Agriculture is a very large heterogeneous industry. It involves many types of business in producing and distributing agricultural goods to consumers. It includes farm credit, transportation, storage, financing, processing, standardizing, selling and distributing to the consumers. Thus, agribusiness is the sum total of all operations involved in the manufacture and distribution of farm supplies, production operation on the farm and the storage, processing and distribution of farm commodities and items made from them. The institutional and non-institutional agencies as noted in the figure 5.1 have been engaged in promoting the production and marketing of cardamom by performing various agribusiness activities. The institutional agencies are the registered government/quasi government agencies, government departments, public sector undertakings like the Spices Board, trade unions, cooperatives and NGOs. They are the promotional agencies involved in production, processing and marketing of cardamom. The non-institutional agencies are the individuals concentrating on the promotional activities of cardamom. Non-institutional agencies include: innovative farmers who are the award winners of the Spices Board, exporters who have been given awards for their outstanding performance in foreign trade, technocrats such as manufacturers of equipments suitable for cardamom production, curing/processing, auctioneers who are conducting auctions for cardamom in different places and cardamom dealers who are the licensed traders to deal with cardamom buying and selling activities. In this chapter, the performance of prominent institutional agencies and non-institutional agencies involved in cardamom production, processing and marketing are analyzed.
Figure 5.1
Institutional and Non-institutional Cardamom Promotional Agencies

Promotional Agencies

Institutional

Government

State

Central

Non-Government

Universities & Colleges

Cooperative

Cardamom Growers Associations

Ministry of Commerce

Spices Board

Indian Cardamom Research Institute (ICRI)

Indian Institute of Spices Research

Cardamom Planters Association (CPA)

Kerala Cardamom Processing and Marketing Company (KCPMC)

Non-Institutional

Innovators

Cardamom Dealers

Exporters

Auctioneers

Technocrats
The Associations formed by the cardamom growers themselves play a vital role in the promotion of cardamom production and marketing activities. They are the registered promotional agencies concentrating on the developmental activities such as supply of agricultural inputs, arranging for marketing and coordinating the various functionaries involved in cardamom production and marketing. Among the Cardamom Planters Associations, the Kerala Cardamom Processing and Marketing Company (KCMPC), and the Cardamom Planters Association (CPA) are the prominent institutions. The performance of these institutions is presented below.

A. Kerala Cardamom Processing and Marketing Company

The Kerala Cardamom Processing and Marketing Company (KCPMC) was started in 1990 to take care of the needs of the cardamom growing community by starting weekly cardamom auction at Kumuly in Kerala State. It is promoted by a group of agriculturists, cardamom planters and exporters. The major activities of the KCPMC are propagating the new varieties of cardamom to increase the productivity to arranging for supplying the agricultural inputs; and undertaking marketing activities, especially by conducting auctions and exporting quality cardamom. Technical services are also provided to the growers.

(i) New Varieties of cardamom: The KCPMC has developed three new varieties of cardamom-Elaranil, II and III-at its research center in Thekkady. The clones for these have been identified from selected mother clones from an estate at Kadamkuzhy in Idukki District. The leaves of Elarani 1 are dark green in colour. The plant shows a strong tiller base with 50 per cent of its capsules of the size 6.5-7mm. Average flowering and crop is noticed throughout the year for 8 rounds. The health of the plant and the high-yielding characteristics make
it one of the most promising varieties in the field. Elarani II is an average flowering variety and gives a normal crop throughout the year for 8 rounds. The leaves are light green in colour and its panicles are long. The capsules look round and the size of almost above 40 per cent is 7-8 mm. Elarani III is reported to be one of the highest yielding varieties which gives a good crop for 8 rounds throughout the year. The new varieties are 25-50 percent superior to njallani plants. The yield of the new series seems to be 100-150kg per acre more than that of the njallani varieties.¹

(ii) Agro Inputs: The parent organization of KCPMC is the Kerala Cardamom Processing and Marketing Cooperative Society, which was set up to provide the farmers with a robust and reasonable arrangement to provide reliable fertilizers and other agro inputs for plantations. This was at a time when fertilizer was a scarce commodity and the reliability of timely supplies was at question. This situation in the early 70s prompted the institution of supply outlets and later as full-fledged KCPMC branches. Today, it has 12 branches in Idukki and Waynad catering to the needs of farmers for all kinds of agro inputs. From 1990 till today, the KCPMC has expanded its agro-input supply services by opening several distribution outlets and it also represents several reputed indigenous and multinational companies as their authorized distributors. The KCPMC is the close associate of all major domestic companies and multinationals in the agro-input industry. This association helps to gather worldwide information pertaining to the latest techniques in agri-operations, current market trends and other valuable information. The KCPMC provides agro-inputs, agro-equipments, operational assistance, and technical expertise and market trends under one roof. In difficult times, the efficiency of the services provided has helped them to sustain and improve their sales turnover. Even though there was an increase in market share, the company proposed to improve their network further to non-traditional areas as well. The company
turnover for agro inputs has increased to an all time record of Rs29.43 crores in 2005-06 against the previous year’s figure of Rs.27.27 crores.

(Mi) Cardamom exports: The KCPMC is a registered exporter under the Spices Board and a member of “All India Spices Exporters Forum”. In 1997, the KCPMC, entered the world of cardamom exports bringing valuable foreign earnings into the country. In 1997-98 it opened its account in the export market by exporting about 20MT to the Middle East. In 1998-99, even though the cardamom, industry faced a low production in general due to adverse climatic conditions, the KCPMC was able to maintain its export level at 20MT. Apart from strengthening its ties in the Middle East it has also entered Japan, a difficult market to break into. Till 2001, the KCPMC maintained, an experienced team of professionals to procure good quality cardamom, according to market needs. The procured cardamom undergoes a quality test so that it meets the quality specifications of the importer. After thorough examination and export quality inspection it is shipped out to various destinations. The KCPMC has also started branding the cardamom in its own name (KCPMC) and it is sold in consumer packages ranging from 250 gms to 1 kg. It also exports in bulk 50 kg gunny bags. The KCPMC also adheres to packaging specifications required by the importer. While Kerala is the origin of most of the cardamom produced in India., trade in cardamom happens mostly from Bodinayakanur in TamilNadu. The KCPMC has a strong presence in the Bodi market and does vibrant trade with northern India where cardamom is consumed in large quantity.

(iv) Business operation: The KCPMC had increased its turnover to Rs.41.69 crores in 2005-06 against Rs.30.76 crores in the previous year. The profits grew (12%) to Rs.128 lakhs in 2005-06 from Rs. 1 14 lakhs in the previous year (Table 4.1).
Table 5.1
Business Operations of the KCPMC

<table>
<thead>
<tr>
<th>S.No</th>
<th>Particulars</th>
<th>2005-06</th>
<th>2004-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agro inputs sales</td>
<td>12943.40</td>
<td>2727.82</td>
</tr>
<tr>
<td>2</td>
<td>Cardamom Trade</td>
<td>57.11</td>
<td>78.80</td>
</tr>
<tr>
<td>3</td>
<td>Cardamom Export</td>
<td>111.97</td>
<td>219.09</td>
</tr>
<tr>
<td>4</td>
<td>Others</td>
<td>43.40</td>
<td>50.90</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>4169.03</td>
<td>3076.61</td>
</tr>
<tr>
<td>6</td>
<td>Cardamom Auction</td>
<td>1976.69</td>
<td>598.47</td>
</tr>
<tr>
<td>7</td>
<td>Profit before taxes</td>
<td>128.40</td>
<td>114.23</td>
</tr>
<tr>
<td>8</td>
<td>Net Profit</td>
<td>83.96</td>
<td>73.82</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>19513.96</td>
<td>6939.74</td>
</tr>
</tbody>
</table>

Source: Annual report of KCPMC

The KCPMC has traded a substantial volume of 22586.30kg of cardamom in the domestic market, amounting to Rs. 57.11 lakhs and an export volume of 45000kg, amounting to Rs.1 11.97Lakhs in 2005-06. However, they need to further focus and cash in on the booming retail market as well.

B. Cardamom Planters Association

The Cardamom Planters Association (CPA) was started earlier in 1920 with the name of Travancore Cardamom Planters Association to promote the interests of the Cardamom planters and traders. By 1944 the Association started functioning with the new name of Cardamom Planters Association of South India. For administrative convenience the Association was renamed Cardamom Planters Association (CPA) in 1979. Now the CPA is functioning with the following achievements over the years.
It has established its head office in its own building at Bodinaikanur in Tamilnadu and with branches at Santhanpara, Gajanaparai, Parathodu, Poopara, Pulianmalai and Pialram in Kerala and these branches function as cardamom collection centers as well as depots for distribution of manure and pesticides.

It has opened auction centers at Bodinaikanur and Santanpara.

It has established a college viz., Cardamom Planters Association College in Bodinaikanure.

The CPA has been functioning with 423 members (as on 31-03-06) and helped the cardamom planters in the following ways.

- Introduction of Compounding Tax system with regard to agricultural Income Tax assessment
- Sales Tax from Sales Point to the Purchase Point
- Removal of Plantation tax
- Abolition of cess

Small planters have been benefited from these measures. Besides, the CPA has representation in the Agricultural Income Tax Advisory committee, the Plantation Labour Committee, the Industrial Relations Committee and Finance committee. It is instrumental in forming Planters, auctioneers and Traders Association. It is also a part of the advisory committee to the Cardamom Development Fund maintained by the Spices Board. Thus, the CPA has become a spokesman of the cardamom growers, especially small planters in India.

The performance in the business operations of the CPA is highlighted in Table 5.2.
Table 5.2
Cardamom Trade of the CPA

(Rs in Lakhs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Members</th>
<th>Area under cultivation of members (in acre)</th>
<th>Santhamparai</th>
<th>Bodinayakanur</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quantity (in Kgs)</td>
<td>Value (in Rs)</td>
<td>Quantity (in Kgs)</td>
</tr>
<tr>
<td>1994-95</td>
<td>562</td>
<td>653.5</td>
<td>222031</td>
<td>563.05</td>
<td>494</td>
</tr>
<tr>
<td>1995-96</td>
<td>592</td>
<td>6546</td>
<td>415428</td>
<td>692.84</td>
<td>84163</td>
</tr>
<tr>
<td>1996-97</td>
<td>586</td>
<td>6271</td>
<td>340230</td>
<td>1119.64</td>
<td>103773</td>
</tr>
<tr>
<td>1997-98</td>
<td>563</td>
<td>5917</td>
<td>451568</td>
<td>1115.56</td>
<td>93160</td>
</tr>
<tr>
<td>1998-99</td>
<td>520</td>
<td>5680</td>
<td>322198</td>
<td>1579.97</td>
<td>133080</td>
</tr>
<tr>
<td>1999-00</td>
<td>626</td>
<td>6215</td>
<td>314311</td>
<td>1319.63</td>
<td>287353</td>
</tr>
<tr>
<td>2000-01</td>
<td>603</td>
<td>2561</td>
<td>245430</td>
<td>1385.99</td>
<td>83046</td>
</tr>
<tr>
<td>2001-02</td>
<td>610</td>
<td>2505</td>
<td>149417</td>
<td>882.04</td>
<td>1.1185</td>
</tr>
<tr>
<td>2002-03</td>
<td>573</td>
<td>2504</td>
<td>126782</td>
<td>706.64</td>
<td>32607</td>
</tr>
<tr>
<td>2003-04</td>
<td>561</td>
<td>2401</td>
<td>334811</td>
<td>1109.96</td>
<td>75955</td>
</tr>
<tr>
<td>2004-05</td>
<td>492</td>
<td>2181</td>
<td>271930</td>
<td>763.47</td>
<td>77140</td>
</tr>
<tr>
<td>2005-06</td>
<td>421</td>
<td>1.672</td>
<td>637786</td>
<td>1257.02</td>
<td>111960</td>
</tr>
<tr>
<td>2006-07</td>
<td>485</td>
<td>2048</td>
<td>381971</td>
<td>986.65</td>
<td>95508</td>
</tr>
</tbody>
</table>

Source: Annual report of the CPA
It can be seen that the growth rate of both membership and the area under cultivation of members show a declining trend. However, the efforts taken by the Association in the sale of cardamom through its auction centers in 2005-06 is encouraging. During the year 2005-06 the CPA conducted 40 auctions against 44 auctions in the previous year. It sold 637786kgs and 1,11,960 kgs in 2005-06, 3,81,971 kg and 95508 kg in 2006-07 through Santhapara and Bodinaikanure auction centers respectively. It takes 21 days to make the payment to those who have sold through its auction centers. Besides cardamom trade, it also undertakes distribution of agricultural inputs such as fertilizer, insecticides and the like.

(i) E-Auction Facility for Cardamom: The CPA is the first organisation to introduce electronic auction system in cardamom trade in Bodinaickanur, one of the traditional major assembling centers in India. It was launched on 23rd August, 2007 to ensure transparency in cardamom trading in the country. The e-auction system, a new initiative of the Spices Board, has been developed with the support of consultancy services from Bangalore, to promote healthy competition for purchasing cardamom. The main objective of the system is to revamp existing manual procedures on par with modern technologies. Moreover, the new system provides a platform to make the transactions smooth.
‘E’ Auction in Cardamom Trade at Boodinayakanur
and hassle free. Proper error-free documentation will, also be ensured in this system. It will also eliminate chances of hidden costs. The moisture of bulk density of every lot offered for sale is displayed on the screen at the center which helps the bidder assess the quality. The new system is designed to replace the traditional manual auction system of shouting out bids followed in auction centers. The manual auction methods conducted by licensed auctioneers at the approved centers in Kerala, Tamilnadu and Karnataka lacked clarity and confused the farmers about the conclusion of bidding. The same system is likely to be introduced in other four centers, namely, Vaonda-medu, Kumuli, Thekkady, and Pulianmala in Idukki District. The new system will set a new trend in cardamom marketing, bringing more benefits to farmers and curtailing formation of cartels.

(ii) Redressal of Grievances

On the occasion of the inaugural function, of the e-auction system of the CPA, Bodinaikanur, the cardamom growers submitted a representation to the Minister of Commerce, Government of India, Sri. Jaiaram Ramesh their grievances for immediate redressal (see Appendix-VI). They have highlighted in their representation the following grievances.

1. High cost of cultivation due to the higher wages of labour

   Low prices of cardamom

   Natural calamities

   Illegal entry of cardamom from Guatemala

   Positive measures to increase and sustain the domestic consumption and improve the export of cardamom

   Moratorium on the increase in wages through mutual trust and dialogue between the planters and the labourers

1 Increase in the price of manure and pesticides
Waiver of loan to the cardamom planters to the prevent tragedy of farmers suicide

Disadvantages of online trading culture

Uneconomic cardamom cultivation

C. Indian Institute of Spices Research

The Indian Institute of Spices Research (TISR), Calicut, a constituent body of the Indian Council of Agricultural Research (ICAR), is a major institute devoted to research on spices. In 1976 it was started as a Regional Station of the Central Plantation Crop Research Institute (CPCRI), Kasaragod, engaged in research on spices.

The IISR, a National Research Centre for Spices, was established in 1986 with its headquarters at Calicut, Kerala, by merging the erstwhile Regional Station of the CPCRI at Calicut and the Cardamom Research Centre at Appangala., Karanataka. Realising the importance of spices research in India this Research Centre was upgraded to the Indian Institute of Spices Research on 1st July 1995.

The research programmes of the institute (externally funded) are carried out under various projects, which are time bound, and have specific objectives. The broad areas under which research programmes are being conducted at the institute include

> Collection, conservation, evaluation and cataloguing of germplasm

> Development of varieties of high yield, quality and resistance to biotic and abiotic stresses through conventional and biotechnological approaches

> Standardizing propagation methods to ensure large scale production and distribution of high yielding gene types.

> Development of agro techniques for increasing production and productivity
> Integrated pest and disease management
> Post harvest technology
> Socio-economic aspects of cultivation, marketing and information dissemination in spices

Infrastructural facilities both for basic and applied research in crop improvement, production, protection and post-harvest technology have been set up at the institute. Specialized laboratories for biotechnology, molecular biology, post-harvest processing and biocontrol have been established. Atomic absorption spectrophotometer, advanced microscopes with image analyzing systems, spectrophotometer, gel electrophoresis system HPLC, thermal cyclers, biolistics particle delivery systems, bio-fermenter ultra centrifuges and walk-in-cold room are some of the infrastructural facilities available here. The other facilities available at the institute include

- Agricultural Technology Information Centre
- National Information Centre for Spices
- Agricultural Research Information System
- Bioinformatics Centre
- Consultancy Processing Cell and Hindi Cell.

D. SPICES BOARD

Cardamom is a plantation crop as per the Cardamom Act, 1965 and as such comes under the purview of the Ministry of Commerce, Government of India. The Ministry established the Cardamom Board by an Act of Parliament in 1966 to oversee research and development of cardamom. Subsequently the Government of India established the Spices Board in 1987 under the Ministry of Commerce by merging the Cardamom Board with the Spices Export Promotion Council by the Spices Board Act 1986. Under this Act, the following functions relating to cardamom have been assigned to the Spices Board.
Develop, promote and regulate export

Grant Certificate for export

Undertake programmes and projects for promotion of export

Assist and encourage studies and research for improvement of processing, quality techniques of grading and packaging

Strive towards stabilization of prices for export

- Evolve suitable quality standards and introduce certification of quality through quality marketing for export

Control quality of cardamom for export

Give licenses, subject to such, terms and conditions as may be prescribed to the manufactures of cardamom for export

Market Cardamom, if it considers necessary in the interest of promotion of export

Provide warehousing facilities abroad

> Advice the central government on matters relating to import and export of cardamom

The Board may also

promote co-operative efforts among growers;

[insure remunerative returns to growers;

Provide financial or other assistance for improved methods of cultivation and processing of cardamom, for replanting cardamom and for extension of cardamom growing areas;

Regulate the sale and stabilization of the prices of cardamom;

Provide training testing and fixing grade standards of cardamom;

Increase the consumption of cardamom and carry on propaganda for that purpose;
Register and license brokers (including auctioneers) of cardamom and persons engaged in the business of cardamom;

Improve the marketing of cardamom;

Collect statistics from growers, dealers and such other persons as may be prescribed on any matter relating to the cardamom industry, publish statistics so collected or portions thereof and extracts therefrom;

Secure better working conditions and the provision and improvement of amenities and incentives for workers; and undertake, assist or encourage scientific, technological and economic research;

(i) Registration of Exporters of Spices: To start any export, one has to obtain an Import-Export Code Number issued by the Director General of Foreign Trade or Joint Director General of Foreign Trade and it is mandatory. In all foreign trade as well as foreign exchange documentation the IE code number has to be mentioned. A Certificate of Registration as Exporter of Spices issued by the Board is also required in addition to IE Code No. The Spices Board issues Certificates of Registration for export of spices under section 11 of the Spices Board Act. The documents to be given/formalities to be fulfilled for obtaining Certificate of Registration as Exporter of Spices include certified copy of PAN Card, application in the prescribed format, Rs.2,000/- by Demand Draft in favour of the Spices Board, payable at Ernakulam from any Nationalized/Scheduled Bank, copy of (self attested) IE Code No., self attested copies of Partnership Deed/Memorandum and Articles etc. if it is a partnership firm or company, Bank Confidential Report in the prescribed format. A self-attested copy of SSI Certificate in case manufacturer/exporter has to be enclosed along with the application.

(ii) Licensing of Cardamom Auctioneers; The Spices Board issues licenses to cardamom auctioneers. Almost 60% of the produce is traded through auctions. During 2002-03 the Spices Board issued license to 19 cardamom auctioneers.
(iii) Licensing of Cardamom Dealers

The Spices Board also issues licenses for dealing in cardamom. At present there are 407 licensed dealers in the active list. The cardamom markets where the cardamom dealers are engaging themselves in cardamom dealing include Cochin, Thodupuzha-(Kerala); Saklashpur, Medikeri, Mangalore-(Karnataka); Bombay-(Maharashtra); Virudhunagar, Cumbum, Bodinayakanur, Thevaram, Pattiveeranpatti (Tamil Nadu).4

(iv) Activities during X Plan

The Spices Board proposed to implement the following programmes of activities during the X Plan period for improving the production, productivity and post-harvest practices in cardamom.

a) Extension Advisory Scheme: The scheme envisages provision of technical guidance/support to growers through regular field visits, farmers’ meetings, group discussions, training programmes and seminars. Preparation and distribution of technical literature also constitute part of the activity.

b) Production and Supply of quality planting materials: High yielding and disease free planting materials are to be made available to facilitate replanting. Hence, it is proposed to make available planting materials through the department nursery and certified nurseries in growers' fields.

c) Cardamom Replanting Scheme: The economic life span of cardamom is 10-12 years and hence replanting is to be done once in every 10-12 years at the rate of 6000-6500 hectare per annum. The scheme is aimed at rejuvenating the old, diseased and uneconomic plantations.

d) Spices Board awards for growers: The award has been instituted by the Spices Board to encourage healthy competition among growers of cardamom and to promote organic farming. The award consists of one first prize and two second prizes. The first prize carries a cash award of 25,000, a citation and a
certificate. Each second prize carries a cash award of Rs. 15,000/- a citation and a certificate.

(v) Services offered to growers

The following services are offered by the Spices Board to the cardamom growers.

- Plantation visit and on the spot study of pests and disease problems
- Recommendation for pest and disease control
- Supply of high yielding and improved varieties planting materials
- Supply of bio-control agents for controlling specific diseases and pests.

♦ t* Conducting planters’ meet and group discussions
- Offering training to planters.

(vi) Subsidy for Replantation

During the X Plan period the subsidy proposed for replanting is Rs 9000/- per hectare payable in two annual installments of Rs.6000/- and Rs.3000/- respectively. Small and marginal growers owning up to four hectares would be eligible for the benefit of the scheme. Growers who are desirous of taking up replanting under the scheme have to submit their application in the prescribed format to the Board. Officials of the Board would verify the credentials of the applicants. Minimum area to be replanted under the scheme is 0.10 hectare in a contiguous block and the maximum is four hectares. Subsidy will be paid only in cases where minimum survival rate is 85 percent in the 1st year and 95 percent in the second year. It was proposed to cover 3450 hectares during the X Plan period.
(vii) Educational stipend for children of cardamom labourer

Cardamom estate workers are entitled to avail of assistance in the form of educational stipend for pursuing post-SSLC education subject to the rules and norms in force.\(^5\)

(viii) Irrigation and land development scheme: Irrigation is one of the important inputs by which yield increases can be obtained in cardamom. Moreover, irrigation will help the plantations to withstand drought situations. The Board is implementing the programme in collaboration (financial support only) with the Western Ghats Development Authorities of the States of Kerala, Karnataka and Tamilnadu. The scheme aims at providing water resources in cardamom plantations by constructing water storage devices like farm ponds and wells, installing irrigation equipments and taking up soil and water conservation works. During the X Plan, the subsidy rates proposed vary from 25-50 percent cost of construction/purchase of equipments subject to maximum ceiling rates fixed depending upon the category of farmers classified as up to four hectares, up to eight hectares and four-eight hectares. The growers who are interested to avail the financial assistance need to apply to the Board with plan and estimate of construction duly certified by a qualified engineer. After scrutiny of the application and field inspection as regards feasibility and necessity of the investment, where they propose to construct devices, a permit order will be issued authorizing the construction/procurement, on completion of which subsidy amount is released.\(^6\)

(ix) E-market: The Spices Board has planned to launch direct electronic-marketing of cardamom under the brand name, “Flavourit”. Besides finalising the brand, the Board has already decided on the packages such as pouches and food grade plastic. IDBI Bank has been selected as the financial institution to conduct the transactions. Advertising campaign and distribution network only remain to be finalized. The Board would meet initial expenses on promotional activities and designing of the packs. The State Trading Corporation Ltd. (STCL) would do the buying and selling of these products. The Board would
decide and assure the quality of products to the buyers besides ensuring prompt delivery. The STCL would sell the product at mutually agreed prices. The Corporation would charge processing, packaging and transportation charges, while a premium will be realized separately and it would be used exclusively for promotional activities. The idea of launching this campaign is to popularize the products in the domestic and international markets and to ensure better price for the growers for their good quality cardamom. The concept is gaining momentum in the international market. Indonesia, China and Sri Lanka are also planning to market their products through E-marketing.7

(x) Subsidy for Cardamom driers and construction of rainwater harvesting tanks : The Spices Board has launched two schemes of the Central Government for the purchase of cardamom driers and construction of rainwater harvesting tanks, with subsidy component. Cardamom driers using LPG or diesel and rainwater harvesting tanks using silpanline sheets would be useful to cardamom growers in Kerala, Karnataka, and Tamilnadu. For purchase of drier, cardamom growers would be given 33.33 percent of the actual cost of drier as subsidy to a maximum of Rs.1 lakh. Registered small cardamom growers having a minimum, of 0.40 hectares of land and a maximum of four hectares are eligible for assistance. Similarly, a subsidy of 33.33 per cent of the actual cost, limited to Rs.6666, would be given for construction of rainwater harvesting tank with a capacity of 200 cubic metres. Farmers harvesting minimum, holding of 0.10 hectares and a maximum of four hectares of cardamom are eligible.8

(xi) Market Study abroad: The Spices Board has undertaken a market study on cardamom, in the Gulf Cooperative Council (GCC) countries in 2006. The GCC countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE together import about 13500 tonnes of cardamom (43 percent of the total world import), of which India’s share is less than 500 tones. The basic objectives of the study done by Tata Consultancy Services was to formulate strategies to increase India’s share in the GCC countries, especially in Saudi Arabia. It was
at the behest of the report that a detailed study of the Guatemalan cardamom strategy was taken up by the Board. The findings of the study will help in framing of strategies to increase exports from the producing country and to realize a better price for the cardamom grower in India as well as in Guatemala. The study focused on the cultivation of cardamom, its processing and marketing at a very competitive price in the world market.

(xii) Participation in National and International Fairs: The Spices Board has been accorded clearance for participation in 13 international shows and 9 national fairs as a part of domestic and international market promotion programme.

The Spices Board has taken efforts to improve cardamom consumption through domestic as well as international market. The incessant campaigns of the Spices Board for the last two decades to promote cardamom did expand the domestic demand for cardamom from 4000 metric tonnes to 12000 metric tonnes. The forceful campaigns engineered by the Board have helped in sustaining cardamom price through an expansion of domestic market when the export market suffered a steep fall from 2000 metric tonnes to 500-600 metric tonnes.

E. THE INDIAN CARDAMOM RESEARCH INSTITUTE

The Indian Cardamom Research Institute (I.C.R.I.) was established under the Spices Board (erstwhile Cardamom Borad), Government of India, Ministry of Commerce & Industry in 1978. The main Institute is at Myladumpara in Idukki District of Karala. It has three Regional Research Stations one each at Saklespur, Hasan District, Karnataka, started in 1980, at Thadiankudisai, Dindigul District in Tamilnadu, started in 1980 and the third one at Gangtok in Sikkim. The primary mandate of the Indian Cardamom Research Institute is to develop sustainable production, protection and post-harvest technologies for cardamom. The major research divisions of the institute include Crop Improvement & Biotechnology, Crop Management
(Agronomy), Disease Management (Pathology) Entomology, Post Harvest Technology, Transfer of Technology. The objectives activities and achievement of these divisions are highlighted hereunder.

(i) Crop Improvement & Biotechnology: This division is engaged in evolving high yielding and disease resistant varieties and in maintenance of a germplasm bank, Preliminary Evaluation Trials (PET), Comparative Yield Evaluation Trials (CYT) and Multi Locational Trials (MLT). The achievements of this division are explained below:

- The present germplasm holding is 698 accessions of which 250 have been evaluated for various quantitative and qualitative characters.
- Released four high yielding cardamom selections viz., ICRI-I & ICRI-2, (for Kerala Zone), ICRI -3 (for Karnataka Zone) and ICRI-4 (for Tamilnadu Zone). These have high yield potential of 650 to 800 kg/ha under moderate levels of management.
- Three hybrids viz, MHC-IO, MHC-13 and MHC-18 yielding over one ton per ha are in the pipeline to release.
- 9 promising clones suited to various zones of the cardamom tract which are in pipeline for release.
- Studied the breeding behaviour, pollen biology and pathology of cardamom.
- Nineteen selections of small cardamom were evaluated, of which two have shown an yield of about two kilograms of dry capsules per plant. Their selections were pest under continued evaluation for confirming the findings on evaluation of the selections, SBCC.
- Prepared a floristic calendar of the cardamom tract. The bee flora comprises of 37 species to serve the pollen and nectar source to honey bees and out of which 19 are trees.
(ii). Crop Management: The major achievements of crop management are:

- Package of practices for various agro techniques such as nursery preparation, planting methods, nutrient management and judicious irrigation schedules were developed and transferred to the planters.
- An economic schedule of soil cum foliar application of fertilizers for cardamom has been formulated which results in saving in fertilizer costs as compared to soil application.
- Developed remedial measures for zinc and Boron deficiency.
- The institute has analysed about more than 1,00,000 cardamom soil samples received from planters of Kerala, Tamilnadu and Karnataka and most judicious and balanced recommendations were given.

(iii). Disease Management (Pathology): Occurrence, spread and damage due to various diseases affecting Cardamom are being studied in detail and suitable strategies have been developed to manage them. Integrated Disease Management through plant sanitation, soil amendment, fungicidal control, bio-control with trichoderma sp./Metarrihizium are developed for the control of fungal diseases. Surveillance is also maintained to identify the emergence of new diseases. The following are the achievements of ICRI.

- The causal organisms of azhukal, rhizome rots and nursery rots were identified, and characterized.
- For controlling these diseases, an integrated disease management strategy has been developed involving cultural practices, plant sanitation and fungicides and bio agents.
- Large scale screening for phytophthora tolerance has been carried out in germ plasm accessions and identified a few tolerant lines.
- The bio-control agent *Trichoderma sp.*, was found effective to control Azhukal, Rhizome and Seedling rot diseases and also to offer protection from, soil borne pathogens.
• A technique has been developed for mass multiplication of V AM in sorghum roots.

• A number of new diseases such as panicle blight, root rot and leaf yellowing, stem lodging measures were reported and developed control techniques.

• Pilot trials showed that viral disease in plants can be detected through ELISA for the quick, diagnosis.

(v). Entomology : The life cycle of 55 insects and 3 non-insects which are identified as pests of cardamom and their response to various chemicals, plant products and bio-agents have been studied for formulating effective and economic control measures. This could successfully reduce the pesticide applications in cardamom fields from 14 rounds to 7 rounds for pest management. Bio-agents and botanicals like neem oil, yellow stick traps, antagonistic fungi and enemy pests were also developed as part of the integrated pest management. These are widely used in cardamom.

• About forty chemical insecticides formulations were evaluated on major pests of cardamom and recommendation of effective insecticides at the minimum concentration was made to plants.

• The number of insecticide applications has been brought down to 5-7 per year from 12-14 sprays/year for the control of major and minor foliar pests which turn reduced the quantity of pesticides and the application cost.

• Pruning of dried cardamom leaves (cultural control) during February, and application of five sprays of insecticides/year on the lower one third portion of cardamom plants have been effective and economical for trips control. The technology has been demonstrated in planter’s field.
• Pesticide spray schedule for Kerala, Karnataka and Tamil Nadu cardamom plantations was formulated which effectively manages the major and minor foliar pests.

• An IPM consisting of mechanical control of beetles and chemical control of grubs have been worked out for cardamom root grub management and has been demonstrated in planters field.

• Certain plant extracts have been found to have growth regulating and insecticide property on cardamom shoot borer and hairy caterpillar.

• Neem based insecticides were found to be effective on ginger borer.

• Based on MRL (Maximum Residue Limit) value specified for related spice crops, a waiting period of seven days after spray with, insecticides endosulfan was suggested.

• An effective management strategy for whitefly was also evolved (with behavioral control - trapping adult fly with yellow sticky trap and also spray of neem oil suspension at 0.5% on the lower surface of leaves for control of nymphs) and being recommended.

(v). Post Harvest Technology

Post Harvest Technology mainly deals with pre and post harvest studies on cardamom, with the objectives to improve the quality of spices. The main project of the division is evaluation of alternative fuel for cardamom curing. The methods using alter fuel sources using LP gas are being standardized.

(vi). Transfer of Technology

This division aims at bridging the gap between the scientists and planters by transferring the achievements in the institute for application in the planters field. This is mainly achieved through training programmes, conducting seminars, group discussions, exhibitions, organizing spice clinics etc.
Training programmes on production, protection and post harvest technologies management of cardamom have been organized. Scientists of the institute serve as the resource personnel in seminars and planters meetings. Spice clinics an open house interaction between farmers and scientist were organized to clarify the doubts. Exhibitions have been organized at various places to enlighten the farmers with the latest technologies developed by the research institute.

The vermiculture division also undertakes vermiculturing for the production of vermi compost using two types of exotic earth worms viz., *Eudrella euginiae* and *Eisema foetida*. Studies are being carried out to compare the effect of different organic manures with the yield pattern in Cardamom. In this direction, the following are the achievements of the institute.

- 170 short term training programmes were conducted to transfer the new technologies.
- Participated in 125 seminars along the length and breadth of the cardamom tract.
- 'Spice Clinics’ were organized at different locations in Kerala and Tamil Nadu.
- Participated in 20 exhibitions / melas by opening a stall to highlight the various achievements made in spice research.
- The following Booklets were brought out (a) Book on ‘Cardamom production technology’ - A guide to planters. (b)‘Micro propagation of cardamom’ - A Practical manual for handling cardamom tissue culture, & Herbal spices -cultivation and usage.
- Need based advisory field visits to different estates are made to render farm advisory services.
- Scientists also participated in All India Radio programmes and also deliver lectures. Video films on varieties, tissue culture, agro-techniques, integrated pest and disease management in cardamom and vermi-cutlrue were brought out.
(vii) Statistics and Computer Division

Statistics and Computer division is mainly concerned with planning and design of experiments, analysis of experimental data and integration of results of various research programmes identified in cardamom. In addition, software support is provided to the research as well as administrative section. Development of software for monitoring research programmes and farm labour wages are undertaken. The following are the achievements of the division.

- A model was evolved for yield forecast in cardamom.
  The factors’ affecting the seasonal prices of cardamom has been studied.
- Various experiments have been designed and the data obtained were analysed. The various Soft wares developed are:
  > CRD, RBD and Factorial designs
  > Path analysis
  > Multiple correlation
  > Multiple regression
  > Time series analysis
  > Farm labour wages
  > Technical documentations
  > Monitoring research programmes
  > Library information’s

Contributions of Central and State Governments

The Central and State Governments especially in Kerala where cardamom is cultivated in large scale have played a vital role in production and marketing. The cardamom growers, particularly those who cultivate on lease lands have been facing a lot of problems. To find a solution, the Kerala State
Government takes efforts joining various agencies supporting the cardamom growers.

Issue of lease land for cardamom cultivation: As of today 10836.7147 hectares of cardamom, lands have been leased for cardamom cultivation in 8,749 cases in Idukki District. These leases were originally given by the Maharaja of Travencore in 1942 when the system of giving 'pattas' was stopped. In 1961, cardamom lease rules were framed and leases have continued thereafter. The present area of the Udumbancholai Taluk consisting of the Cardamom Hill Reserve was notified as Deemed Reserve by notification in 1896 for the promotion of cardamom cultivation on commercial lines. When the Spices Broad Act was introduced, the cultivation of cardamom in the leased forest land became a major issue. The issue cropped up only because of the interpretation of cardamom being included in the schedule of spices in the Spices Board Act. It is treated as one of the spices which means it can be interpreted as non-forestry activity.

The state government took efforts claiming that the area under lease has more or less remained undamaged and the tree cover is intact even though cardamom cultivation has been going on for 50 years. The state government therefore urged the Government of India to consider the proposal and grant general sanction under section 2 of the Forest Conservation Act, 1980 for renewing the leases for over 10000 small cultivators of cardamom in 10,836 hectares of cardamom lands, so that the state government may renew the leases as and when the lease period expires. However, the report sent by the Divisional Forest Office Munnar, to the state government on September 18, 2000, stating that though 10836.7147 hectares of forest was leased out for cardamom cultivation, presently only 20 percent of the area is still under cardamom cultivation. The rest is already converted to pepper and other cash crop plantations. As per the existing statutory provisions, conversion of cardamom land is not permitted and if such conversion occurs, the land shall be taken back by the government. Hundreds of cases were reported to the
authorities concerned by the Forest Department. Under these circumstances, the state government requested the Central Government through its letter to consider sanction under section 2 of the Forest conservation Act, 1980, for giving conditional pattas for cardamom cultivation to the exiting lease holders. The moment any violation of the terms takes place, the land can be taken over. The nature of land can remain as deemed reserve forest. This proposition was more equitable and justifiable since the Government of India has already agreed for regulation of occupation under section 2 of the Forest Conservation Act, for the surrounding areas where people encroached the land upto January 1 1977. Further, the state government in its own interest, had submitted a memorandum to the Government of India for general exemption from the Forest Conservation Act. The Act provides for sanction from Government of India (GOI) for the renewal of leases on expiring of the lease period. Since the average landholding is only around 1.25 hectares 8500 proposals have to be submitted to the GOI. But one way to overcome the problem is to move the regional office in Bangalore which has the authority to clear proposals for less than five hectares. Political pressure from Tamil Nadu and Kerala was given seeking Central clearance to the proposals for giving sanction for general exception from the Forest Conservation Act to give pattas for leaseas in the Cardamom Hill Reserve. However, the high Court, as per the impugned judgment, had redrafted Rule 2(b) and nullified all leases granted to the Cardamom growers. The Supreme Court had now stayed the High Court judgment denying, benefits to encroachers in the grant of lease of government land for cardamom cultivation based on a Special Leave Petition (SLP) from a batch of cultivators challenging the High Court judgment.

Export Credit Guarantee Corporation of India Ltd (ECGC): The Export Credit Guarantee Corporation of India is a Government of India enterprise located in Mumbai. It has a standard policy to cover losses that arise due to war, import and exchange restrictions and inability of the importer to pay off. It can also help secure loans from banks for pre-shipment and post-shipment
needs. It also acts as a catalyst for exports. The cardamom exporters can make use of the ECGC for harvesting benefits available for exporting of cardamom.

STCL Limited

STCL Ltd. was launched as Cardamom Trading Corporation Ltd, a government of India undertaking established under the Ministry of Commerce and Industry. The company has gone through various stages of improvements in its process of development and growth. Realising the immense market potential, the company developed slowly from cardamom trading company to Spices Trading Corporation Ltd. in 1987. With globalization and opening up of market world over spices trading corporation Ltd., has now been renamed as STCL Ltd. The STCL Ltd. has made purchases of cardamom worth of Rs. 32.00 crore during 2005 - 06. The cardamom auction is conducted on every Thursday by the CPA exclusively for STCL Ltd. The company is now functioning with a reasonable amount of profit.

Export subsidy by the Government of India: The Planning Commission has extended export subsidy through the Commerce Ministry, Government of India for cardamom in a bid to increase exports on the one hand and to arrest the decline in domestic prices of cardamom on the other. The total amount involved in the scheme would cover costs such as local transportation, processing and export freight of cardamom.

The WTO compatible subsidy would make the Indian produce competitive in terms of price in the overseas markets. Besides, it would also help regulate the supply, which in turn would arrest the fall in prices while the farmers get a remunerative price. To make the prices competitive in the international market, the central Governments' subsidy support has become inevitable because, the cardamom growers in other countries are offering their produce at prices much lower than that of the Indian produce leading to a sharp
decline in exports. Guatemala is said to be offering at half of the India price in the international market. The competitive freight advantage enjoyed by other producers coupled with the cost involved in quality improvement has to be compensated. This could be made possible by extending the WTO compatible subsidy for exports of cardamom. Ever since the Spices Board announced the airfreight assistance on October, 2005, the total, export buying is pegged around 300 tonnes. This, coupled with the domestic pull, had pushed up the prices of the commodity. Apart from boosting exports, this has actually acted as a market intervention exercise.

The airfreight assistant of Rs.45 a kg would make the Indian cardamom competitive in the overseas market. Initially, it was Rs.30 a kg from October 16 to November 30, 2005 and was raised to the current level from 1st December 2005. In view of the positive response received and the market conditions become favourable, the trade has suggested that the airfreight assistance from the Cardamom Development Fund may be extended whenever it is necessary.

‘Flavourit’ Brand: The Union Commerce Ministry has approved the launch of the ‘Flavourit’ brand of Indian Spices including cardamom promoted by the Spices Board in US markets. The centre has agreed to bear 50 per cent of the cost of launching while the rest would be borne by the other stakeholders. ‘Flavourit’ has a market potential in US markets especially in areas like Silicon Valley dominated by Indo-Americans. The Board has embarked on the venture based on a marketing study in the US conducted by an international agency. The Central Government has shown interest in financing a publicity campaign in the US for promoting the ‘Flavourit’ brand. The introduction of the brand promoted and quality assured by the Spices Board is an attempt to re-establish their identity to get a fair share of value realized in the international cardamom market. The launch is aimed at providing a marketing channel for growers of
cardamom, particularly those who have taken up organic production of cardamom. 14

II. NON -GOVERNMENTAL AGENCIES

Futures Trading in Cardamom by National Multi-Commodity Exchange of India (NMCES) Foreign institutional investors are making serious enquiries about the multi-commodity exchanges and are likely to enter trading in Kochi. The on-line futures contract in cardamom was inaugurated by the National Multi Commodity Exchange of India Limited through a terminal of Geojit Securities. It is a landmark move and is a potential area of growth for commodities markets. The Exchange has been told to adopt the best trading practices and to bring in transparency to win the confidence of the producers as well as the consumers. It is regulated by the Forward Markets Commission and efforts are on to strengthen the regulatory mechanism so that the Exchange provided "Price Security" to the growers at the same time providing hedging to traders. However, the success of futures trading in cardamom depends on the level of understanding among the cardamom growers. Therefore, the leading market players have to undertake a series of training programmes to educate the farmers and traders about the commodity markets. 13

III. INNOVATORS

Innovative Cardamom Growers: A Case Study: While research and development activities are carried out by the Agricultural universities/research institutions in different parts of the country, a few innovative farmers have become role models. They use their own land as their laboratories to test their innovations. Such innovative cardamom growers are well recognized and they are being rewarded by the Spices Board for their outstanding performance in cardamom production and marketing. The profile, performance and perceptions of one such innovative cardamom grower are highlighted here.

Shri P.N. Surilivel, a married man and a father of three children, is a simple Gandhian living in Vamsanadu, Theni District, Tamilnadu. He started
cardamom cultivation in 1962 with two acres of land in Sasthanodai Village located fifteen kilometers from Kumuli in Kerala State. He has now become a familiar figure among the cardamom growers in India because of the new variety of cardamom called PNS Vaigai introduced by him to the world of spices. Because of his hard work and personal attention in cardamom cultivation in a slopy land, he has set an example to other cardamom growers.

He is not a scientist but an innovative farmer who has studied only up to 8th Standard. His tireless work was not a waste in his personal life. He was lauded by the then President of India Sri, A.P.J.Abdul Kalam, at New Delhi, on 12.02.07 for his achievements in getting more productivity in cardamom cultivation in 2002-03. His outstanding performance in 2002-03 brought him laurels. He got the Central Government Spices Board National Award for the highest yield per acre of cardamom in the country.

He became a role model to another cardamom grower Mr.Gnanaselvam (from Cumbum), who secured second prize of Spices Board Award in 2003-04, by using the PNS Vaigai variety. Mr.Gnanaselvam is the best evidence for the innovative idea of Shri.P.N.Surilivel. Shri.P.N.Surilivel has now become the friend, philosopher and guide to many such interested cardamom growers, in Kerala State. Many farmers benefited by cultivating PNS Vaigai variety.

What is the basic reason for his achievements in the cultivation of cardamom? He has not only followed scientific methods but also used his experience gained through constant observation. In 1992, when he started to undertake the replantation work in his land he noticed a new variety of cardamom which was different from other cardamom plants. When he started to differentiate such plants, it was a surprise for him to see its special features. Immediately he brought it to the knowledge of Dr. Vardarajan, Senior Scientist of the Indian Cardamom Research Institute at Mayiladumparai located 55 km s away from his land. It was a different kind of variety not only for him but also for many scientists working in the ICRI and other cardamom growers of the area. The scientists from ICRI encouraged him to develop and multiply this
variety. The inspiration got from the scientists and his tireless efforts in developing this variety during the last several years are the basic reasons for the introduction of the new variety viz., PNS Vaigai cardamom.

What is his background? He is an inspiring farmer. His land is located just one and a half kilometer from his own house in Sasthanodai Village in Kerala State. Sasthanodai is 100 km away from his native place of Vanisanadu in Tamilnadu. He and his son are looking after the cultivation assisted by a manager. The house in Sasthanodai has been constructed in such a way as to perform processing and storage functions.

Except cardamom no other crop is cultivated in his land. Though he has introduced his own variety, i.e., PNS Vaigai, in the earlier years he cultivated the Mysore variety of cardamom. He has dug wells, one at the top and another at the bottom of his slopy cardamom land. There is a river at the bottom of the slopy hill which is the main source of irrigation. In that slopy hill land he has made arrangements for drip irrigation (fogur). He has both oil and electric current motors which have been used to lift the water from the well and supply to the plants through drip irrigation method. It is worthwhile to mention here that he constructed a stone wail around the entire area of his slopy land to prevent soil erosion. A proper drainage system is provided to avoid stagnation of water around the plant.

Every plant is under cultivation in $10^5 \times 10$ pieces of land. So, uniformity in the size of the area of cultivation can be found on his land. This spacing facilitates airation and entry of light to enhance the rich green colour of the pods.

At every clear interval soil test is being undertaken. Similarly, he undertakes gap filling activity by taking seedlings from his own cardamom land. According to him the average age of a cardamom plants is 8 years. However, he has 15 year and 17 year old plants in his land. He usually applies
organic manure three times and inorganic manure two times in a year. He also applies vermi compost once a month. He applies pesticides / insecticides to prevent pest attack. He uses power sprayer to apply pesticides/ insecticides.

The shedding of green capsules and other such problems have been minimized to the maximum extent possible by adopting scientific way of cultivation. Whenever, Mr.Surilivel notices unwanted things the in cardamom field he immediately contacts the experts and follows their advice. Thus, a close contact between him and the experts could be seen as one of the reasons for his success in cardamom cultivation.

Is there a cordial relationship with the agricultural labourers working in his land? He says that it is possible for him to get more yields due to his cordial relationship with his agricultural labourers.

According to his opinion the trade union of the agricultural labourers is sometimes good. Most of his agricultural labourers are members of the CITU. The working hours of the agricultural labourers starts at 7 am and ends at 3 pm with a lunch break of half an hour. He pays wages as per the prevailing rate. The existing rate paid by him is Rs 95/ per labourer per day. Weekly payment is made to the labourers.

On an average, once in forty days the harvesting operation is being carried out. In the year 2006-07, he harvested eight times. Thus, he is getting the yield throughout the year except for a month. He has two processing units with a capacity of 300 kgs of green capsules to be cured per unit.

He is undertaking curing of cardamom in his own unit following modern technology and stocking the cured cardamom, if possible, to get a reasonable price. Thus, he follows the modern methods not only for cultivation, but also for the curing of cardamom.

On an average he is able to produce 1 kg of dried cardamom out of 5kgs of green capsules. It means that he is able to get a recovery of 20 percent per kg of green capsules. Before undertaking curing he washes the green capsules and
puts them in the drier after filtering the water. He uses Jayaseelan drier manufactured at Cunibum in Theni District, Tamilnadu. He performs cleaning, polishing, grading and standardizing functions. He has the equipments to perform all these functions. However, he needs to know more about the ‘Agmark’ grade of cardamom.

Only 15 percent of dried cardamom could be seen of lower quality cardamom from the bulk produce. The average yield that he gets is about 700 kgs per acre. He follows scientific methods in storing the stocks in the godown.

He sells his produce to the Kerala Cardamom Processing and Marketing Company (KCPMC) in which he is an active member. In his opinion personal attention is essentially required while performing almost all functions pertaining to cardamom cultivation, viz., weeding, forking and earthing up, manuring, irrigating, pesticides/ insecticides spraying, replanting, gap filling, harvesting and curing. In all these activities he pays personal attention and as a result he is able to reduce the expenses besides practicing direct supervision in farm management.

He has spent, on average Rs 70000/- per acre. He feels that it will help the cardamom planter if the government introduces Minimum Support Price Policy to cardamom as it has been done in the case of other crops. He is ready to become a member of a cooperative society if it is formed by the cardamom growers. Thus, Sri.Surilivel is a simple and dedicated innovative farmer.

His persistent and tireless efforts and application of scientific methods coupled with his own experience brought him laurels. The wholehearted support and encouragement given by his wife and family members also contributed immensely to add feather to his cap. To sum up, he is a role model and has become a friend, philosopher and guide to his counterparts in India.

Technocrats: Technical knowhow is an essential aspect in cardamom production and marketing. The scientific approach in the process of cardamom production and marketing helps the cardamom growers in reducing the cost and
thereby increasing the net amount out of gross income. In such activities a few technocrats have engaged in innovations which enhance the operational efficiency in cardamom production and marketing. The operational aspects of such innovations of technocrats have been highlighted hereunder.

Moisture Analysers: It is one of the most sophisticated yet easy to use portable moisture testers introduced by Lunkad Enterprises, Mumbai. It incorporates microprocessor technology and electronic circuit to give digital readouts. It can be used to test the moisture content of cardamom before buying, selling and storing.¹⁶

Dryer for curing: A Survey undertaken in Kerala, Karnataka and Tamilnadu by the research team of the Cardamom Planter Association (CPA) College, Bodinayakkanur, Theni District in Tamilnadu has revealed that the thermal efficiency of conventional curing chambers ranges from 3 to 16% of the fire wood used for cardamom drying. The rest is wasted. It has been found that 12 million kg of fire wood is wasted annually in conventional chambers. When growers do not get dead wood for fuel, they cut green trees resulting in deforestation. To overcome these difficulties in the curing of cardamom, the same research team has achieved a breakthrough in cardamom curing research by fabricating a solar drier, a small prototype solar drier unit of 20kg capacity. The research team has fabricated 3 more solar driers of larger capacity with better results. They are called solar water heater, solar air heater and forced flow drier. The solar water heater is a system by which water in a rectangular tank is heated by solar energy to dry 35 kg of cardamom spread out on 9 racks. About 10 liters of hot water is circulated through the tank continuously. The unit has 3 rectangular panels with flat plates to collect heat from the sun and retain it for a time long enough to ensure a continuous uniform heating of the water. The unique feature of this solar equipment is that it is a hybrid unit in the sense that even after sunset or when there is no sunlight, it can be operated, using minimum firewood or electricity. It takes 30 to 36 hours for the cardamom to get dried.
The Solar Air heater is also a ‘hybrid unit’ which, can be operated on solar energy and by burning firewood. It comprises 3 long inter connected insulated solar panels. Fabrication of this unit is easier than that for the water heater. It contains a cylindrical tank and an ejection box at the top. Even while hot air is passed through the tank controlled burning of firewood from an oven below is effected in order to suck hot air from the panels. Normally a blower has to be used to blow air into the panel. But the use of firewood, leads to avoiding the use of the blower. This unit can also dry 25 kg of cardamom and cost about Rs. 14,000. If produced on a mass scale the cost could be brought down to about Rs. 10,000.-.

In the forced flow drier, hot air obtained through the solar panels is passed through an elongated container to heat 40 kg of cardamom contained in the drier box. A new method of bed drying is done in this unit, wherein cardamom is placed in bulk in the box and not in trays as in other units. The drying time is reduced to about 18 hours, compared to 28-30 hours in the solar air heater and 36 hours in the water heater as well as in the conventional chamber. The capacity may even be increased up to 500-600 kg by using larger containers. The unit also has a multiple exchange in order to pan hot smoke from burning firewood through copper tubes at night or when there is no sunlight. The Indian Cardamom Research Institute (Spices Board) is evaluating alternative methods of cardamom drying using kerosene or liquid petroleum gas, as sources of fuel and has achieved a considerable rate of success. The cost of construction of the drying house along with adoption, of kerosene or LP gas system works out to Rs.30,000 to Rs.35,000/- for 100 kg drying, and drying cost works out to around Rs.2 to Rs.2.50 per kg fresh capsules.

ECCARD (Economical Cardamom Drier) is a modified conventional curing chamber developed with a better fuel efficiency oven. The outer surface is well insulated to avoid loss of heat. The hot smoke from the oven is passed through an insulated pipe to a tall tank placed 3m below the drier. The main
drying unit consists of a well insulated rectangular box maintained on a stand. Four flue pipes at the 4 comers of the smoke tank and the surface of the smoke tank transfer the heat to the drier. The unit contains movable trays to spread cardamom on.

Provisions are made on the side wall for entry of fresh air. A control opening at the sealing is provided (with exhaust fan) for the drier to ensure the removal of moisture. The curing will be completed in 26 hours and the capacity is 80-100 kg of cardamom at a time. Fuel efficiency, reduced duration, less cost and above all good colour retention are some of the advantages of ECCARD over the conventional curing house. ECCARD is based on the principle of economic use of firewood for drying cardamom. In several trials, it has shown that cardamom of good colour and quality can be obtained from it.

The major drawbacks in the case of solar drier are the non-availability of sufficient sunlight in the plantation area. Even in the case of electric driers, the interrupted supply and high cost of electricity are limiting factors. A recent addition to the cardamom drier is the one developed by the Indian Institute of Science (IISC), Bangalore. Standard designs for drying 25 -100 kgs of wet produce per day are available and have proved to be the most fuel efficient.\textsuperscript{19} The Malleswarar Engineering, Bodinaickanur Tamilnadu, has developed a low cost bio-mass based cardamom drier. It is a semi-automatic, indirect heating cardamom drier in which the air is heated by firing bio-mass, waste wood, firewood briquette, coconut shell and terrestrial plant solid mass to dry the cardamom. This drier operates automatically on pre-set temperature. The biomass based cardamom drier has both the physical structure and operating systems which are similar to those in the diesel based cardamom drier, except the firing system.

The furnace in the drier works as a firing chamber as well as heat exchanger. The fire in the furnace will burn with a high level flame till the temperature of the air reaches the preset value and, through a thermostat
control system, the flame will be reduced gradually till the air temperature reached the low level cut off temperature and this process cycle will be continued and constant air temperature is generated and supplied for curing.

Thus, atmospheric air is heated in the heating chamber by firing the automatic fuel burner and the hot air is supplied to the cardamom -drying tank by the blower. The hot air uniformly passes through all cardamom pulses in the drying tank and absorbs the moisture from the cardamom and with the moisture the air is passed outside through the air ducts. The process is repeated and the moisture in the cardamom is taken away gradually. Since the operating temperature for the drying process is low, i.e., cto 53 Celsius the cardamom which is under the drying process, dose not get damaged in any way. Also the moisture from the cardamom is not disturbed physically during the drying process. The greenish colour in the cardamom is retained and does not fade.

When 75 per cent of the firing chamber is filled with firewood, the firewood will burn continuously for two hours with automatic reducing and rising of flame for supplying air in constant temperature to the curing tank. Since the entire hot air produced in the drier is utilized only to cure the cardamom there is no loss of heat and hence fuel consumption is reduced. The air from outside passes over the metallic surface of the firing chamber by the action of the blower and the low temperature air gains the heat from the high temperature metallic surface of the furnace and at the same time the furnace wall loses its heat to the air. The furnace in the drier operates at a low temperature and hence the life of the furnace and other parts of the drier are long and the maintenance cost is less. The operation of the drier is simple and any unskilled person with a little training can operate it. The drier is compact and it can be placed on any type of floor without civil foundation work. Thus, the biomass based cardamom drier is considered to be one of the best cardamom driers compared to the other driers in respect of operating system, human safety, cost of drier, quality of cardamom, consumption of heat energy, maintenance cost, fiiel cost, pollution, etc. (See Appendix-VII). Kardi dryers
produced by Kardi Deyers (P) Ltd., Chennai is also available in different sizes in the market. The details of cost estimates are shown in the (See Appendix - VIII).

Cardamom Curing in Guatemala is done in specially built cardamom processing drums. It is known as Desidecata doras de cardamomo invented in the early 1960s by Edgar Champney and made by fito Fumagally make: Estinctomich. Thus, cardamom processing is done big drums allowing hot air to enter through the bottom to pass through green capsules thickly put in above a wire mesh. About 24 to 28 hours are required to get the green capsules dried. A motor is attached to blow air through. Firewood and coffee husks are the main fuels. There could be more than one drum placed inter-connected in a room for curing.' Cardamom curing in Guatemala now is limited to drying and polishing only. Drying is done artificially by heater system in large bins where hot air is blown by turbines through the capsules. The heating source is either kerosene burner or firewood. A large number of dryers use firewood as heating source. Cardamom in the bin is turned two times during drying; once after 20 hours and the second time before taking it out for polishing. The capacity of each bin is 1800 to 2250 kg. The fuel requirement for each batch is as follows:

1. Kerosene burners = 1 gallon / ltr.
2. For turbine diesel engine 5-10 HP = 9 gallons / batch
3. Firewood = 4 cmt / batch
4. Workers required = 3 per batch

Each drying shed had 5-10 bins, thus when working to full capacity each drier could dry 20-40 metric tonnes per week. The dry cardamom is transported to processing units in polythine lined / woven poly bags. The cost of each drying unit of 1800 kg capacity is put at 1.5 to 2.5 lakhs. 21
References: