SHADE MANAGEMENT FOR HIGH PRODUCTIVITY IN CARDAMOM

(*Elettaria Cardamomum* Maton)

V. S. KORIKANTHIMATH
National Research Centre— for Spices,
Cardamom Research Centre,
Appangala, Heravanad P. O.,
Madikeri-571 201,
Kodagu, Karnataka.

The natural habitat of cardamom is the evergreen rainforests of Western ghats in South India. Cardamom being a pseophyte, is very sensitive to moisture stress and performs comparatively better in a cool enviornment. Shade regulates moisture as well as temperature and provides congenial micro climate for cardamom. Hence, provision of shade and its regulation are deemed to be very important. Cardamom is one of the few plantation crops which can be cultivated with least disturbance to the natural forest growth. Cultivation of cardamom in evergreen forests not only helps in restoration of natural ecosystem but also in becoming financially viable for management wherein benefits from both cardamom and tree culture can be derived.

Although cardamom is a shade loving plant, excess shade is quite detrimental (Anonymous, 1976; Kololgi, 1976). In areas where the trees are too much over crowded with a packed canopy casting dark and dense shade, lopping of excessive and undesirable branches so as to allow sufficient light penetration is quite essential. The shade has to be regulated based on lay of land, moisture retentivity etc. so as to get 50-60% filtered sunlight for better performance of cardamom.

An attempt is made here to highlight the importance and impact of shade regulation for overall increase in productivity of cardamom.

Effect of shade

Cardamom grows well under moderate natural shade. Filtered shade is ideal for cardamom which activates the plants metabolic processes resulting in vigorous growth and high yields. Under inadequate light, uptake of plant nutrients is restricted and there may not be response to the added fertilizers. The microclimate prevailing under optimum shade conditions favours better root development. There will be wide fluctuation of soil moisture and temperature when soil is exposed to direct sun (Korikanthimath, 1983).

The computed dry cardamom yield per hectare with high density planting (9000 plants/ha) was 1873 and 1928 kg. under medium light (40-45%) and high light (65-70%) respectively as against 864 under low light (15-20%) intensity. Plants under medium light produced heavier capsules (75.60g/100 capsules) as compared to plants under high light (72.30g) and low light

(71.00g). Harvest index under medium was 0.073 as against 0.066 under low light and 0.057 under high light (Sulikeri, 1986).

It is noticed that in the border areas where cardamom plants are exposed to the direct sun, severe scorching associated with an accentuation of pests (mites) and diseases (chenthal) are often pronounced. Weeds grow luxuriantly in the open areas and pose a great problem in the management of cardamom plantations.

Shade requirement

This varied from place to place depending on the lay of the land, soil type, rainfall pattern, crop combination etc. (Abraham, 1965). Comparatively lesser shade is required in the northern and eastern slopes. Cardamom plants can afford less shade in areas where well distributed and adequate rainfall is received. In Guatemala which receives well distributed rainfall round the year cardamom is grown practically in open areas with either no shade or one or two odd trees here and there (Anonymous, 1977).

In general Malabar type of cardamom is less sensitive to sunlight and drought conditions than Mysore type.

Cardamom plants receive reduced light filtered through a continuous overhead canopy provided by top storey of the orginal evergreen forest. Under the plot system of cultivation (Malai), cardamom plants receive full sunlight for a few hours in the morning and during rest of the day they are covered by deep shadow cast by surrounding forest trees. Thus cardamom plantations are well protected (Main, 1951).

- Shade regulates moisture as well as temperature and provides congenial microclimate for cardamom.
- Weeds grow luxuriantly in the open ares.
- Cardamom plants can afford less shade in areas where well distributed and adequate rainfall is received.
- Malabar variety is lees sensitive to sunlight and drought conditions than Mysore type.

It is a common practice to interplant cardamom with arecanut in certain parts of Karnataka and Kerala. Arecanut palms provide an adequate shade to cardamom plants. Interplanting of cardamom with coffee is also gaining an impetus in recent years. The association of coffee with cardamom provides a congenial microclimate and taps solar radiation at different intervals i. e. heights (Korikanthimath, 1988).

Cardamom can afford lesser shade in valley bottoms and flat lands which have got better retentivity of soil moisture.

Beneficial aspects of shade trees

Shade trees regulate soil moisture and temperature and provide congenial microclimate. Availabiltty of leaf litter from shade trees for mulching and enriching soil fertility need no emphasis.

The leaves falling from the shade trees provide enough mulch material. Mulching is quite essential and beneficial in cardamom estates to combat drought by conserving soil moisture minimising temperature fluctuations, improving physical properties of soil and suppressing weed growth. Mulchiug is a most important cultural operation to combat dry spell as nearly 75-80 per cent of the plantations are still under rainfed condition.

Cardamom growing soils are generally high in fertility status. The presence of shade trees is an important factor responsible for high fertility status of soil through addition of leaf fall. The biocycling of nutrients takes place in cardamom estates.

The shade trees provide a suitable microclimate by providing cool atmosphere required for proper growth and yield of cardamom. Trees prevent passing through of descicating wind from hinterlands, create a congenial microclimate. The role of trees in receiving rainfall needs no emphasis.

4. Ideal shade trees

As cardamom is generally cultivated in forest land and all kinds of trees that are grown in the forests are maintained as shade trees. An ideal shade tree in cardamom plantation is expected to have the following characteristics (i) wide canopy, (ii) minimum side branching, (iii) no shedding of leaves during flowering phase of cardamom so that pollination is not affected by self regulating of shade during mosoon and summer (George etal, 1984).

It is desirable to maintain a few medium sized shade trees which facilitate shade regulation. It is preferable to have a system of mixed shade trees so as to maintain more or less optimum conditions throughout the year.

The main considerations while selecting the shade trees are adptability to the climate, rate of growth and ease of establishment. Some of the suitable common shade trees in cardamom estates are: Balangi (*Acrocarpus fraxinifolius* wt.) Nili (*Bischofia javanica* Blum & Jack (*Artocarpus heterophylls* Lamk), Red cedar (*Cedrella toona* Roxb), Karna (*Vernonia monocis* C. B. Clarke), Karimaram (*Diospyros ebenum* Koenig) etc (Rai 1978). African shade tree (*Maesopsis eminii*) is a recent introduction in cardamom estates (Korikanthimath, 1983).

The shade tree species which often carry crowded crown of canopy are proved to be quite undesirable for cardamom cultivation as they hardly allow any filtered sunlight which is quite essential for enhancing tillering and yield. *Erythirina lithosperma* and *E. indica* are most unsuitable for cardamom as they compete for nutrients and soil moisture (shallow rooted) and act as alternate host for nematode. Undesirable shade trees may be replaced with good ones.

Shade regulation

Before raising cardamom plantations in virgin forest areas, the undergrowth is cleared and overhead shade is regulated by lopping the tree branches to provide adequate shade to cardamom plants. Filtered shade is essential especially in the early years for production of tillers and vigorous growth of cardamom plants.

- Arecanut palms provide an adequate shade to cardamom plants.
- Inter planting of cardamom with coffee is gaining an impetus in recent years.
- An ideal shade tree in cardamom plantation is expected to have the following characteristics.
  - (i) wide canopy
  - (ii) minimum side branching
  - (iii) no shedding of leaves during flowering phase of cardamom.

To provide adequate light during rainy season when the intensity of light is less, it is necessary to carry out shade regulation before the onset of monsoon. It is equally important to ensure that shade tress put sufficient flush of leaves and provide adequate shade by the time summer sets in. In overhead canopy should, therefore, be regulated once in a year during May-June.

Usually many planters are averse to regulate shade as they believe that cardamom requires dense shade. While this is true as far as summer months are concerned to some extent in rainfed areas, excess shade is found to be always detrimental as it affects tillering and growth of cardamom (Krishna, 1970).

The shade trees like red cedar which shed their leaves in monsoon provide natural shade regulation.

Two tier canopy is desirable with a height not more than 3 m in between the lower and higher canopy. Areas exposed to Western side should have more shade.

Deforestation and its effect on climate in cardamom estates:

A cool humid microclimate is the ideal condition for cardamom that prevail in the forests of Western ghats. With the denudation of forests in the Western ghats, the normal ecosystem was affected destabilising the microclimate and rainfall in the cardamom growing tracts. With the onset of dry season the

cool humid microclimate in the plantation is rapidly changed as the hot wave of air from the hinter lands pass across the cardamom tracts without much hindrance due to deforestation all round the cardamom pockets, with the consequence cardamom has to face incliment enviornment resulting in poor growth and yield.

i) Rainfall

Due to indiscriminate deforestation the distribution of rainfall particularly the premonsoon showers in the Western ghats is affected though there is not much difference in the total average quantity of rainfall. The receipt of premonsoon showers during February to May is most crucial for cardamom for panicle initiation. The failure of showers during April-May could result in poor crop as majority of the cardamom estates are rainfed (Ratnam and Korikanthimath, 1985).

ii) Wind effect

Wind velocity is increased as there is no wind breaks i. e. absence of trees after deforestation. Due to high velocity of wind the rate of transpiration and evaporation will be increased. Moreover, plants suffer due to the physical pull of the high velocity of wind. The enhanced evaporation and transpiration deplete soil moisture rapidly (Abraham etal, 1979). Cardamom being a moisture loving plant is greatly affected by dry winds.

iii) Disturbance in soil temperature

On removal of trees, filtered sunlight is cut off and the soil becomes exposed to direct radiation which increases the soil temperature. This upsets the ecological balance and the microclimate in plantations, plant growth as well as chemical snd biological activities on the soil are greatly influenced by the soil temperature.

- Only the crowded canopy and shade branches need to be regulated.
- Cardamom requires filtered light for its proper growth and yield.
- The shade in cardamom plantation is often said to be "Necessary evil".

iv) Pest out breaks

The ecological upset particularly the edaphic factors has added new pest problems in cardamom plantations. Many pests which were considered as minor are assuming alarming proportion in many cardamom growing pockets. Root grubs has emerged as a serious pest in most of the cardamom growing zones in the Western ghats (Gopal Kumar, etal, 1987). More population of root grubs is seen in exposed, warm and less shaded conditions. Similarly white flies are threatening the existence of cardamom plantations in many pockets. Recent outbreak of locusts in Udumbanchola taluk in Idukki district of Kerala is another example of ill effects of change in the microclimate (Joseph, 1986).

In view of above incidences, it is quite essential to retain shade trees and regulate shade to allow 50-60% filtered light. Unscrupulous deforestation should be put to an end.

7. Afforestation in cardamom plantations

Planting of fast growing shade tree species depending on the lay of the land would ensure provision of adequate shade and prevent descicating winds by keeping the entire estate cool.

i) Redgum

In the recent years some parts of tea estates in Kerala and parts of Tamil Nadu and Karnataka are being planted with redgum particularly flat land and vally bottoms. These areas are quite potential for cultivation of redgum due to availability of moisture almost all round the year. Redgum would not only provid adequate fuel for tea factories but also act as ideal shade for cultivation of cardamom (Krishna, 1982). Redgums are planted at a regular spacing, when redgum trees grow taller, the crown gets thinner and sways in gentle breeze, minimising harmful effects of direct sun. It is observed that cardamom grown in redgum areas put up better growth due to uniform availability of light to all the cardamom plants as compared to natural jungle areas where there is a non uniformity in shade due to mixed shade tree species. There has been a considerable expansion in areas under cardamom in Central Travancore and this has now spread to Annamalais.

ii) Plot system

In large cardamom plantations in some patches, It may be difficult to establish cardamom inspite of repeated replanting. Such patches may be virtually taken as places unsuitable for cardamom. If in such patches a thick tree growth is established, it may afford protection to immediate surrounding areas and increase the overall production of the estate.

Plot system of cardamom cultivation consists of dividing of plantation into small plots of various sizes in accordance with lie of the land and suitability of area for cardamom surrounded by vegetation belt. This system has been successfully tried in some of the estates in Coorg district of Karnataka. Here, the cardamom plants receive full sunligt for a few hours in the morning and during rest of the day they are covered by shadows cast by surrounding forest trees. Adoption of plot system would help in combating drought by preserving soil moisture, arresting, the sweeping of descicating wind through plantations, avoiding scorching action of hot sun and thus providing congenial microclimare for proper growth and higher yields in cardamom.

iii) Shelter belts

Wind breaks particularly in Western aspects provide better protection from descicating wind in summer (Antony Cherian, 1977). These will not only serve to maintain the congenial forest enviornment required for moisture conservation, but may also act as barriers against diseases/pests from adjoining plantations.

Shade management and high productivity in cardamom

Forestry is one of the many possible ways of land use. In the natural forests, different types of trees, vines and shrubs, coext utilising the different layers of soil and air space. Growing of more than one crop simultaneously in the field has gained an impetus in the recent years to realise the highest possible returns per unit area. This multicropping concept is now spreading among planters. Multicropping, besides resulting in better utilisation of soil, ensure a more balanced and stable financil situation to the land owners who need not depend upon the income from a single crop.

A very good example of forestry cum cash crop management is growing of cardamom in the forest. Cardamom needs overhead and regulated forest shade for its growth. It is a natural undergrowth in some of our overgreen forests. Some of the forests are uneconomical for management or utilisation due to the heavy cost involved in building up suitable infrastructure for extraction and transportation of available timber. Such forests, when brought under cardamom will become financially viable for management and benefits from both cardamom and tree culture can be derived (Joseph, 1978).

In cardamom plantations though it is quite essential to retain adequate number of shade trees excess shade is quite detrimental. Unlike other plantation crops such as tea, rubber and to certain extent coffee which require almost clear felling of forest trees, cardamom can coexist as an under growth with available shade trees in the natural ecosystems. There is absolutely no need to cut down any of the shade trees. On the contrary shade tree canopy can be regulated by pruning so as to allow 50-60% filtered light for adequate growth and yield performance of cardamom. Only the crowded canopy and shade branches need to be regulated.

Indian cardamom growers continue to depend on rainfall and conventional cultivation practices, as a result, the productivity is very low (60 Kg/ha) and the cost of production is very high. Their competitiveness in the world market has also suffered due to low production per unit

area. Only high productivity per unit area would ensure rejuvenation of cardamom industry and also to compete in the stiff international market.

In view of the above facts, several studies were carried out at the NRCS, Cardamom Research Centre, Appangala and the Research — cum — Demonstration plots in farmers plantations with an objective of increasing the yield per unit area and to bridge the gap between actually realised (60 Kg/ha) and realisable i. e. potential yield. The adoption of high productivity agrotechniques has yielded 778 Kg dry cardamom per hectare (average of 5 years) which is 13 times more than the national average meagre yield of 60 kg/ha (Korikanthimath, et al, 1989). In the high productivity Technology Programme shade regulation to allow 50-60% filtered light coupled with other intensive cultivation practices was responsible for obtaining break through in cardamom cultivation.

Cultivation of cardamom with arecanut has proved to be quite a practical proposition. Here, the arecanut palms provide well distributed shade and uniform filtered light which is quite essential for the growth and yield of cardamom.

Mix cropping of cardamom with rubber and interplanting of pepper vines to shade trees in the natural forest flora is gaining an impetus in the recent years.

In all these crop combination, the solar radiation is tapped at different layers and so also there is a mining of nutrients from different horizons.

Cardamom requires filtered light for its proper growth and yield. The shade in the cardamom plantation is often said to be 'Necessary evil' regulation of shade to allow 50-60% filtered light is most essential. There is an urgent need to identify and screen fast growing shade tree species for planting in vacant and open areas to ensure adequate shade depending on the various agroecological conditions.

Provision of shelter belts, wind breaks and cultivation of cardamom in plot system are some of the measures which help in ensuring adequate shade and minimising the ravages of frequent dry spells.

The forest ecosystem has a tremendous potentiality in intensive cultivation of cardamom with afforestation and bringing of swamps and unproductive low lying marshy areas for profitable cultivation of cardamom. Examplary high yields are obtained under the redgum areas due to well distributed and filtered light.

Cultivation of cardamom with coffee as a mixed crop has been assuming greater significance in the recent years in light of frequent dry spells and fluctuating price structure and providing gainful employment to the small and marginal farmers.

Shade trees provid adequate nectar to honey bees all round the year as the forest natural flora consists of varied species which blossom at periodical intervals. Maintaining of bee hives in cardamom platations not only helps in the pollination and capsule setting but also in providing gainful employment to people even in remote forests.

Cardamom is perhaps the only plantation crop which needs least felling of trees as compared to other plantation crops. Even the deep interior forest, inaccessible by roads can conveniently be put under cardamom. The productive potentialities of forest ecosystem in the Western ghats with cardamom is great.

Creating awareness about efficient shade management for high productivity in cardamom;

i) Educating planters in maintaining adequate shade by lopping only the side branches and crowded canopy and stopping indiscriminate felling of trees.

ii) Identification add planting of fast growing shade trees in vacant and open areas.

iii) Identification of unsuitable or undesirable shade trees and replacing them with beneficial species.

iv) Popularising bee keeping in cardamom plantations to make the best use of collection of nectar from shade trees as well as cardamom flowers during blossm periods.

v) Identification of valley bottoms, low lying marshy areas and establishing fast growing shade tree species for successful cultivation of cardamom.

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SPICES BOARD'S PARTICIPATION IN AHARA '91, NEW DELHI

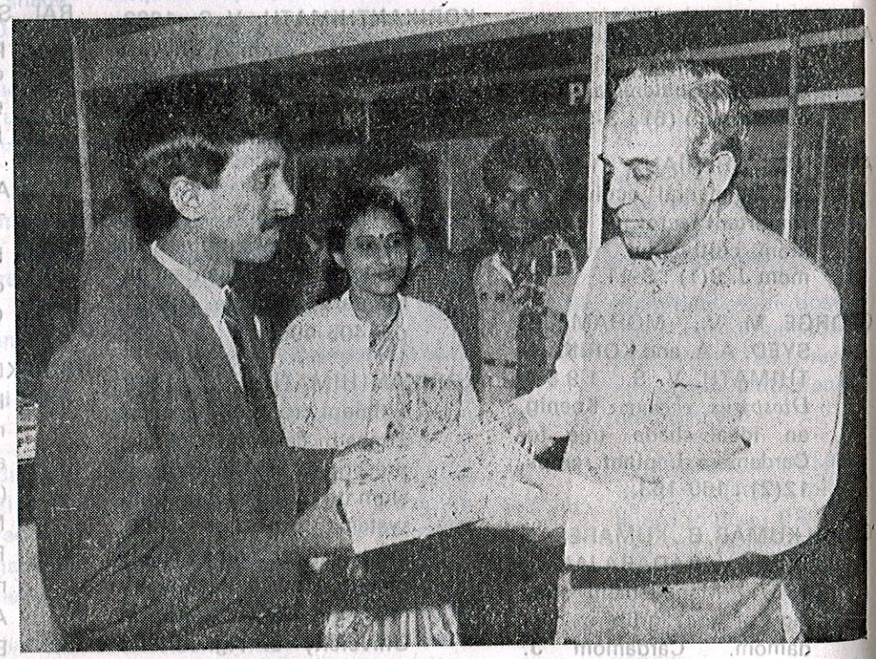
Sri Rao Birendra Singh, Union Minister of Food and Civil Supplies visiting the Spices Board's stall

AHARA '91, organized by the Trade Fair Authority of India, had over 220 companies and organizations from India and abroad who displayed the latest trends in food processing, packaging, hotel & restaurant equipment and supplies. The foreign participants include Italy, Austria, Czechoslovakia, France, Germany, Japan, Sweeden and the UK.

The Spices Board's stall in the Theme Pavilion put main emphasis on 'Spices Export' as its theme and displayed different spices and end-products like curry powder, 'nstant masala pastes, oils and oleoresins of spices, spicedrop

The Spices Board has participated in the 7th International Food Exposition — AHARA '91, held at Pragathi Maidan, New Delhi, from 18th to 23rd, January 1991.

Inaugurating the Fair on 18th, Sri Rao Birendra Singh, Union Food and Civil Supplies Minister suggested that enterpreneurs in the food processing industry take up the problem of child malnutrition and develop know-how for the production of low-cost food from cereals, pulses and oil seeds. He said even the middle income groups were now going in for proces sed and instant foods. The need of the hour was low-cost nutritious foods.



Sri Subramaniam Swamy, Union Commerce Minister presenting the momento to Sri Shivaram Pailoor, Spices Board at the Stall

etc. There were samples of these products from renowned exporting companies in India. Copy panels and photo panels on spices, various publications of the Board were also displayed. Pamplets, company profiles and cardamom samples were distributed to the visitors at the stall.

A good number of domestic and international trade enquiries for various items were received during the event.

On the concluding day Sri Subramaniam Swamy, Union Minister of Commerce visited the Board's stall and shown keen interest on display items. He also presented a momento for Board's participation in AHARA, on behalf of APEDA and Ministry of Food Processing Industries to Sri Shivaram Pailoor, Publicity Assistant (Kannada) who represented the Board at the stall.

Visitors at the stall

SEMINAR ON BYADGI CHILLI

Byadgi chilli is cultivated in Dharward district of Karnataka State. This district has an area of 70933 ha with a production of 16953 tonnes of chillies. The important taluks growing chilli are Byadgi, Hubli, Hirekerur, Haveri and Kundagol which constitute about 60 per cent of the area under chilli in this district.

Byadgi chillies are mainly of three types — Byadgi Kaddi, Byadgi Dubba and Byadgi Hubli. In regard to low pungency and deep red colour, Byadgi chilli has most of the characteristics of sweet paprika. Sweet paprika which constitute more than 70 per cent of the international trade in chillies is not commercially produced in India. This chilli is also used in large quantities for the extraction of oleoresin. The suitability of Byadgi chilli as a substitute for Paprika has evoked great interest in the commercial exploitation. In order to give a fillip to Byadgi chilli cultivation State Department of Horticulture, Govt. of Karnataka arranged a one day seminar at Kundagol in Dharward district on 14-12-1990.

Dr. C. K. George, Executive Director, Shri Antony Cherian, Director Development and Dr. R. Naidu, Director Research from Spices Board; Dr. A. K. M. Nayak, Director of Horticulture, Govt. of Karnataka and Professors of University of Agricultural Sciences, Dharward attended the seminar. The seminar was inaugurated by Shri. M. S. Katagi, MLC, Kundagol and presided by Shri B. A. Uppin, Ex-MLA, Kundagol. A large number of chilli farmers attended the seminar.

The seminar identified the need for developing a Byadgi chilli variety with high colour value as high as five lakh units as a real substitute for sweet paprika. The farmers are to be helped for introducing irrigation facilities for nursery as well as main field. Extension services are to be strengthened to educate the growers on improved agronomic practices in cultivation and for minimum use of pesticides.

ERRATA

In Spice India January 1991, on Page 17, the item "27 more spices brought under Spices Board" may be read as "26 more spices brought under Spices Board". Large Cardamom is in the earlier list as Cardamom (Small and Large).