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Sustainability Dimensions and Organic Farming – A Case Analysis of Organic Cardamom (*Elettaria cardamomum*) Growers in Kerala State of India

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ABSTRACT

Sustainability concerns about organic farming is a sector of prime importance in every nation, that aims to make agriculture economically viable, ecologically sound, equitable, culturally appropriate, and grounded on holistic science. This study was conducted in the spice garden of the Kerala state-*Idukki* which contributes a large amount to the export basket in India. More than that, this sector contributed largely to the economic development and employment generation in the area. The study identified that along with the ecological sustainability of the organic cultivation practices, farmers were more oriented to the economic and social sustainability of the organic way of cardamom production due to the social and cultural linkage which the crop possessed in the study area. The study revealed that organic cardamom production has enormous potential for improving the sustainability of agriculture practices followed and suggests that organic cardamom farming should receive prime attention from all stakeholders to realize its full potential in socio-economic dimensions along with the environmental sustainability concerns which it offers in agriculture.

Keywords: Ecological sustainability, Economical sustainability, Organic farming, Social sustainability, Sustainable agriculture

INTRODUCTION

Agriculture and its role in Indian economic development hardly need any elaboration (Niti Aayog, 2019). The benefit of growth in the agriculture sector is accompanied by the increased assimilation of the workforce in it with the creation of better bargaining power for a majority of India's population (Himanshu and Kundu, 2016). Even if modern agriculture having its vivid and flourishing influence on the global economy, it is facing several constraints including fragmentation of land holding, low productivity, and conversion of agricultural land to other uses, added with a declining trend in the total factor productivity (Cummings and Paroda, 2019). Despite all this, agriculture is providing several opportunities in all sectors due to the rising need for quality and value-added produce (Chandrasekar, 2010). Commercial agriculture created much negative impact on the social and economic balance of the living system. On this altering background of ecosystem amendment, there is a global demand for a more sustainable way of alternate farming (Parr *et al*., 1990; Millennium Ecosystem Assessment, 2005; Bhushan *et al*., 2017; Nielsen, 2018) based on the essential concept of 'giving back to nature' (Behera *et al*., 2011). The endeavour of an alternate farming system is to sheltered ecosystem health by an assortment of conservative methods. In the view of the renaissance of interest in

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the alternate farming system approach and development from different parts of the world, the organic agriculture movement has been seen as a tangible effort to create more sustainable development. It seems to have an edge in the espousal process in the farming community. As per Codex Alimentarius Commission, 2004 "Organic production systems are based on specific and precise standards of production which aim at achieving optimal agroecosystems that are socially, ecologically and economically sustainable." Though India is one among the 172 countries which are practicing organic farming the sector has tremendous potential to go ahead as only 0.7 per cent of total agricultural land is under organic cultivation (Barik, 2017). The mainstream of organic farming in India started simultaneously from two streams, in which the commercial growers of spices, scented rice, and cotton adopted organic farming for a premium price in the export market, but resources poor farmers adopted it as an alternative livelihood approach, which leads to long term sustainability (Venkateswarlu *et al*., 2008; Jaganathan *et al*., 2009; Ramesh *et al*., 2010). Among these two categories of organic farming scenario, spice cultivation recorded the utmost growth especially in India's most imperative spice state Kerala, most vitally the case of Queen of Spice, 'Cardamom' (*Elettaria cardamomum*). These organic plantations ensure a better return to growers, higher proceeds to the government by export and enhanced income to the workers, and contributing overall sustainable development of agroecosystem of the region. A sustainable agroecosystem is treated as a unit that helps to conquer the resemblance of a forest ecosystem in species miscellany and wealth (Palaniyappan and Annaduri, 2007). As the natural haunt of cardamom itself is forest it is very essential to protect it from dilapidation. Since, all of these reasons and the nature of cardamom as a high-value low volume crop, ecological, social, and economic sustainability points also need to get prime importance while adopting organic farming in cardamom. On the underpinning of this background, the study had been conducted to determine the sustainability margin among organic and inorganic cardamom cultivation in total sustainability terms and specifically on three pillars of sustainability of organic farming like economic, ecological, and social indicators.

METHODOLOGY

The study was conducted with an exploratory research design in purposively selected spice district of Kerala namely *Idukki*, as intensive spice cultivations especially, organic cardamom production and certification are taken up by many agencies. Kerala is one of the pioneer states in India that had started efforts towards organic movement at the government level. The state Department of Agriculture started promoting organic farming by setting up a separate cell for the promotion of sustainable agriculture and organic farming back in 2002-03. It was also claimed that Kerala has rich potential for the promotion of organic farming since the inorganic agriculture in the state is not that severe compared to other states in the country. *Idukki* district has eight blocks; out of which, three blocks namely, Udumbanchola, Devikulam, and Peermadu are mainly growing organic cardamom. These three blocks were selected purposively for the study. From each selected block, one village, and from each village, 30 organic cardamom growers and 10 inorganic cardamom growers were selected randomly for the study. The total sampling size of the study was 120.

In organic cultivation of cardamom, the methods to be followed should conform to the standards laid down for the purpose. Complete avoidance of inorganic fertilizers, plant protection chemicals, etc. which are an integral part of conventional farming and full adoption of a nature-friendly, chemical-free way of cultivation and processing are followed in organic cardamom production. India has developed the National Standards for Organic production and prescribed the Guidelines for Production of Organic Spices. Leading international certification agencies like Indocert International accredited by the Spices Board are already offering certification services for cardamom in *Idukki*.

The sustainability aspects of various organic farming practices were analysed through an index developed that contains a set of twelve items of three dimensions of sustainability viz., Ecological, Economic, and Social.

RESULTS AND DISCUSSION

Sustainability parameters of organic and inorganic cardamom production were analysed by using different

items selected under three pillars of sustainability. Since the Wilcoxon-Mann–Whitney's statistical test is equivalent to the t-test, it was used to test the significant difference between organic and inorganic cardamom farmers concerning their perception regarding sustainability parameters of organic cardamom production practices. The test statistic value presented in Table 1 showed that there was a highly significant difference among the sustainability parameters among the two groups of cardamom farmers (organic and inorganic). The difference was seen especially in total sustainability and its social and economical components. A further solid result was obtained from the mean rank analysis.

Mean ranks obtained from the response of the organic and inorganic cardamom farmers revealed that organic cardamom cultivation was more sustainable than inorganic cultivation (mean rank of sustainability of organic cardamom farming is 72.94 which is much significant as compared against the mean rank of the inorganic cardamom farming, 23.18). Even though the farmers differed in economical, social, and ecological components, based on the perception, the ecological sustainability difference is marginal only (Mean rank of ecological sustainability of organic cardamom cultivation was 63.63 and that of inorganic cardamom farming was 51.10) as against the general perception about the organic farming. Farmers identified the social sustainability component of organic cardamom cultivation as the most significant contributing pillar of total sustainability. It was evident from the probability indicated in the table. The mean rank for social sustainability was observed as 74.12 and 19.63 for organic cardamom farming and inorganic cardamom farming respectively. Similarly, the economic sustainability of organic cardamom practices (Mean rank 68.51) was also found significantly higher as compared with the inorganic methods (Mean rank 36.48). Even though the environmental dimension of sustainability enjoyed the lead position in many of the previous studies related to organic agriculture, while the comparison of inorganic and organic cardamom farmers in the present study area, identified ecological sustainability as a component with less importance than the economic and social pillars of sustainable agriculture. Since organic farming can not be practiced in a segment of land while others are practicing the inorganic ways of cultivation, a group approach or social movement is needed for the same. In the study area due to the intervention of the extension and developmental agencies farmers were quite knowledgeable about the economic, ecological, and social benefits of organic cultivation especially in the forest ecosystem. But the social and cultural networking pattern prevailing in Kerala contributes more to the prestige that the organic farmers assumed to be possessed. The title of 'Organic Farmer' itself is giving more acceptance for the farmers in the society and the market places. The result of the present study signifies this statement as it shows that the more important dimension of organic cardamom production is social sustainability while comparing with inorganic cardamom cultivation.

Since the sustainability component of the organic cardamom farmers was highly significant as compared with the inorganic cardamom farmers, it was further analysed for knowing the most significant component that contributes to each sustainability pillars. Since the data collected was on an ordinal scale of measurement

Table 1: Comparison of sustainability of organic cardamom farming and inorganic cardamom cultivation

Category	Mean Rank		Mann-Whitney U	Z	p-Value
	Organic farmers (N=90)	Inorganic farmers (N=30)			
Total sustainability	72.94[a]	23.18[b]	230.50	-6.820	.000
Ecological sustainability	63.63[a]	51.10[a]	1068.00	-1.750	.080
Economic sustainability	68.51[a]	36.48[b]	629.50	-4.458	.000
Social sustainability	74.12[a]	19.63[b]	124.00	-7.546	.000

Mean rank with same superscript in each category is not significantly different

Table 2: Comparison of sustainability pillars of cardamom cultivation (N=90)

Sustainability	Mean rank	Q (Observed Value)	Q (Critical value)	d.f.	p-value
Social	1.222[a]				
Economical	1.789[b]	150.651	5.991	2	< 0.00
Ecological	2.989[c]				

Mean rank with same superscript in each category is not significantly different

we employed Kruskal–Wallis one-way analysis of variance, a non-parametric test for this purpose.

The three sustainability pillars like social, economic, and ecological sustainability of organic cardamom production showed significant variation as indicated by the farmers' perception ($Q=150.651$, $p < 0.00$). Multiple comparisons were also done to identify a similar grouping of the three pillars. From Table 2, it is well evident that all the three components of sustainability differed from each other in a significant way. The mean rank from the table of multiple comparisons (Table 2) showed that the ecologic sustainability component of the organic cardamom production was given priority among organic cardamom farmers. The table showed that the mean rank for the ecological component was 2.989. It was followed by economic sustainability (mean rank 1.789) and social sustainability (mean rank 1.222). Results showed that each component of sustainability was different and belonged to different groups. Each component of sustainability was further analysed in item wise to identify the major contributing elements. Since the items in each sustainability pillar are related Friedman's non-parametric test was used in the comparative study.

Results in Table 3 indicates that four components of ecological sustainability had assembled into a single homogenous group according to the farmers' perspective. Even though the mean rank obtained for the chemical-free food as a benefit of adoption of organic cardamom cultivation was with the maximum value (2.711), the further multiple comparisons showed that the observed changes in the mean rank of different ecological sustainability components were not significant to distinguish perceived benefits of each from one another. With the understanding of the result of a growing acceptance for organic producers, which may partly be due to favourable perceptions of organic agriculture about the environment, many of the developed nations identified, developed, and implemented policies related (The 2008 United States Farm Bill') to the ecological and environmental friendly factor of organic production (Organic Farmers Action Network, 2009). In the ecological sustainability dimension of organic cardamom cultivation, the perceived increase in the system biodiversity gained through the adoption of organic cultivation practices was observed with a minimum mean

Table 3: Dimensional analysis of ecological, economic and social Sustainability pillars of organic cardamom production (N= 90)

Ecological Sustainability	Mean rank
Increase in the system biodiversity	2.267[a]
Protect and recharges the farm resources	2.378[a]
Low negative impact on environment	2.644[a]
Chemical-free food	2.711[a]
Economic sustainability of organic cardamom production	
Help farmers to become self-sufficient with minimal risk in long run	2.144[a]
Low dependence on external inputs reduces cost of cultivation	2.300[a]
Enable to accumulate working capital	2.561[ab]
Improve net income from the farm	2.994[b]
Social sustainability of organic cardamom production	
Rural poor involved in the approach	1.383[a]
Equitable access to assets	2.517[ab]
Indigenous knowledge recognized within the approach	2.806[b]
Technology safer to human and animals	3.294[c]

Mean rank with same superscript in each category is not significantly different

rank (2.267). The innate forest-based cultivation of the cardamom added to this perception as the growers were not paid enough attention to observe the changes in the biodiversity of the cultivation area. Many of the prior studies showed that organic production methods have optimistic environmental benefits (Pimental *et al.*, 2005; Feber *et al.*, 1997). Some of the previous results showed the minute form of the negative effect of organic farming on the environment. The study conducted by Pretty (1995) showed that sometimes organic farming creating some negative impact on the ecosystem through the accumulation of heavy metals by the additional use of Bordeaux mixture. Since the cardamom was cultivated in a huge area in the forest, farmer's awareness about the ill effect of leaching of these metals to water bodies would have prevented them from giving the most significant rank to the ecological sustainability of organic farming as compared with the inorganic cultivation.

Results of economic parameters analysis indicated that among the four components that come under the economic sustainability, the most imperative parameter identified by the farmers was organic cardamom production leads to improvement in their net income from the farm; hence it had the mean rank of 2.994. Serious qualms have been raised about the ability of organic farming in attaining the sustainable economic level as compared with production and profit achieved under conventional agriculture (Das and Biswas, 2002; Bhattacharyya and Chakraborty, 2005). It has been renowned that the change from conventional exhaustive farming to organic farming reduces the yields, at least during the initial years. However, it has also been reported that in subsequent years the organic farming can reduce this yield gap (Rajendran *et al*., 2000). A study conducted by Thakur and Sharma, (2005) gave shreds of evidence of higher yields in organic farming practices. Similarly, farmers who were following the organic production methods in cardamom cultivation also identified the economic sustainability component in it, especially with the improvement of net income from the farm. The next most pertinent factor of organic farming in cardamom was that it enables farmers to accumulate working capital (mean rank 2.561). Even though these two factors were with two different mean ranks, multiple comparison analysis revealed that these factors were present in a single group or on par in the significance. Similarly, the least significant factor in the economic sustainability parameter identified by farmers was organic cardamom production helps farmers to become self-sufficient with minimal risk in long run with a mean rank of 2.144. Most of the organic cardamom farmers reported that they did not purchase costly inputs from the market; rather they used self-produced inputs such as suckers, manures, green manure, vermi-compost, farm compost, plant protection material, etc. which reduced their dependence on external costly inputs, and consequently enhanced their self-reliance in crop production. Even if farmers were getting more income from organic cultivation, the incidence of pests and lack of sufficient organic manure would create problems in long run. Similarly, in organic production, the farmers had low dependence on the external input, but the non-availability of enough organic manure within the farm itself was adding to the cost side. But the return from the organic cardamom production was able to cope with the additional cost and farmers were getting more income. Even though the other two factors like low dependence on external inputs reduces the cost of cultivation (mean rank 2.30) and it enables to accumulate working capital (mean rank 2.561) were identified as more significant than minimization of risk in long run (mean rank 2.144) multiple comparison reveals the homogeneity between those three components in the economic sustainability of organic cardamom production.

Even though the social component was identified as a significant part of sustainability while comparing with inorganic cardamom cultivation, within the organic cardamom farmer group it was identified as the least noteworthy component of sustainability, (Table 2). Results of this study indicated that within the social sustainability of organic cardamom production, socially accepted technologies which were safer to human and animals with mean rank 3.294 contributed more to the social sustainability component. Followed by this, the use of indigenous knowledge recognized within the approach (mean rank 2.806) gained more important consideration by the organic cardamom farmers. But the multiple

comparison analysis revealed that these two components were on par. The least significantly important component identified by the growers within the social sustainability parameter was the involvement of rural poor in the approach (mean rank 1.383). Equitable access to assets and indigenous knowledge recognized within the approach was identified as a homogenous group of components. As per the recommendation of IFOAM, 2007 social issues are one of the key elements of organic production and hence need careful validation. The social leg of sustainability is important because no human activity can continue and flourish unless it fully incorporates individual and social needs. This mainly is based on some broad principles: say equitable access to resources as support of decent standard of living, opportunities to participate in decision making, identification and use of the indigenous technologies for the crop improvement with special emphasis on the rural population, livelihood development, opportunities for cultural and integral growth, etc.

CONCLUSION

The dream of a 'win-win-win' scenario - of achieving progress lies within the economic, social, and environmental pillars of sustainable development. The growing evidence of organic farming indicated that the practice resulted in a lot of environmental, social, and financial benefits. Conversion of conventional to organic cultivation in cardamom will lead to initial yield loss and comparatively a gap of five to seven years of yield stabilisation period. Even though those economical constraints were present in the initial period the margin obtained in terms of economic returns of organically produced cardamom is much higher due to its export potential in the world market. The group farming approach followed in the study area for organic certification of the cardamom was reduced the procedural cost and made social integrity among the farming community. Technological modification in organic cardamom cultivation made ecological sustainability in the forest, which is the natural habitat of cardamom. The shift toward organic production among the cardamom farmers in the study area can be viewed as an agricultural change that stems from societal change. Thus organic cardamom production act as a factor of sustainable development in the study area.

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