

The study on ecofriendly practices of large cardamom (*Amomum subulatum* Roxb.) cultivation in Sikkim and Darjeeling region

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ABSTRACT

Large cardamom is an important cash crop of Sikkim and Darjeeling district of West Bengal. About 80-85 % of large cardamom is being produced annually from these regions, which are emerging as India's organic large cardamom hub. Most of the tribal farmers living in remote places are following traditional methods of large cardamom cultivation, which are eco-friendly, less expensive due to utilization of local resources, knowledge and labour. Traditional agricultural practices can play a key role in the design of sustainable and eco-friendly agricultural systems, increasing the likelihood that the rural population will accept, develop and maintain innovations and interventions. Eco-friendly agriculture implies the use of organic nutrients and adoption of natural methods of plant protection in place of fertilizers and pesticides. Hence, realizing the importance of sustainable agriculture of farming systems that are environmentally sound, profitable production and maintain the social fabric of the rural community, this study was undertaken to establish and enhance rural environment. Documentation was done to keep record of prevalence of practices for the coming generation.

Key words: Eco-friendly, Large cardamom, Traditional practices.

Introduction

Green revolution technologies have more than doubled the yield potential of agriculture product. Those high input production systems requiring massive quantities of fertilizers, pesticides, irrigation and machines, however, disregard the ecological integrity of land, forests and water resources, endanger the flora and fauna and cannot be sustained over generations. In this context, eco-friendly methods are being considered as environmentally safe, selective, biodegradable, economical and renewable alternative for use in organic farming system (Manimozhi and Gayathri, 2012). Large cardamom (*Amomum subulatum* Roxburg) belongs to the family Zingiberaceae under the order Scitaminae is an im-

portant spice crop in India. It is indigenous to moist and semi evergreen forests of Sikkim, the Darjeeling hills and to some extent in North Eastern states like Arunachal Pradesh, Nagaland, Mizoram, Manipur, Meghalaya and Assam. Nepal and Bhutan are the others two Himalayan Countries where large cardamom cultivated. It grows wild in forest ecosystem and also domesticated in the sub-Himalayan region, at altitudes ranges from 1000 to 2200 m above mean sea level (Rao *et al.*, 1993). It is a shade loving plant (sciophyte) grown in tracts with well distributed rainfall spread around 200 days with a total of 3000 -3500 mm/year. Its local names are *bada elaichi* in Hindi and *alainchi* in Nepali. Sikkim is the largest producer of large cardamom and constitute lion share of Indian and World market. The *Lepchas-*

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were believed to be the first to collect large cardamom capsules from natural forests primarily for the purpose of medicine and as an aromatic edible wild fruit (Sharma *et al.*, 2000; Sharma *et al.*, 2009). While those large cardamom forests eventually converted into ownership and the crop was domesticated in the process. Large cardamom is used for various food preparations, in confectionaries, making perfumes and other medicines. The seed contain 3% essential oil rich in cineole which is used as flavoring agent and spice. It is a perennial herb and grown under mixed forest tree in Eastern Himalayas.

Material and Methods

The study was conducted in large cardamom growing areas of Sikkim and Darjeeling regions in the year 2011-12. Participatory Rural Appraisal (PRA) methodology was adopted to identify and document the traditional practices followed by the farmers for large cardamom cultivation. Key informants including progressive farmers belonging to small, marginal and big farmer categories, aged farmers, farm women and farm labourers were involved during the process of data collection. By contacting the respondents through one to one interaction and group discussion methods the traditional practices used by farmers for large cardamom were documented. Triangulation exercise was also done in the study areas to gather reliable information. In addition, various literatures were surveyed to know the indigenous traditional knowledge in large cardamom cultivation.

Results and Discussion

Area and production

Total area of Sikkim and Darjeeling district of West Bengal under large cardamom cultivation as re-

corded in 2011-12 was 26,459 ha of which 23154 ha was recorded from Sikkim and 3305 ha from Darjeeling district of West Bengal. Total production of large cardamom from Sikkim and Darjeeling district of West Bengal in 2011-12 was recorded to be 3863 MT. Large cardamom production was highest in Sikkim (3237 MT) followed by Darjeeling (626 MT). Among 4 districts of Sikkim, East district (1036 MT) was ranks first in term of production followed by South district (824 MT), West district (722 MT) and North district (655 MT) (Spices Board, 2012). Total area (ha), yielding area (ha), number of holding (approx.), average yield (Kg/ha) and production (MT) is represented in Table 1.

Plantation establishment and management

There are mainly six popular cultivars of large cardamom *viz.*, Ramsey, Ramla, Sawney, Varlangey, Seremna and Dzongu Golsay. Large cardamom is generally grown in forest loamy soils having soil depth of few centimeters to several inches. Colour of large cardamom soil ranges from brownish yellow to very dark greyish brown. Texture varies from sandy, sandy loam, silty loam to clay. In general, large cardamom soils are acidic in nature and majority of soils have pH ranges from 4.5 to 6.0. Because of steepness of the terrain, chance of water logging is less, and water logged conditions are not suitable for the plants and adequate drainage is quite essential for the better stand of the crop. The ideal time for planting large cardamom in Sikkim & Darjeeling is May to July, preferably during June - July when the intensity of South West Monsoon is low. By this time, the planting materials i.e., mature tillers with 1-2 immature tillers/vegetative buds become ready. Mulching is done at the plant base using dried organic matter, leaves, weeds etc. Mulch improves the soil condition and the soil fertility.

Table 1 Area and production of large cardamom in 2011-12 in Sikkim and Darjeeling district of West Bengal.

District(Sikkim)	TotalArea (Ha)	Yielding Area (Ha)	No. of holdings (Approx)	Av. Yield (Kg/Ha)	Production (MT)
North	6973	3642	3300	180	655
East	6965	4866	5200	213	1036
South	4597	3640	2900	226	824
West	4619	3354	5100	215	722
Sikkim Total	23154	15502	16500	208	3237
Darjeeling Total	3305	2715	6600	230	626
Grant Total	26459	18217	23100	219	3863

Agro-biodiversity

Large cardamom grows well in forest loamy soils with gentle to medium slopes. Luxuriant growth is observed nearby perennial water sources. However, water logged condition is detrimental to the plants. It is shade loving plant (Sciophyte). It is noticed that heavy shade or less shade hinders crop growth and production. Large cardamom agro-forestry practice support conservation of tree biodiversity in the region. Biodiversity is an important indicator for the sustainability, and biological diversified systems such as cardamom based traditional agro-forestry have a greater capacity for adaptability, ecological resilience and show more sustenance. Such agro-forestry helps in soil and water conservation by proper land-use, protecting from deterioration of soil quality. The system help in increasing of organic matter and nutrient levels in soil, control soil erosion and soil conservation by improving the fertility levels. It also plays an important role in the conservation of water and thus helps in providing quality water for local consumption. The large cardamom agro-forestry practice also acts as a habitat for pollinators and biological control agents of pests and diseases. It supports birds and other wildlife which influences the ecological structure and functioning of ecosystem. It helps in maintaining biological diversity. Due to its shade loving nature, large cardamom is playing an important role in reducing deforestation. Hence it is regarded as the best landscape management for biodiversity conservation and excellent slop management, soil fertility maintenance and resilience to extreme conditions (Sharma *et al*, 2008). *Utis* (*Alnus nepalensis*) is

the most common shade tree and *Utis*-cardamom is a very good agro-forestry system for sustainable production in the region. The other species of shade trees that are commonly used by most of the farmers are Panisaj (*Terminalia myriocarpa*), Pipli (*Bucklandia* sp.), Malito (*Macaranga denticulate*), Argeli (*Edgeworthes gardneri*), Asare (*Viburnus eruberens*), Bilaune (*Maesa Cheria*), Kharane (*Symplocos* sp.), Siris (*Albizzia lebbeck*), Faledo (*Erythrina indica*), Jhngani (*Eurja tapanica*), Chillowne (*Schima wallichii*) etc (Gupta *et al*, 2012). The alder (*Alnus nepalensis*) based cropping pattern is commonly practiced.

Land Preparation

Most of the tribal farmers living in remote places are following traditional methods for land preparation. Pits are prepared with appropriate spacing from the centre of the pits. Pits are left open for weathering for a fortnight and then filled with topsoil mixed with cow dung compost / FYM @ 1-3 kg per pit. Pit making and filling operation are completed in the third week of May before the onset of pre-monsoon showers.

Application of manure and irrigation

Application of manuring is done by well decomposed cattle manure once in year. Most of the farmers recycled all the crop residues in the plantation and FYM / organic materials etc are applied as and when required. In most of the traditional plantations, farmers depend on rainwater for irrigation. They mostly used bamboo water channel for tapping of steam and spring water to irrigate large cardamom plantations during dry season. It is an in-



Fig. 1. Large cardamom plantation under 50% forest shade trees



Fig. 2. Large cardamom plants in a traditional farming system

digenuous system made from bamboo (Fig. 4). The farmers of Sikkim and Darjeeling regions mostly used this system since bamboos are locally available and cheap. Bamboos of varying diameters are used for laying the channels. About a third of the outer casing in length and internodes of bamboo pieces have to be removed while fabricating the system.

Weed control

Weeding is generally done by using a traditional knife known as "sickle" or by hand depending upon the intensity of weed growth. From around the plant base weeds are pulled out by hand and in inter-space needs only slash with sickle. While weeding dried shoots and other thrashed materials are used as mulch around the plant base.

Indigenous plant protection practices

Among the insect pests that attack large cardamom, leaf caterpillar (*Artona chorista* Jordon) and stem borer (*Glyphipterix* sp.) are considered as important pests of the crop. The fungal diseases, particularly the *Colletotrichum* blight and viral diseases *Chirke* and *Foorkey* are major threat to this crop. The farmers in these regions have been following eco-friendly pest and disease management practices. The diseased plants are uprooted and destroyed as and when they are seen. Some farmers also used to take disease infected plant to an isolated place, chopped into small pieces and buried in pits for quick decomposition. Traditional pest management practices were followed by the farmers. It is adopted to manage house hold pest also. Ash and leaf extract are commonly used to manage pest (Table 2).

Harvesting and curing

The indication of time of harvest is when the seeds



Fig.3 Fresh capsule of large cardamom



Fig. 4. Bamboo water channel

Table 2 Traditional practices of pest management in Sikkim and Darjeeling

Sl/No.	Traditional practice	Against pest
1.	Collection and burning of infested part	Leaf caterpillar, stem borer and shoot fly.
2.	Leave extract – Titepati, Chillowney, Indreni and Tobacco	Chewing and sucking Pests.
3.	Field exposures to Sun shine & Bird	Soil insects mainly white grub.
4.	Application of ash and ash solution	Ants and aphids.
5.	Covering of Cardamom clump with dried leaves / small branches	Mammalian Pest viz., civet, wild boar and deer.
6.	Crop rotation	White grub and other soil borne insects.
7.	Drainage / Flooding	Soil insects – white grub.
8.	Kerosene	House hold pest / Ants.
9.	Mint leave	House hold pest / House fly.

of top most capsules turn brown. As soon as the said colour appears and to enhance maturity bearing tillers are cut at a height of 30-40 cm from ground and left for another 10-15 days for full maturity. The spikes are harvested by using traditional knives known as "Elaichhuri" by the farmers of these regions. The harvested spikes are heaped and capsules separated and dried. The cured capsules are rubbed on wire mesh for cleaning and removal of calyx (tail). Traditionally cardamom is cured in *Bhatti*, where capsules are dried by direct heating. Under this system the cardamom comes in direct contact with smoke which turns the capsules to dark brown or black with smoky smell.

Packing and storage

The dried capsules are allowed to cool and then packed in polythene lined jute bags. Most of the farmers in Sikkim and Darjeeling regions stored the bags on wooden platform away from sidewall to avoid absorption of moisture and thereby to avoid fungal growth on the stored produce.

Gender roles in large cardamom cultivation

Man and women do almost all works from land preparation to capsule storage. However, their role depend more on the family situation than on gender or ethnicity. In a family with more male members, male works in the fields, whereas in families with fewer men, women work equally with men. Both men and women actively participated in land preparation and pit formation. Planting, manure application is done by both men and women. Mulching is done mostly by men, although women help as when required. Weeding is done mostly by women. Harvesting is done by men and plucking of capsules

from spike is mostly done by women and children. Curing in *bhatti* is done by men and removal of tail (calyx) from dried capsule is done by women and children, although men help as when required.

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