol. 8(1), January 2009, pp. 17-22
- 7 Indigenous knowledge on bio-resources management for livelihood of the people of Sikkim -J R Subba, Indian Journal of Traditional Knowledge, Vol. 8(1), January 2009, pp. 56-64
- 8 Chapter 4 Large Cardamom - B. Chempakam and S. Sindhu
Chemistry of Spices - Indian Institute of Spices Research, Calicut – 673 012, Kerala, India
- 9 Spice Board of India
- 10 http://www.sikkim.nic.in/sws/sikk_indu.htm
- 11 Amomum subulatum Roxb. has medicinal potential - Ashwani Kumar
<http://www.science20.com/print/61072>
- 12 http://www.sikkim.nic.in/sws/card_card.html and
http://www.sikkim.nic.in/sws/card_harv.html
- 13 <http://www.sikkiminfo.net/govt/horticulture.htm>
- 14 Mr. G C Chauhan, Ad. Director, Spices, Dept. of Horticulture, Gangtok, Sikkim
- 15 Mr. P P Kannel, Deputy Director, Marketing, Spice Board, Rongpo, Sikkim
- 16 National Collateral Management Services Limited (NCMSL) laboratory, Hyderabad

Annexure

Various tree species for cardamom shade management⁸

Table 1. Shade tree species their uses and relative distribution in large cardamom plantations.

Shade tree species	Frequency of occurrence out of 13 places	Range of relative density in plantations (%)	Altitudes of Occurrence and plant characteristics
(1)	(2)	(3)	(4)
<i>Fuel and minor timber:</i>			
1. Utis (<i>Alnus nepalensis</i>)	12	5-95	900 to 3000 m. A deciduous tree flowering after the leaves dropped.
2. Chillowane (<i>Schima wallichii</i>)	7	2-73	600 to 1500 m. A tree of 25 to 30 m height.
3. Malato (<i>Macaranga denticulata</i>)	4	9-14	900 to 1500 m. A small ever green tree.
4. Argalli (<i>Edgeworthia gardeneria</i>)	3	3-9	1500 to 2100 m. A large much branched shrub with stout branches.
5. Billowane (<i>Maesa chesia</i>)	3	6-56	600 to 2400 m. A 10 m tree often a shrub.
<i>Timber trees:</i>			
6. Kharani (<i>Symplocas theaefolia</i>)	2	10-17	1500 to 2400 m. An erect tree often 15 m branches glabrous.
7. Lapsi (<i>Melia composita</i>)	2	3-26	Tropical Himalayas. A large handsome tree. Fruits used for pickle.
8. Okhar (<i>Juglans regia</i>)	3	3-11	900 to 3100 m. A large deciduous tree attaining 30 m height with a trunk of 3 m in girth.
9. Katuse (<i>Castanopsis tribuloides</i> , <i>C. indica</i>)	3	3-5	Tropical to sub-tropical Himalayas. An exceedingly variable tree of 12 to 18 m. Variety longispina 310 to 1220 m variety forox 1220 to 2100 m.
10. Asare (<i>Viburnum erubescens</i>)	1	17	910 to 3100 m. A small tree.
11. Panisaz (<i>Terminalia myriocarpa</i>)	2	2-10	310 to 900 m. A tree of 24-31 m height.

Table 1. Shade tree species their uses and relative distribution in large cardamom plantations.

Shade tree species (1)	Frequency of occurrence out of 13 places (2)	Range of relative density in plantations (%) (3)	Altitudes of Occurrence and plant characteristics (4)
12. Siltimbur (<i>Shorea robusta</i>)	1	5	Tropical Himalaya. A very large tree but often occur in stunted form.
13. Siris (<i>Albizia julibrissin</i>)	3	3-21	1800 to 2100 m. A small size unarmed tree.
14. Tuni (<i>Toona ciliata</i>)	1	5	915 to 2440 m. Flower used for dying.
15. Chuletro (<i>Brassiopsis mitis</i>)	2	2-15	1200 to 2440 m. An erect small tree of 6m. Leaves one feet diameter prickly young branches.
16. Khasro (<i>Ficus hirta</i>)	1	9	Tropical Himalaya. A small tree or shrub.
17. Nevaro (<i>Ficus hookeri</i>)	3	9-20	305 to 1830 m. A small tree, leaves 13-25 cm.
18. Bur (<i>Ficus bengalensis</i>)	1	10	Sub Himalayan region. A tree of 20-30 m rooting from branches.
19. Lute/Rai Khanyun (<i>Ficus cunia</i> /F. <i>ben-jamina</i>)	3	7-38	Sub Himalayan region. A low tree with heavy foliage.
20. Dudhillo (<i>Ficus nemoralis</i>)	2	5-15	457-1980 m. Sometime up to 2440 m. A small glabrous tree.
21. Gogun (<i>Saurauvia nepalensis</i>)	5	2-33	1525 to 2150 m. A moderate size tree.
22. Jhingani (<i>Eurya japonica</i>)	2	17-21	1525 to 3050 m. a shrub of 3 to 4 m height.
23. Kawla (<i>Machilus edulis</i>)	2	2-20	Ascending to 1830 m. An ever green tree.
24. Phuta (<i>Celtis cinnamomea</i>)	1	19	Ascending to 1525 m. An ever green tree.
25. Bepari (<i>Balisporium corymbiferum</i>)	1	7	1220 to 1525 m. An erect slender shrub of 2 to 3 m.

Table 1. Shade tree species their uses and relative distribution in large cardamom plantations.

Shade tree species	Frequency of occurrence out of 13 places	Range of relative density in plantations (%)	Altitudes of Occurrence and plant characteristics
(1)	(2)	(3)	(4)
26. Gineri (<i>Pieris ovafolia</i>)	1	8	915 to 2440 m. A tree of 6 to 12 m.
<i>Others, Thatch, fodder, hedge, fruit, etc.:</i>			
27. Falado (<i>Erythrina arborescens</i>)	1	3	Ascending to 2150 m. A low tree with prickly branches, legume. Used as hedge grow.
28. Choya bans (<i>Dendrocalmus sik- kimensis</i>)	1	10	Tropical Himalayan bamboo of 25 m height and 10-20 cm girth.
29. Parang (<i>Arundinaria hookeriana</i>)	2	5-10	1220 to 2150 m. 5 to 6 m in height.
30. Banana (<i>Musa spp</i>)	1	12	Tropical to subtropical Himalayas Fruit plant.