

Reducing the input cost while doubling the productivity in Cardamom –

**Story of experimentation in standardizing cultural practices with
new variety by Mr. Paulos , Idukki district , Kerala**



Many farmers who own about five acres of estate with cardamom plantation are usually incurring about Rs.7-8 lakhs annually as expenditure towards mostly the cost of chemical inputs for procuring fertilizer and pesticides . But to any one's astonishment and in spite of managing 40 acre of cardamom plantation ,Mr.Paulos in Rajakumari , Kerala incurs less than 50 % of normal expenses or just few lakhs to manage the entire farm. With less spending for chemical inputs he maximized his income from cardamom cultivation but doubled the productivity of plants by adopting low cost cultural practices .This is the story of Mr.Paulos who developed innovative practices and also developed a new cardamom variety which is capable yielding higher under low input system.

Mr. Paulose (47) studied up to +2 in Kajanapara village in Idukki district of Kerala. After completing his school education he took up farming when he was below 20 years old . Initially he has been cultivating pepper and ginger in ½ acre land and gave up due to labor problem and shifted to cardamom cultivation . His family was owning 6 acres of cardamom plantation . He isolated few clumps with long panicle and bold capsules and expanded this new variety to his entire garden . He experimented fertilizer application , plant protection ,mulching and evolved

low cost practices .With steady income he acquired land nearby his field to the tune of 28 acres ; he also built a pucca house and procured two vehicles to bring laborers . All was possible by reducing the input cost while doubling the productivity . This is the way he shows to others that agriculture is more profitable than any other profession . He was awarded for the highest productivity for cardamom in 1995 and during 2009 by Spices Board .With three decades of his involvement in his plantation, he developed eco-friendly cultural practices which reduced the cost of inputs in cardamom cultivation and maximized the yield.

Story of Experimenting new ideas



Mr. Paulose is a hard worker and equally competent with other plantation labourers and developed confidence in all aspects of cardamom cultivation. He also climbs tall trees for pruning them or dig pits for planting cardamom clumps. He watched various planters surrounding his farm and other areas in Idukki district who practice various operations viz. terrace making, ridges & furrow formation, spraying against insect pest and disease , soil application, etc. He used to adopt such method in his farm on small area in few clumps and discard them if it is not up to the mark. Thus he discarded many modern practices of using chemical inputs and slowly made progress in low cost cultural practices such as mulching, lopping / pruning of trees for shade regulation, identifying good clumps with vigorous

growth for good yield ,pest and disease resistance etc. Over the two decades of hard work, he stabilized these practices. His innovations are described below:

i)Mulching in cardamom



About two decades back , he noticed that whenever there is a rain fall, water run off quickly from his field . He observed that those areas where soil is covered with leaves and twigs of trees where more moisture was maintained and this is due to less let out of rain water . Such place the soil pan become loose and in turn growth of the near by plants are found with good stand with less pest / disease. Therefore he never removes the fallen leaves and twigs or small branches from his field; (such leaves/twigs obtained while pruning the trees are usually removed by laborers for fuel wood purpose).This practice has helped arresting run off of rain water from his field and improved the texture of the soil with more compost due to decomposition of organic matter . Then he expanded this mulching technique to all his 40 acres field .



The accumulation of fallen leaves and twigs of shade trees made into a thick cover of mulch with more than one-foot depth. These leaves become decomposed by *in-situ* composting process. Thus humus content is higher in his garden compared to neighboring plantation and the soil bulk density is very low . The soil has organic matter content in his field is 4.05 % as compared to 2.6 for the normal fields (refer table) . On examining the top layer of the soil , real soil could be traced only at a depth of 10cm , all the above layers are filled with decomposed plant / tree materials that had been lying in the field for more than 20 years .The best indicator of the soil is that if the soil is held / rolled firmly in hand to form a ball , in normal fields it forms a ball due to presence of soil content in the top soil where as in Paulose's field it does not form a ball and it crumbles as a friable mass due to the presence of high organic matter .

. Mulching reduced the acidity of soil and increased the pH level and organic carbon (Table 1, report of soil analysis provided by Indian Cardamom Research Institute). This increased the fertility status of the soil and he therefore stopped applying many rounds of chemical fertilizers but restricted to single application of lime and dolomite and 150 g of NPK mixture (usually farmers apply 4 -7 rounds of fertilizer application). Mulching led to many advantages which are summarized :

- i) The growth of plants is fast and incidence of thrips on capsules and stem borer is very minimum
- ii) The height of the 17 year old plant is 15 – 20 feet tall and there are about 100 tillers in each clump.
- iii) Usually cardamom plants are replanted with new suckers (by planting the clumps) within 8-10 years of cultivation. But Paulose plantation is being continued successfully for 18 years with compact clumps (without walking of tillers i.e. old suckers are decomposing fast rather than undergoing rotting process usually noticed in other farmers field) and are still healthy with maximum yield ; i.e. 28-32 racemes / panicle compared with around 20 in local varieties. In other farmers field cardamom plants tend to walk out i.e, tillers go wide apart due to rotting of rhizomes in the centre after 5 or 6 years of planting . Lateral roots are spread even in between rows or the inter space.

- iv) There is no need for weeding as the soil is not exposed and self shade of cardamom clumps suppresses weed growth; farmers in other plantations incur cost for weeding where mulch is less or soil is exposed.

The newly introduced variety -ICRI 5 plants (planted during 2010) has given exceptional performance with high yield and good color of the capsules. The cultural operations are similar to that of the normal field. Plants were with full vigor with good production, whereas yield is less in other fields located in this area due to effect of mulching followed in his garden.

So far 200 farmers visited the cardamom plantation of Paulos over the last 6 years and has opined that such type of developing thick mulch in cardamom field takes atleast a decade and it could be possible and sustainable in the long run. This thick mulch brought miracles in his field, withstand severe drought without much loss of yield experienced during Oct2012 continued till Feb 2013 while the cardamom plantation was wilting in neighboring fields.

ii) Innovations in Shade regulation in Cardamom plantation

Trees such as Jack, silver oak, mango, rose wood, *Karuna*, *Korangatti* etc are grown in cardamom for providing shade. These trees are normally thinned / pruned before or the beginning of monsoon season. However Paulos has adopted pruning the trees during summer, i.e. Dec – Jan, as the falling of twigs / branches will cause minor damage to tillers and provide sufficient time to recover coinciding with monsoon season for maximum yield. Since the soil is fertile and heavily mulched, the roots are not exposed to extremes of temperature in summer months even after pruning of tree branches and hence plants are not affected; instead, new shoots emerge in large numbers.

Usually farmers allow lateral branches to spread while pruning which suppress the growth of trees vertically. Paulos allow trees grow more height by thinning all lateral shoots. The tall trees with over head shade (trees grow with branches/foliage only at top due to pruning of side branches) facilitate better aeration as well as allow copious indirect sun light to fall on the tillers. So it is presumed that photosynthesis is very effective and hence the growth of tillers,

panicle and capsule set is extremely better: the aeration helps to reduce the canopy temperature which facilitate better fruit set (without the “*kamaral*” or drying of pollinated flowers) as well as reduce the multiplication of pests and diseases causing organisms.

iii) Minimizing chemical fertilizer reduced soil acidity level

Usually farmers apply chemical fertilizer 5-7 times in a year but he is restricting to only once during monsoon season with bone meal and neem cake mixed about 500 gm for each clump. In order reduce chemical fertilizer he applied cowdung solution to few selected clumps and observed for one year and concluded that such clumps are susceptible to disease and left that practice. He satisfied that mulching alone is sufficient. Minimizing chemical fertilizer application has reduced acidity in the soil. On the other hand it increased the humus content (organic carbon 4.2) and also pH level (increased up to 5.6). Reduction of acidity of soil increased the composting process leading to availability of nutrients to plants. Therefore old rhizomes are decomposing faster rather than rotting as happen in neighboring plantations.. Similarly he has stopped applying fungicides like copper sulphate, Bavistin while others pursue this regularly on monthly basis. Pesticide application has also been reduced to 2-4 rounds while others adhere for 12-14 times or on monthly basis.

iv) Natural control of pests :

Indain Cardamom Research Institute (ICRI) recommendations include package of practices to use judicious application of chemical pesticides to control stem borer or thrips in cardamom. As Paulos use little pesticides in one or two round compared to normal 8 applications which is common in these areas. Because of less chemical pesticide use the incidence of natural enemy /parasites of stem borer in capsule was 47% parasitization in his plot as compared to 12% in ICRI farm and 2% in a farmers plot (where more insecticides are used) as per survey report of ICRI during Aug 2012.

v) New Pest Resistant Variety developed by Mr. Paulose



Mr. Paulose's father planted "Nallani" variety in their land . Mr.Paulose has observed few clumps with distinct superior qualities . He segregated such clumps / labelled them. From this clump he has taken the suckers and planted them during 1997 (16 years before). Now the new variety has following advantages.

1. Tolerant to thrips with very few *sorikkai* (thrips affected capsules)
2. Able to withstand more than 15 years with sustained yield and higher productivity in Idukki district where rainfall is less than. (Also due to mulch effect practiced by him)
3. The plant height, width of leaves, number of panicles, productive tillers, number of racemes and capsules per raceme are higher and therefore productivity is higher.
4. Compared to new introduced variety ICRI – 5, a hybrid cardamom (introduced by Indian Cardamom Institute (ICRI) his new variety is superior in terms of yield and pest resistance . Characterization of variety (based on plant samples) is tabled below :

5. Characterization of New Variety (Sample size : 7 plants)

Sl.No.	Parameters	New Variety by Paulose	ICRI - 5	Nallani original
1.	Plant height in cm	432-441	110	265
2.	No of Panicles	95-110	88	57
3.	No of Racemes	27-34	23	20
4.	No of capsules / Raceme	8-11	7	4-6
5.	Width of leaves in cm	13.6	12	12
6.	Length of leaves in cm	68.2	61	49
7.	Total tillers	79.2	81	92
8.	Productive tillers	61.4	57	47
9.	No of Thrips damaged capsules	1.6	3	7
10.	No of shoot borer damaged tillers	2.0	5.2	13
11.	Number of capsule / kg	600-650	1000-1500	900-1000

Characters of plant variety is as follows

- Average no. of panicles per plant – 139.6
- Average green capsules per panicle – 100.8
- Expected no. of green capsules per plant – 14071.68
- Fresh weight of capsules per plant @ 1000 capsules / kg – 14.07kg
- Dry weight of capsules (1:4.5) – 3.13kg
- Harvested crop – 1 round 0.275kg
- Cost of cultivation : Rs. 1.5 lakh per acre or Rs . 3.75 lakh per ha
- Average yield per plant : 3.405 kg
- Average yield per ha @ 1000 plants / ha – 3500 kg / ha

Managing estate without supervisor

He and his wife and children are living in the midst of their farm and they involve almost in all operations such as watering of plants or fetching labourers from outside . With all his prosperity he is not keeping any farm manager / assistant to supervise his 40 acre farm (22 acre his own land + 12 acre sister's land now he manages) as he was able to plug the holes of possible expenses which is unnecessary in his farm and therefore labor cost become minimum . Usually 5-10 acre estate employs 1-2 managers to manage the over all operations in cardamom cultivation and marketing finally as some times this drains out more income when they are not sincere or honest.

vii) Encouraging natural colonization of Honey Bee

He understood that honey bees pollinate cardamom flowers he allowed natural colonization of bees by un harming them and asked his workers or outsiders not to disturb them . Unlike normal fields honey bee boxes are kept at random to facilitate cross pollination . There are more than 300 honey bee colonies in his farm thriving on the soil mounds or under the branches of shade providing trees .If any one passes through his garden he can see swarming of bees in his field expected for better setting of cardamom .

Maximizing Income by minimizing inputs

He has reduced the cost of laborer due to no weeding or applying minimum inputs or pesticides . He spends 3 laborers for weeding compared to 90 in other fields ; surprisingly he spends money as double the cost of labour for harvesting of capsules because of maximum capsule in his field i.e 200 laborers comapred to only 100 in other fields .Refer table :

Comparative expenditure for one acre

Sn o	Name of operation	Paulos field			Other farmers		
		No of times	Labourers needed	Total labourers needed	No of times	Labourers needed	Total labourers needed
1.	Fertilizer application	1	1	1	6	1	6
2.	Pesticide application	4	2	8	12	2	24
3.	Soil application	once in 10 year			once in a year	10	10
4.	Pruning of shade trees	1	10	10	1	5	5
5.	Pruning of dry leaves	2	15	30	3	15	45
6.	Weeding				3	30	90
7.	Harvesting	5	40	200	5	20	100
Total				234			270

He has been getting sustainable yield of 1600 kg / acre. In an average he harvests about 2-5 kg of dried cardamom / clump (of 100 tillers). The size of fruits are bold and round in shape and the seeds are thick and more in weight (dry capsule litre weight is 450-460 g). Based on the discussion cost of cultivation for 1 acre is Rs.15500 only of which nearly Rs.11500 was spent for harvest and processing of cardamom where as in normal fields farmers spent more than 1.5 lakh per acre for cultural operations . Only Rs.40,000 was spent on cultural operations such as shade tree looping (main source of organic matter for the soil) , trashing , hose irrigation) and 3-4 rounds of pesticide application . Yield per plant was estimated at 3.4 kg dry capsules per plant or 3400 kg per ha . As per discussion had with him in one acre he has obtained around 2000 kg of dry cardamom . The average price was around Rs.700 per kg . He is also getting premium price of 10-40 per kg because of bigger sized capsules . This clearly shows that cost benefit ratio in his field is exceptionally high . He received award from Spices Board for getting highest yield of cardamom during 1995 and during 2019- 2010.

**MICROBIAL STATUS IN SOIL (as per report from
ICRI,Mayiladumpara 2012)**

Microbes	Microbial (cfu / gd.wt of soil) Paulose plot	Near by field
Trichoderma	1.16 x 10 ⁷	0.27 x 10 ⁷
P. fluorescens	4.12 x 10 ⁴	3.41 x 10 ³
Azopirillum	0.63 x 10 ⁷	0.41 x 10 ⁷
Phosphate solubilising bact	3.05 x 10 ⁶	1.83 x 10 ⁶
Total Fungi	6.71 x 10 ⁵	5.50 x 10 ⁵
Total Bacteria	9.80 x 10 ⁷	6.10 x 10 ⁷
Total Actinomycetes	5.49 x 10 ⁶	4.8 x 10 ⁵
P.H	5.6	4.3
Organic carbon	4.3	2.1

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