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Conceptualization, Characterization and Establishment of Model Large Cardamom Village in Eastern Himalaya of West Bengal

Sujit Sarkar[1], R. N. Padaria[2], R. R. Burman[3], Natasha Gurung[4], D. Barman[5], Soham Chatterjee[6], Sanjay Dutta[7] and Sayan Debnath[8]

[1,4]Scientist, [5]Principal Scientist, Indian Agricultural Research Institute, Regional Station, Kalimpong, West Bengal, India
[2]Principal Scientist and Joint Director (Extension), ICAR-Indian Agricultural Research Institute, New Delhi, India
[3]ADG (Agricultural Extension), ICAR, New Delhi, New Delhi
[6]District Development Manager, NABARD, Darjeeling, West Bengal, India
[7]District Horticulture Officer, Kalimpong, West Bengal, India
[8]Assistant Director of Horticulture, Kalimpong, West Bengal, India
*Corresponding author email id: sujitgovt@gmail.com

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ABSTRACT

The farmers' livelihood in the Himalayan region of West Bengal mainly depends on large cardamom cultivation. However, the farmers in the region were continuously facing low yield, high disease incidence, and poor quality of large cardamom. An alternative extension approach namely 'Model Large Cardamom Village' was conceptualized to address these issues in Tindhurey village of Kalimpong in West Bengal. Diverse scientific technologies and practices were promoted in the adopted village from 2018 to 2022. An outcome-based impact evaluation was done in 2023 with a sample of 350 farmers. The maximum yield increment was observed in the *Seremna* cultivar (45.94%) followed by *Bharlangey* (42.86%), *Ramsai* (40%), and *Golsey* cultivar (36.67%). Similarly, the maximum increase in income was reported in the *Seremna* cultivar from Rs. 160000/ha. to Rs. 290000/ha. Other significant impact of Model Large Cardamom Village was increased adoption of recommended technologies, the decline in pest and disease incidence, enhanced social networking, the decline in migration of youth from the village, increased access to different production inputs and services, and starting large cardamom-based tourism. The study shows the potential of a specific and focused extension approach to address the technological gap at the regional level.

INTRODUCTION

Large cardamom (*Amomum subulatum Roxb.*), also known as the queen of spices/black gold, is the most important cash crop of Eastern Himalaya. Initially, it was a wild plant in a forest ecosystem and later domesticated in the sub-Himalayan region between 1000 to 2200 m. above mean sea level (Rao et al., 1993). The Lepcha community were believed to be the first to collect it from deep Himalayan forest mainly for medicinal purpose and also to use as an aromatic edible fruit (Sharma et al., 2000; Sharma et al., 2009). It is a shade-loving plant (sciophyte) and grows heavily under well-distributed rainfall spread over 200 days with a total of 3000-3500 mm/year (Gudade et al., 2013). The suitable agro-climatic conditions of Sikkim and Darjeeling hills in eastern Himalaya provide the ideal climate for its cultivation. As a result, Kalimpong and Darjeeling hills hold the second position in large cardamom cultivation in India after Sikkim.

Large Cardamom is cultivated over 3,500 hectares in the districts of Kalimpong and Darjeeling in West Bengal (Das, 2019).

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Kalimpong contributes 80 per cent while Darjeeling contributes 20 per cent of the total area under large cardamom cultivation (Tarafder et al., 2018). Looking into the importance, a large area under rice terraces/vegetable has been converted into large cardamom field in an unplanned way. However, this unplanned crop diversification does not go well with large cardamom farming. Now farmers are reporting about increased diseases, crop failure, low yield, and poor quality of the produce. The farmers in the region reported about a 30-40 per cent decline in yield within the last ten years. Since 2004-2005, the area under large cardamom has also registered a decline in the region (Jamwal, 2018). The Indian Institute of Spice Report (2016) mentioned that despite the increase in area and production under large cardamom, the yield declined from 214 kg/ha in 2004-05 to 203 kg/ha in 2014-15.

Multiple factors like old plantations, heavy fungal and viral disease infestations, faulty farming practices, lack of scientific knowledge, low technological support, poor extension linkage, lack of quality planting materialsetc. were responsible for the decline in yield of large cardamom (Tangjang & Sharma, 2018; Das, 2019; Tarafder et al., 2018; Sharma & Katoch, 2019). Ngadong & Longkumer (2018); Gudade et al., (2012) mentioned about the low knowledge level of farmers and poor adoption rate of scientific practices as major issues in large cardamom cultivation. The state agriculture department, spice board and private bodies like NGOs make isolated efforts to address the issue but with limited success. Hence, the need for an alternative extension approach specifically focusing on the problem of large cardamom growers was felt by all stakeholders. In this background, a new extension approach 'Model Large Cardamom Village' was conceptualized to promote and demonstrate the recommended large cardamom growing technologies in Kalimpong hills of West Bengal.

METHODOLOGY

Initially, one hundred criteria of model village were identified for the characterization of a model large cardamom village. These criteria were administered to fifty experts to find their relevancy on a four-point scale. Finally, fifty criteria with a mean value of more than 3 were selected as the final criteria of the model large cardamom village (Figure 1). After finalization of criteria, Tindhurey village from Kalimpong hill was selected in 2018 for intervention, where the majority of villagers were engaged in large cardamom farming (>50%). The project gradually spread to nearby villages

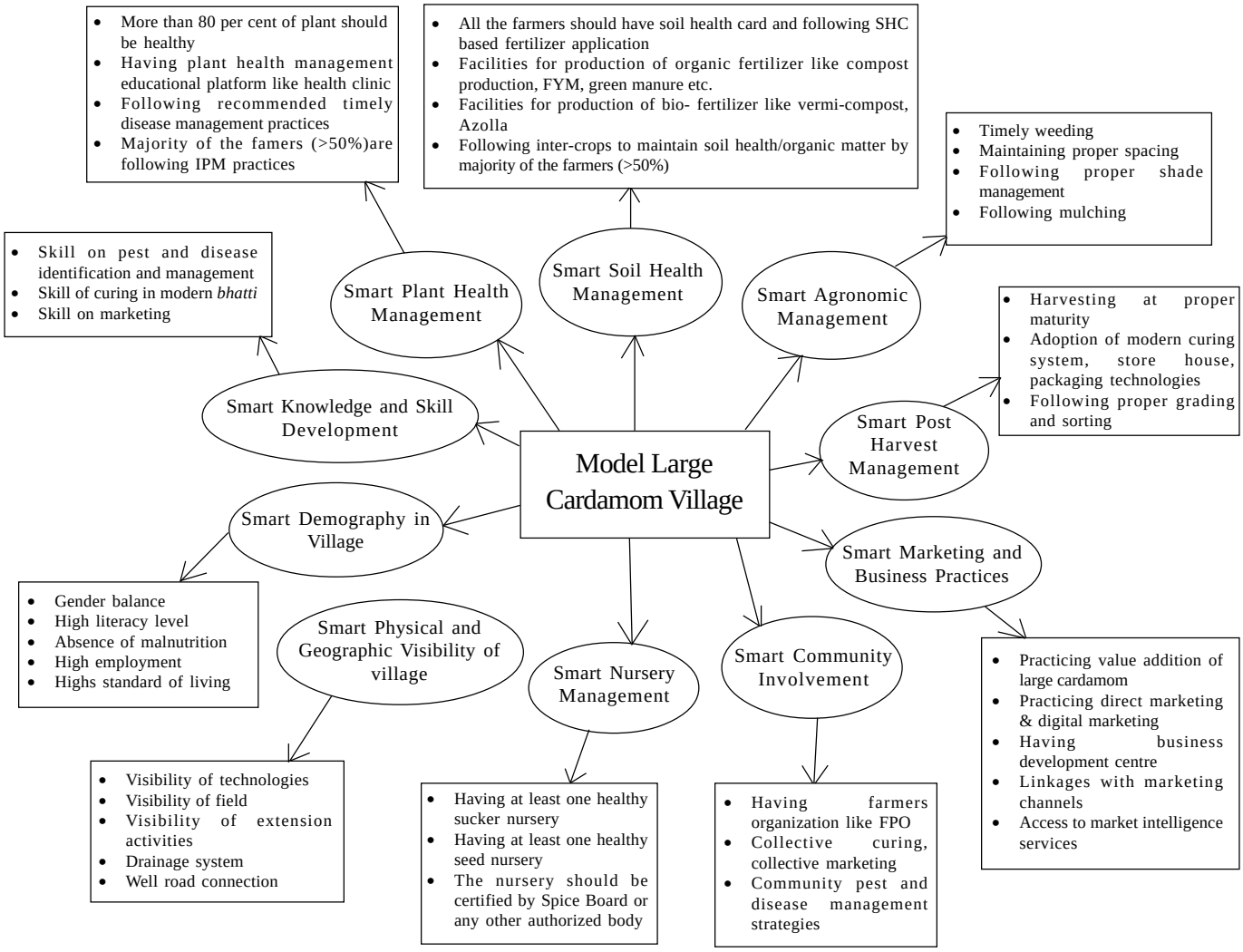

Figure 1. Conceptual map of model large cardamom village

like *Kali khola, Sunuwargaon, Durkhulagaon, Lepcha gaon, Rai gaon, Sherpa gaon* throughout the watershed approach. Thus, a cluster of seven villages was the experimental village for interventions. Diverse interventions were made in these villages during 2018-22 as per the action plan. A total 10,000 suckers of *Varlangey*, 5000 suckers of *Seremna* and 5000 suckers of *Ramsai* were distributed in the villages. Besides these, regular training and soil testing services were provided, inputs like micronutrient, bio-fertilizer etc. were distributed, three nurseries, two vermicompost units and one modified *Bhatti* (curing structure) was established and one FPO was formed. Ten demonstration fields were established so that farmers could learn by seeing the result of the demonstration plot. Fifty farmers from seven experimental villages were randomly selected for an impact assessment survey. Both the 'Before-After' and 'After Only' method of impact assessment was used for evaluating the impact of the model village on the livelihood of farmers. Statistical tools like mean, frequency, percentage, and z-test were used to analyze the data. The State Horticultural Department has certified the village Tindhurey as a 'Model Large Cardamom Village' in 2022.

RESULTS

Conceptualization of model large cardamom village

In a developmental context, the term 'Model Village' or 'Adarsh Village' is imagined as a village which is endowed with all the modern infrastructure, facilities and services. However, a village cannot become a model until its villagers become socially, culturally, economically and environmentally exemplar for others. Hence, the humanistic value system of the society has been emphasized in the recent approach of model village. Similarly, an agricultural model village or any crop-based model village is described as a village with all the modern agricultural technologies and practices, farmers are preserving their environment and climate through farming, having gender balance in farm activities, and maintaining socio-economic equilibrium. An agricultural model village must develop some quantifiable and measurable unique characteristics or take measures over a period to address some farming or livelihood-related problems and help the community economically, environmentally and socially. A model large cardamom village has been conceptualized as a village which can act as the demonstration village for ideal large cardamom farming, where all the villagers contribute to the successful cultivation of the crop, follow a scientific package of practices, bring positive behavioral change keeping environmental, climatic and social issues in mind, engages in continuous skill development process, involves whole community and pursue community approach for overall village development through large cardamom farming. A conceptual map of 'Model Large Cardamom Village' was prepared based on the experts' rating and presented in Figure 1.

Enhancing the yield and income of large cardamom growers

The study found that the yield of large cardamom has increased significantly in the model large cardamom village (Table 1). The maximum yield increment was observed in the *Seremna* cultivar (45.94%) followed by *Bharlangey* (42.86%), *Ramsai* (40%) and *Golsey* cultivar (36.67%).With enhanced yield, their income level has also gone up. Cultivar-wise (Table 1), the maximum increase in income of 44.83 per cent was reported in *Seremna* cultivar (from Rs. 1,60,000 to Rs. 2,90,000/ha.) followed by the *Golsey* cultivar (43.18%), *Varlangey* cultivar (42.30%) and *Ramsai* cultivar (39.13%). The findings of the z-test confirm that the after-income level was significantly different from before-income at a 1 per cent level of significance for all the cultivars of large cardamom.

Increased knowledge and adoption level of recommended technologies and practices

The study found that earlier only 27.14 per cent of farmers had knowledge of the recommended time of harvesting and method of harvesting which has now increased to 100 per cent and now all the farmers (100%) adopted the recommended guidelines on time and method of harvesting (Table 2). The study revealed that now more than 90 per cent of farmers had knowledge of the ideal time and method of weeding (earlier 26.86%), shade tree management (earlier 25.71%), different types of curing structure or Bhatti system for drying (earlier 11.43%), recommended pest & disease management strategies (earlier 10.86%), recommended fertilizer application rate (earlier only 16.86%) and recommended time of planting (earlier 63%) for successful large cardamom cultivation. Similarly, more than 90 percent adoption was reported in large cardamom farming technologies and practices like suggested shade tree for large cardamom fields (earlier 35.14%), ideal time and method of weeding (earlier 20%), recommended pest & disease management strategies (earlier 23.14 %), improved curing system or Bhatti system for large cardamom drying (earlier 30%). The knowledge of the farmers has also increased in the case of recommended irrigation management practices (82.35%), the benefit of using propagated planting materials (57.72%), recommended plant-to-plant spacing (68.21%), recommended cultivar as per elevation (78.86%), recommended planting time for large cardamom cultivation (55.14%). Similarly, the adoption rate of the recommended cultivar as per elevation was increased by 66.92 per cent, recommended irrigation practices by 75.36 per cent,

Table 1. Before-after yield of large cardamom in model villages

Cultivars	Before yield (kg/ha)	After yield (kg/ha)	% increase	Z-Score	Before income (kg/ha)	After income (kg/ha)	% increase	Z-score
Bharlangey (5-8 years)	200	350	42.86	118.42**	150000	260000	42.30	17.44**
Seremna (5-8 years)	200	370	45.94	135.91**	160000	290000	44.83	20.83**
Ramsai (5-8 years)	180	300	40.00	110.71**	140000	230000	39.13	59.22**
Golsey (5-8 years)	190	300	36.67	87.55**	125000	220000	43.18	56.11**

** indicates that the test was significant at 1 percent level of significance

Table 2. Before-after knowledge level and adoption level of farmers

Items	Knowledgelevel		%	Adoption level		%
	Earlier (%)	Now (%)	increase	Earlier (%)	Now (%)	increase
Recommended cultivars as per elevation	18.00	85.14	78.86	25.14	76.00	66.92
Recommended time of planting	63.00	100.00	55.14	25.00	75.00	66.67
Recommended irrigation management practices	15.00	85.00	82.35	19.71	80.00	75.36
Recommended fertilizer application rate	16.86	97.14	82.65	18.86	86.86	78.29
Propagated planting materials	36.00	85.14	57.72	15.14	85.00	82.07
Recommended plant to plant spacing	25.43	80.00	68.21	14.29	75.71	81.13
Suggested shade tree for large cardamom cultivation	25.71	95.71	73.13	35.14	92.86	62.16
Ideal time and method of weeding	26.86	94.86	71.68	20.00	92.86	78.46
Recommended pest & disease management strategies	10.86	95.71	88.67	23.14	91.14	74.61
Recommended harvesting time & method of harvesting	27.14	100.00	72.86	42.86	100.00	57.14
Different improved *Bhatti* system for drying	11.43	100.00	88.57	30.00	92.86	67.69

recommended healthy propagated planting materials by 82.07 per cent and recommended plant to plant spacing by 81.13 per cent in the model large cardamom village.

Decline in pest and disease infestation in large cardamom field

The findings (Table 3) revealed that the majority of the farmers earlier reported that the incidence of *chirke* disease was high (39.14%) in the village which gradually declined over time and now the majority of the farmers (43.14%) reported that incidence of *chirke* is low in the village. Earlier 30.57 per cent farmers perceived high incidence of *furkey* disease but now 41.14 per cent of farmers perceived a low incidence of furkey disease in the village. Similarly, the phenomenon of blight disease in the village was declined and now the majority of farmers (37.14%) reported about low incidence of blight disease. Earlier a huge crop loss occurred due to frost injury in the winter season but now a majority of the farmers (34.57%) reported about low incidence of frost injury in large cardamom fields. The pest attack has also declined according to the majority of the farmers (40%) in the village. Earlier drying of leaves due to sun exposure was reported as very high by 43.14 per cent of farmers but now only 15.14 per cent of farmers reported about this problem in the village.

Socio-economic impact of model large cardamom village

Diverse socio-economic impacts were also documented in the model large cardamom village. The findings in Table 4 revealed that enhanced social networking among various stakeholders in large cardamom farming was the major socio-economic impact with a mean score 3.75 followed by establishment of gender equality (X=3.72), decline in migration of youth (X=3.68), increased mobile usage among the farming communities (X=3.67), increased marketing linkages and better marketing services (X=3.40), formation of

Table 3. Decline in pest and disease incidence

Health Problems	Very high		High		Medium		Low		Very low	
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)
Incidence of *Chrike* disease	15.14	6.86	39.14	10.00	30.00	12.00	8.86	43.14	6.86	28.00
Incidence of *furkey* disease	10.00	4.86	30.57	7.14	23.14	12.86	25.14	41.14	11.14	34.00
Incidence of blight	23.14	8.00	45.14	15.14	20.00	18.00	6.86	37.14	4.86	21.71
Frost injury	10.00	5.14	27.14	13.14	31.14	20.00	22.85	34.57	8.86	27.14
Incidence of pest attack	16.86	6.00	36.00	11.14	18.00	14.86	19.14	40.00	10.00	28.00
Drying of leaves due to exposure to sun	30.00	8.00	43.14	15.14	20.00	16.00	4.00	36.86	2.86	24.00
Presence of healthy suckers in the field	8.00	25.14	14.00	36.00	20.86	19.71	35.14	13.14	22.00	6.00

Table 4. Socio-economic impact

Impact	SA (%)	A (%)	UD (%)	DA (%)	SDA (%)	Mean score	Rank
Decline in migration of youth	30.00	35.14	14.86	13.14	6.85	3.68	III
Gender equality has been established	34.00	36.86	6.86	12.00	10.29	3.72	II
Enhanced social networking	31.14	40.00	9.14	12.58	7.14	3.75	I
Increased market linkages & better marketing services	22.86	37.14	10.86	15.14	14.00	3.40	V
Increased access to production inputs and services	20.86	34.00	8.86	20.28	16.00	3.23	VIII
Formation of FPO enhances the social capital in the village	23.14	32.00	8.00	20.00	16.86	3.25	VII
Attracting tourist in the villages	24.86	30.86	10.00	22.00	12.29	3.34	VI
Increased mobile usage among the farming communities	28.86	36.00	15.14	13.14	6.86	3.67	IV

social institution like FPO in the village (X=3.25) and increased access to different production inputs and services (X=3.23).

DISCUSSION

The farmers from Darjeeling and Kalimpong hills have reported that fifteen years back they could have harvested 300 kg yield from one hectare area. But now they can hardly harvest upto 200 kg/ha. In some areas, it was even lower than this (as low as 150 kg/ha). The findings of Sharma et al., (2016) and ISSR report (2016) highlighted the same issue of low productivity. To enhance production and productivity, a number of interventions like planting healthy planting materials, skill building on scientific management practices, providing advisory service on pest and disease management etc. have been regularly made in the model large cardamom village. As a result of all these efforts, the production has increased to 300-350 kg/ha. in the model village. Bhattarai et al., (2013) also mentioned about enhanced production and yield of large cardamom after the rejuvenation of old fields with new plantations in their work on livelihood security through large cardamom cultivation.

In Darjeeling and Kalimpong hills, large cardamom is the largest contributor to the income source of farming communities. More than ten thousand families in the hills are engaged in cardamom farming (Das, 2019). The crop is an important part of the local economy, contributing on average 29.2 per cent of the income of households (Sharma et al., 2016). However, the farmers have reported heavy losses in large cardamom cultivation in the recent past due to low production and poor quality of the produce. Hence, the project has introduced the modified *bhatti* for curing of seed followed by proper grading of the produce to ensure quality produce and better market price. As a result, farmers in the model village have earned approximately Rs. 2,40,000 from the one-hectare area (300 kg/ha as an average yield and Rs. 800/kg as an average price).

Earlier the farmers in the region have followed the decade old practices of large cardamom cultivation due to a lack of scientific knowledge and skill on large cardamom cultivation. Because of this, the adoption scenario of recommended technologies and practices in large cardamom farming is found to be very poor in the region. Gudade et al., (2012); Ngadong & Longkumer (2018) reported about the low knowledge and adoption level of different recommended technologies and practices in large cardamom cultivation. Hence, diverse modern technologies and practices are promoted in the model village between 2018-22 and a regular training programme are organized to upgrade the skill of farmers on a scientific package of practices in large cardamom cultivation. As a result, both the knowledge level and adoption rate of all the recommended technologies and practices have increased in the village. For example, now all the farmers in the village have been following recommended time of planting (100%), harvesting time & method of harvesting (100%) and adopting improved curing structure or *Bhatti* (100%) for drying the capsule so that the produce face higher market price in the market.

Though both the knowledge and adoption rate has increased significantly in the village but it is observed that the adoption level is comparatively low as compare to their knowledge level. It is found that knowledge still has not been converted into action for a minor section of farming communities. Hence, more intensive extension programme needs to be organized regularly to bridge this attitude-behavior discrepancy for selective technology in the village.

In large cardamom farming, diverse pest and diseases like *chirkey, foorkey* and blight are major problems not only in this village but in whole Himalayan region. To address the issues, healthy suckers are provided for replacing the old and disease infested plant in the field with new one. The inputs like bio-fungicide and bio-pesticide are provided keeping the organic orientation of farmers in mind. Beside these, intensive training programe on pest and disease management has been regularly conducted using farmers field school approach. As a result, the incidence of pest and diseases has declined in the village significantly. Now majority of the farmers have reported about the low incidences of *chirkey, foorkey* and blight diseases in the village. All these are possible because of integrate approach taken in the villages starting from selection of healthy planting materials to phyto-sanitary measures taken at community level using integrated pest management strategies. Bhattarai et al., (2013) have also showed that how an integrated approach can successfully manage the pest and disease of large cardamom. Beside technological impact, diverse socio-economic impact were witnessed in the model large cardamom village. The villagers unanimously have agreed that now their networking with government department like spice board, IARI, state agricultural department, horticultural department, KVKs, NGOs and private markets has been strengthened and diverse project has been started in their villages after the recognition of model village. Beside this, the establishment of one FPO has helped to mobilize the farming communities and strengthened the social capital of the village. Now farmers can get inputs directly from FPO and can also sell their produce directly through FPO. It has also helped in establishing market linkages & getting better marketing services. In this regard, Singh et al. (2021) have showed how the farmers of Arunchal Pradesh have been forced to sell their produce at lower market price to the middleman and emphasized on the need of farmers organization for developing marketing linkages with major marketing players and agencies. Most importantly, the migration of youth from the village has declined and they have started large cardamom farming and home stay-based tourism activities in the villages and farmers are earning extra bucks through large cardamom-based tourism. Gills et al., (2021) in their study have also highlighted the role of different socio-economic parameters beside ecological parameters in ensuring the sustainability of organic cardamom cultivation in Kerala state.

CONCLUSION

The establishment of model large cardamom village helped in enhancing the production, productivity, and income of farmers from large cardamom cultivation. It also helped in enhancing the awareness, knowledge, and skill level of farmers on recommended large cardamom growing technologies and practices. The study showed that a focused extension approach like ‘Model Large Cardamom Village’ can reduce the technology gap and revive the large cardamom cultivation. Positive socio-economic impact like enhanced social networking, decline in migration of youth from the

village, gender equality, establishing market linkages, increased access to different production inputs and services, emergence of FPOs in the village, on-set of large cardamom-based tourism, increased mobile usage for getting agro-advisory services etc. were witnessed in model large cardamom village.Therefore, this type of innovative extension approach should be up-scaled and out-scaled by state department for revival of large cardamom cultivation in the problem prone areas.

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