TRANSITION TO ORGANIC AGRICULTURE IN KASARAGOD DISTRICT: A MULTI DIMENSIONAL ANALYSIS

by

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(2014 - 11 -143)

THESIS

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2016

DECLARATION

I, hereby declare that this thesis entitled **"Transition to organic agriculture in Kasaragod District: A multi dimensional analysis"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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INTRODUCTION

CHAPTER I

INTRODUCTION

The increasing concerns on environmental pollution due to over use of pesticides and health issues thereof have evoked substantial interest in organic agriculture worldwide. Historically, environmental impact of modern agricultural practices became a major public concern with the publication of the book 'Silent Spring' by Rachel Carson in 1962, which prompted the world to think of sustainable alternatives to chemical intensive farming. It is well known that the green revolution which was initiated in the sixties was characterised by high yielding varieties and input intensive production methods which essentially included chemical fertilisers and plant protection materials. The debate on the prospects and problems of converting the traditional chemical intensive production regime into an organic system was fuelled by reviews on the experiences of green revolution. Though green revolution is widely accepted as the most important factor that has helped India attain self sufficiency in food production (Dubey and Shukla, 2014), there are severe criticisms as well, mainly on account of its deleterious impact. According to Sebby (2010), green revolution in India had resulted in spatial and communal disparities such as the shift from traditional sustainable methods to monocropping and the loss of small farmers' land holdings to commercial farmers leading to heavy marginalisation. It had also resulted in indiscriminate use of chemical inputs in anticipation of better yields.

The debates on sustainable development in the seventies and eighties had also addressed the impact of chemical intensive farming, which resulted in the exploration of sustainable alternatives that could reduce the use of external inputs in agriculture. However, it took decades of proactive interventions by development thinkers, researchers, non-governmental organisations and public activists to formulate a framework of sustainable development with social, economic and environmental dimensions, which was approved in the Rio Earth Summit held in 1992.

This emphasis on sustainable development, *inter alia*, has led to promotion of traditional eco friendly practices in farming the world over. Out of the several streams of alternative modes of farming such as organic farming, natural farming, permaculture *etc*. tried out by farmers, organic farming has gained importance in most places. Defined 'as a production system which avoids the use of synthetically compounded fertilizers, pesticides, growth regulators and livestock feed additives', organic farming rely on resource recycling through crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes to maintain soil productivity and supply plant nutrients. Alongside, eco friendly management techniques are employed to control pests, diseases and weeds (Reddy, 1999; Sharma, 2002). Though the sustainability of organic production systems in terms of improvement of soil properties has been proven beyond doubt, there are several apprehensions on the efficacy of organic modes of production to meet the gaps in production and productivity of farm units.

1.1.Global scenario of organic farming

It is reported that on a global scale, more than 22.81 million hectares of land area is managed organically and the market of organic food is around $30 billion. However, only 0.98 percent (43.1 mha) of the total farm area in the world is under certified organic farming (Thottathil, 2014).

Globally, Oceania constitutes about 40 per cent of the total land under organic farming. While Europe and Latin America contribute to 27 per cent and 15 per cent respectively of the total area under organic agriculture in the world, Asia had 3.4 million hectares in 2013, which would constitute only eight per cent of the total area under organic agriculture in the world (IFOAM, 2015). It is also interesting to note that organic agriculture has not gained much currency in the highly industrialised North American continent as well as the less developed and impoverished Africa, which account for only seven per cent and three per cent of the area under organic agriculture.

In 2015, there were nearly 0.7 million organic producers and most of these were from India (IFOAM, 2015). The leading countries by area were China (2.1 million hectares) and India (0.5 million hectares). Proportion of the land under organic agriculture to total land is reportedly the highest in Timor-Leste (almost 7 per cent). However, consumer demand for organic foods is reported to be on an increase in Asia thanks to growing consumer concerns about food safety as seen in the case of China. India ranks 13th position with regard to area under organic farming.

1.2. Organic agriculture in India

Many states in India have advocated phased transition to organic agriculture as a policy. For example, the north eastern states of the country have already initiated the process of conversion to organic agriculture on account of the ecological importance of this region. Use of pesticides and chemical fertilizers has been banned in Sikkim with 8,000 hectares of farm lands shifting to organic farming in the past two years alone and is now declared as organic farming state. In similar lines, Madhya Pradesh has also initiated a move towards conversion to organic means, with the largest proportion of area under organic production (14.96 per cent). Kerala contributes only 0.46 per cent of the total area under organic agriculture (IFOAM, 2015). Table 1 shows the top six states having largest area under organic farming in India.

Table 1. State wise area under organic farming (Indiastat, 2014)

State	Area (ha)	Area (%)
Madhya Pradesh	2582439.75	14.96
Rajasthan	483292.33	1.89
Uttar Pradesh	170353.91	0.89
Chhattisgarh	98817.31	1.78
Maharashtra	74409.92	0.35
Kerala	**10568.4**	**0.46**

The conversion of chemical intensive farming to organic has been on a slow pace in India, and even this slow transition is a result of the several schemes implemented by the Ministry of Agriculture, Government of India such as the National Programme for Organic Production (NPOP) which was implemented in the year 2001, which involved accreditation programmes for certification agencies, norms for organic production and promotion of organic farming. The states such as Kerala, Madhya Pradesh, Uttaranchal, Maharashtra, Karnataka, Gujarat, Tamil Nadu, Rajasthan, Sikkim, Mizoram and Nagaland have been promoting organic farming through this scheme. This programme provides information on organic production standards, criteria and procedures for accreditation of inspection and certification bodies. NPOP is administered under AGMARK by Ministry of Agriculture.

Another important programme is Paramparagat Krishi Vikas Yojana, a cluster based programme which envisages increase in domestic production and certification of organic produces. The 'National Mission for Sustainable Agriculture' launched to make organic farming sustainable, remunerative and climate resilient mainly addresses soil health management through residue management and organic farming practices.

National programmes and schemes like the Rashtriya Krishi Vikas Yojana (RKVY), National Mission on Oilseeds & Oil Palm (NMOOP), Mission for Integrated Development of Horticulture (MIDH), and the Network Project on Organic farming of ICAR also have components that aim expansion of organic farming. Union budget 2016-17 has given emphasis on organic farming by allocating Rs. 412 crores for organic farming and announced to bring five lakh acres under organic farming in the next three years.

1.2.Organic farming: The Kerala Scenario

Almost in line with national scenario, agriculture in Kerala is struggling to retain its status as an important sector of the economy with its contribution to the state GDP declining every year. This situation is aggravated by labour shortage,

fragmentation of land holdings and price instability of cash crops, to cite a few reasons. This has made Kerala dependent on neighbouring states like Tamil Nadu and Karnataka for major food items like rice, vegetables, fruits, egg, milk and meat. Reports on the increasing presence of pesticide residues in vegetables and other food samples from the neighbouring states have evoked wide response from the public on food safety and made them largely aware of the serious health hazards due to harmful chemicals.

In Kerala, public interest in this issue was grossly aggravated by the incidences of congenital disorders reported from different parts of Kasaragod District ever since Mr. Shri Padre reported about malformed calves born in the house of Mr. Somaje Mahalinga Bhat in Enmakaje. These incidences were attributed to the several rounds of aerial spray of Endosulfan on vast stretches of cashew plantations by the Plantation Corporation of Kerala to control tea mosquito bug attack in cashew. The public outcry on the need to ban pesticides in view of the incidences of diseases in some parts of Kasaragod District was strengthened by the reports of the several committees that had enquired about these incidences.

These factors have jointly contributed to the declaration of an Organic Policy by the Government of Kerala in 2008, which intended to convert agriculture in the whole of Kerala to organic in a phased manner over a period of ten years. It was also decided to pilot the implementation of this policy ideally in Kasaragod District which is widely regarded as a show case of the perils of pesticide application. The pilot programme of converting the existing agricultural practices into organic methods essentially involved ban of chemical pesticides and fungicides in the entire district and promotion of organic agriculture through various support schemes.

1.4. Support for promoting organic agriculture in Kerala

Following the policy of the Government of Kerala to convert the state into fully organic, government agencies, social organisations, women's organisations,

political parties, and self help groups are found to be actively involved in organic agriculture. Public sector agencies like Vegetable and Fruits Promotion Council, Kerala (VFPCK), several societies like The Peerumedu Development Society (PDS), Wayanad Social Service Society (WSSS), and NGO's like Thanal etc. are taking initiatives in promoting organic farming and marketing in Kerala (Indu and Jagathy, 2013). For instance, it is reported that in 2012-13, VFPCK had brought 2509 hectares under organic farming in Kerala.

However, the pilot project in Kasaragod has evoked mixed response from stakeholders. While activists and a section of farmers support the ban on pesticides and conversion to organic agriculture, functional difficulties involved in this kind of a forced transition are concerns for many. There had been reports that several small and marginal farmers have turned away from agriculture due to losses caused by uncontrolled pests and diseases for want of effective control measures. Reduction in production during the initial years of transition and the problems in supporting farmers during the transition phase also have been widely reported. At the same time, many farmers still use chemical inputs from the neighbouring state and districts. In the light of all the above, several debates have been initiated on a wide range of issues pertaining to sustainability of organic farming, particularly concerned with production potential and economic feasibility.

The major apprehension is about the efficacy of organic methods of agricultural production in meeting the growing demands of a growing population. Though organic farming is getting popularised day by day all over the world, it would be difficult for a country like India which ranks second in population with over 1.277 billion people (2015) and contribute more than a sixth of the world's population and has majority of its people depending on agriculture, to switch over to a new system altogether. This is applicable to Kerala as well, with its 33.3 million population (Census, 2011), ever decreasing contribution of its agriculture to GDP and increasing dependency for food. It is not just a question of imposing ban on chemicals and declaring a region organic; but it also involves addressing several associated issues such as the availability and price of good quality organic

inputs, cost of production and certification, opportunities for marketing and premium price of the produce, adequate credit support for the transition *etc*.

It is in this backdrop this study on the impact of the ban on chemicals in Kasaragod district becomes relevant. The study intends to assess the effectiveness of the alternate means for crop management and institutional framework suggested for conversion to organic agriculture. Experiences from the pilot project in Kasaragod would suggest the gaps in research, extension and other support mechanisms required for effective implementation of the organic policy declared by the government. This study would help formulate an indicative programme for scaling up the pilot project and revisit the organic policy of the state more pragmatically.

The study has focussed on the following objectives:

- ✓ To characterise the process of transition to organic agriculture in Kasaragod District
- ✓ To find out the nature and extent of institutional support available for the transition
- ✓ To identify the perception of major stakeholders regarding the effectiveness of various interventions involved in the process of transition
- ✓ To assess the impact of the ban of chemical inputs on major stakeholders
- ✓ To elucidate the functional constraints in banning chemical inputs

1.5. Scope and importance of study

This study has primarily focused on the multiple dimensions of the pilot initiative to convert agriculture in Kasaragod District into organic. The study has been able to characterise the agricultural scenario in Kasaragod district after the implementation of policy, in terms of technological feasibility and economic and institutional support for adopting and sustaining organic practices. The study would further help the policy makers to revisit the organic policy of the state.

1.6. Limitations of the study

The study will be focusing only on limited variables due to paucity of time and resources. Since the respondents selected for the study were farmers and extension personnel there is only limited scope for generalization based on their experiences.

1.7. Organization of the thesis

The thesis is organized in six chapters. The first chapter consists of an introductory section describing the objectives, scope, importance and limitations of the study. Review of literature in accordance with the objectives is provided as the second chapter. The third chapter deals with the methodology followed in conducting research. Results and discussions constitute the fourth chapter. The fifth chapter includes summary, conclusions and future line of the research study and finally ends up with references, appendices and abstract.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

The main objective of this chapter is to provide a theoretical orientation to the study. Review of previous studies would help us understand the present status of the topic and would provide the back drop for interpreting the results.

2.1 Organic farming: Key concepts

Though organic farming is not a new concept, it has several versions of practice followed through ages. Many authors characterise organic farming as a production system with recycling of resources, very low external inputs and hygienic outputs. As described by Oldeman *et al.,* (1990)''organic farming is basically a simple idea beginning with soil, compost, natural cycles that need to return garbage, sludge and wastes back to land, the hazards that pesticides and artificial fertilizers cause to the environment, and personal health benefits that result from eating quality nutritious food". Reiterating this, Tarafdarr *et al.,* (2009) reported that the philosophy behind organic farming is giving back to nature what has been taken from it.

Organic agriculture is not practiced uniformly across the world. Panda (2012) stated that organic farming concept has been perceived differently by different people. He further explained that it did not imply the simple replacement of chemical inputs with organic inputs but it envisages a comprehensive management approach to improve the health status of soil. He observed that the success of organic agriculture depended on the efficiency of agronomic management that was adopted.

However, it is widely approved that organic farming is more of facilitating a natural process through eco friendly interventions. According to Dubey and Shukla (2014) organic farming involves knowledge/understanding of naturally occurring processes, intended to maintain soil health, re-enlivening soil fertility and balancing useful and harmful insect-pests. Almost in similar line, Deshmukh

and Babar (2015) stated that organic farming is a production system, based on revitalizing the ecological processes and bolstering the ecological functions of farm ecosystem to produce safe and healthy food.

2.2. Definitions of organic farming

As seen previously, definitions of organic farming are varied with varying emphases on the different key processes and approaches involved in it. For instance, IFOAM (2009) defined "organic agriculture as a production system that sustains the health of soils, eco systems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved".

Definition by Sharma (2002) was found to focus on the inputs used in agriculture. According to him, organic farming is defined as a "production system which avoids the use of synthetically compounded fertilisers, pesticides, growth regulators and livestock feed additives". More specifically, organic farming systems rely on crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests.

NPOP (2000) focuses on design and management while defining organic agriculture. According to them, it is a "system of farm design and management to create an ecosystem which can achieve sustainable productivity without the use of artificial external inputs such as chemical fertilizers and pesticides"

As evident from the above review, every definition of organic agriculture invariably defies the use of chemical inputs and emphasizes on the health and vitality of the soil and the ecosystem as prerequisites for sustainable production.

2.3. Pattern of consumption of agrochemicals in India

It is widely accepted that it was the introduction of high yielding varieties, use of NPK fertilizers, expansion of irrigated areas and upsurge in cropping intensity which propelled India towards self-sufficiency in food production during the era of green revolution. But it was alleged that green revolution has led to indiscriminate use of chemicals in agriculture, anticipating better yields. Studies have shown that 50 to 60 per cent of the improved food production during 1960-77 could be ascribed to fertilizers for sustainable production.

Apropos consumption of chemicals in agriculture, Joshi (2012) stated that in developed countries, herbicides and fungicides accounted for large share of pesticides whereas insecticides formed the lion's share in developing countries. In developed nations organophosphates and carbamates were found to have major share while organochlorines were prime in developing countries.

Mahaptro and Panigrahi (2013) found that Kerala accounted for a meagre one per cent of total pesticide consumption compared to Andhra Pradesh (14.3%), Maharashtra (11%), Madhya Pradesh (10.1%), West Bengal (9.3%) and Rajasthan (7.5%).

A study conducted by TATA strategic management group of FICCI (Federation of Indian Chambers of Commerce and Industry) on Indian agro chemical industry reported that fungicides and herbicides were the largest growing segments among plant protection chemicals, accounting for 18 per cent and 16 per cent respectively. Top three states contributing to 45 per cent of pesticide consumption in India were Andhra Pradesh, Maharashtra and Punjab, with Andhra Pradesh being the ruling consumer of pesticides with 20 per cent share.

In India, per hectare consumption of pesticides is lowest amongst the world and currently accounts for only 0.6 kg/ha as in contradiction to 5-7 kg/ha in the UK and nearly more than 20-30 times in China (FICCI, 2015).

2.4. Status of agriculture sector in Kerala: An overview

Agriculture and related sectors in Kerala has witnessed a negative growth rate of 4.67 per cent during the year 2014-15. The contribution of the sector has also declined from 14.38 per cent in 2011-12 to 11.6 per cent in 2014-15 to the total GSDP of the state (Economic Review, 2015) (See Table 2). The growth of agricultural sector in the state has been fluctuating with a downward trend during the last several years.

Table 2 Share of agriculture and allied sectors in GDP at the National and State level (Base 2011-12)

Sl No.	Year	Share of agriculture and allied sectors in GDP(India)	Share of agriculture and allied sectors in GSDP(Kerala)
1	2011-12	18.4	14.38(9.1)
2	2012-13	18.0	13.76(9.5)
3	2013-14*	18.0	12.9(8.83)
4	2014-15**	NA	11.6

*provisional **quick figure with 2004-05 base brackets (Directorate of Economics and Statistics, 2015)

This shows that agriculture in Kerala requires great attention and support for growth. The sector requires careful interventions to increase the production and productivity and at the same time profitability of the farmers.

2.4.1 Land use pattern of Kerala 2014-15

As detailed in the Economic Review (2015), out of total geographical area of 38.86 lakh ha, forest occupies one fourth of the total area. Out of the remaining land under agriculture, the net sown area which is 53 per cent is not found to record any significant change. Area sown more than once accounts for 15 per cent of the total area which has recorded a notable increase of three per cent from 5.65 lakh ha in 2013-14 to 5.81 lakh in 2014-15. As a result, the gross cropped area had shown a minor increase of 0.3 per cent. Another important feature is in the reduction in the area of barren and uncultivated land (-5 per cent), permanent pastures and grazing land (-38 per cent) and the area under current fallow (-8 per cent). The land use pattern of Kerala is illustrated in Figure 1 given below.

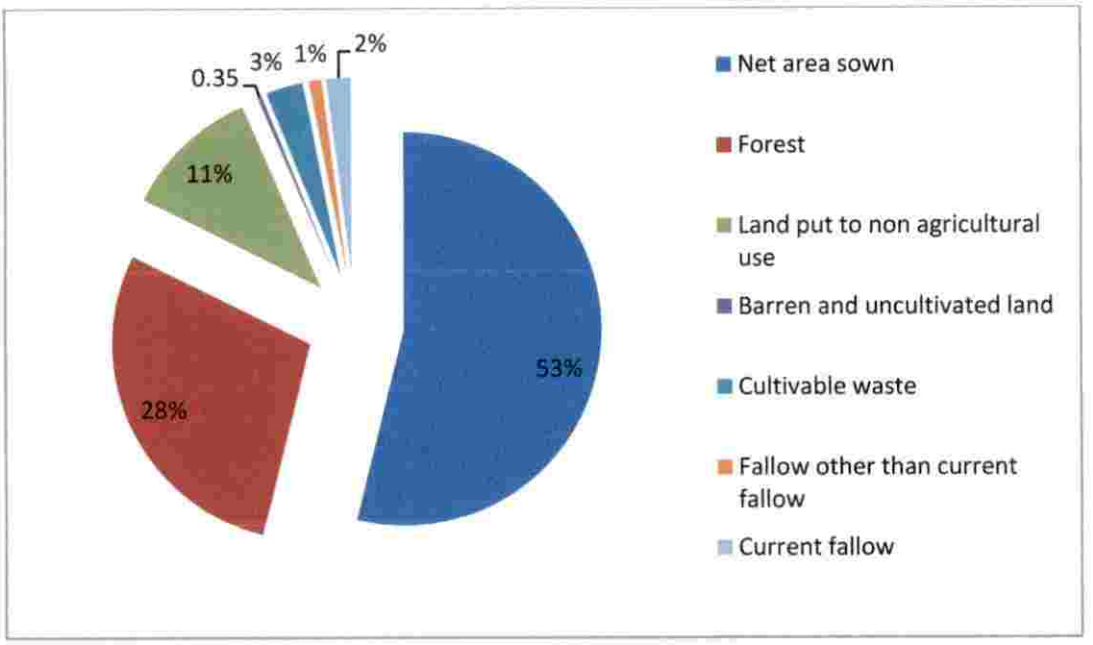

Fig. 1. Land use pattern of Kerala 2014-15
(Source: Directorate of Economics and Statistics, Kerala, 2015)

This shows that there is only limited scope for enhancement of area under cultivation, which calls for intensification of production and productivity of crops in the limited available space.

2.4.2. Trend in area, production and Productivity of crops

The area, production and productivity of crops have been showing consistent decline, as understood from the figures provided by the Directorate of Economics and Statistics (2015). In 2014-15, out of the gross cropped area of 26.24 lakh hectares, food crops comprising rice, pulses and tapioca occupy as much as 10.5 per cent. Food crops showed an increasing trend in production as pulses accounted for an increase of 16 per cent and tapioca for 18 per cent respectively. The area, production and productivity of crops across 2013-14 and 2014-15 are given in Table 3.

Table 3. Area production and productivity of principal crops

Sl No	Crops	Area(Ha)		Production(MT)		Productivity(Kg./Ha)	
		2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
1	Rice	199611	198159	564325	562092	2827	2837
2	Pulses	2989	3601	3019	3409	1010	947
3	Pepper	84065	85431	29408	40690	350	476
4	Ginger	4538	4800	21521	22989	4742	4789
5	Turmeric	2430	2470	6253	6820	2573	2761
6	Cardamom	39730	39730	14000	16000	352	403
7	Arecanut	100008	96686	100018	125925	1000	1302
8	Banana	62261	61936	531299	545431	8533	8806
9	Other plantations	54512	56761	362395	468320	6648	8251
10	Cashewnut	49105	45436	33375	29715	680	654
11	Tapioca	67589	75496	2479070	2943919	36679	38994
12	Coconut	808647	793856	5921	5947	7322	7491
13	Coffee	85359	85359	66645	67700	781	793
14	Tea	30205	30205	62938	65174	2084	2158
15	Rubber	548225	549955	648220	507700	1182	923

Production of coconut in million nuts, productivity in numbers
(Directorate of Economics and Statistics (2015)

Area under rice cultivation has been falling consistently since the last three decades. With regard to area, rice occupies only third position behind rubber and

coconut. Though there had been a marginal increase in area and production, it showed a decline in 2014-15. Coconut which is a principal crop, has shown declining trends in area as well as production. The area under vegetables also showed a sudden increase from 42477 ha in 2011-12 to 90533 ha in 2014-15 (Economic Review, 2015).

Even while the area and production of major crops have reduced considerably, productivity has remained same or slightly increased in many crops compared to the previous year. For instance, the productivity of rice has increased from 2827 Kg per ha in 2013- 14 to 2837 Kg per ha in 2014-15. This has been the case with almost all spices and banana. It is clear from these reports that improving productivity is a major strategy of the government in the agricultural sector. With the area and production declining year by year, the state cannot afford to compromise on productivity at all. Conversion to organic agriculture in Kerala will have to address the issue of productivity as reported by Caporali *et al.*, (2003).

2.5. The background of pesticide ban in Kasaragod District

The Government of Kerala in 2008 announced the organic farming policy-strategy and action plan, which included 24 strategies to convert Kerala into a fully organic state in a phased manner (GoK, 2008). This was the outcome of a series of public action initiatives and commissions reports on the alleged impact of aerial spraying of the pesticide 'endosulfan' by the Kerala Plantation Corporation in its cashew plantations to control tea mosquito bugs. The congenital deformities reported in humans as well as animals and several instances of indescribable agony of children were the reasons behind the public outcry for banning pesticides in Kasaragod District.

In this regard, Mahaptro and Panigrahi (2013) stated that the endosulfan case was considered to be the worst pesticide disasters in the field of community health and toxicology. This elongated tragedy was reasoned out to the two

decades long aerial spraying of endosulfan over the cashew estates of Plantation Corporation of Kerala (PCK) without monitoring its collateral impacts properly.

After multitudes of media reports, court cases and years of pugnacious and widespread public protests in 2003, the High Court of Kerala banned the sale and use of endosulfan within the state. Later in 2011, endosulfan was enlisted under the persistent organic pollutant category to be banned worldwide. Endosulfan is banned in more than 75 countries and the demand for the alternative has also increased after the ban. Some countries like Argentina, Peru, Chile, Germany and Benin are providing alternatives as well (KSCSCT, 2011).

The study conducted by Harikumar *et al.,* (2014) showed that the toxic residues of endosulfan in the deposit and soil samples of selected areas of Kasaragod district were found to be persistent for a period of 1.5–2 years, but the persistence showed variations depending upon the climatic conditions and physico-chemical characteristics like organic matter content, pH and the soil particle size in the area. This study was, however, challenged by Sreekumar and Prathapan (2013) on account of the methodological issues involved in it.

It was due to these widely reported issues related to endosulfan from Kasaragod District, the government took up decisions to ban chemicals and convert the district into completely organic on a pilot basis.

2.6. Perception on impact of ban of chemical pesticides

Since the study examines the impact of the ban of chemicals in agriculture in Kasaragod district, the perception of the stakeholders which include farmers and extension personnel on the ban seemed to be a major point of observation. Ban on chemicals could be perceived positively as well as negatively with respect to its possible outcomes and impacts understood by the respondent. For example, Svotwa *et al.,* (2008) reported that the association between growth in weed population and the usage of organic manures was found to be the major problem in organic farming, which could easily resolved by the implementation of integrated pest management practices.

Devi (2010), while describing the details of the ban of endosulfan reported that farm workers were very well aware of pesticides, starting from comparatively safe ones to highly toxic that are available in the market. But regarding the colour code on the bottles, 99.5 per cent of them could not understand the toxicity level.

The occurrence of causalities may prompt farmers to adopt inorganic means as reported by Ogunlade and Agbeniyi (2011). They revealed that higher occurrence of *Phytophthora* pod rot and mirid bugs causing from high rainfall and relative humidity in cocoa producing areas of Nigeria had forced farmers to smear fungicides and other pesticides on cocoa.

Productivity of organic farming was also found to be uncertain as reported by Panneerselvam *et al.,* (2011) who observed that organic farms in Madhya Pradesh and Uttarakhand were in post-conversion period and experienced increased production whereas farms in Tamil Nadu were in the conversion period and showed decreased production.

Mokwunye *et al.,* (2012) in his study found that banned chemical pesticides were still used among farmers due to their low cost and the effectiveness in controlling pest and diseases, even though they were well aware of the health issues made by these chemicals. Pointing out another related issue, Mahapatro and Panigrahi (2013) revealed that the demand for alternative pesticides has increased after the ban on endosulfan in more than 75 countries.

Nnamonu and Ali (2013) in his study on adoption of organic farming observed that 58.67 per cent of the respondents had positive perception of agrochemical use, 40 per cent had negative perception and 1.33 per cent was undecided. Even though 58.67 per cent agreed that fertilizers and pesticides were effective, with 40 per cent disagreeing and 1.33 per cent undecided, 90.66 per cent agreed that these agrochemicals could damage the environment while 7.34 per cent disagreed and 2 per cent were undecided.

Pointing out the possibility of decreased income as an outcome of organic farming, Taneja (2014) reported that the ban of neonicotinoid pesticides such as

clothianidin, imidacloprid, and thiametoxam in 2013, led the farming community of European Union into trouble. The study further suggested that the ban impacted on farmers' yield by 50 per cent, affecting the income adversely.

2.7. Perception on various dimensions of the sustainability of organic agriculture

Sustainability of a production system is the capability to remain diverse and productive indefinitely. It has got social, economic and environmental dimensions. Different stakeholders of a production system may perceive sustainability differently based on their needs and priorities. The following is a review of available literature on how people perceive different aspects of sustainability.

Narayanan (2005) stated that the concept of quality food has undergone a drastic change over the past few decades. It does give emphasis on the characteristics of the end product, but the method of production and transport are also considered to be equally important.

Kshirsagar (2006) found that the organic farming have several social benefits in terms of resources and benefits to health and environment.

As reported by Lukas and Kahm (2008), improved soil structure, enhanced water holding capacity and augmentation of beneficial organisms, are perceived to be the positive outcomes of conversion to organic agriculture. Similarly, Svotwa *et al.*, (2008) indicated that majority of the farmers perceived that organic crops do not spread diseases.

Kennvidy (2011) found that 60 per cent of the farmers adopted and transformed their conventional rice fields into organic fields in Tramkok District and thus improved farmer's fiscal situation by yielding higher revenue than conventional rice production.

Many farmers are concerned about food safety, as observed by Landicho *et al.*, (2014). They reported that transition to organic farming in Philippines was mainly due to the farmers' anxiety on health and food safety, low-cost organic inputs, and the conservation of their traditional farming practices. About 6.4 per cent of the farmers were apprehensive of the loss of soil fertility which has been lost by the usage of chemical inputs and emphasised the need to bring back soil fertility. About 77 per cent of the farmers recognised the quality of organic products that will ensure health and food safety of both the consumers and the farmers.

In this regard, Yadav *et al.*, (2014) were of the opinion that people believed that organic farming would ensure quality food without adversely affecting soil health and environment. This perception was endorsed by Shehrawat *et al.*, (2015) while stating that more than 75 per cent of the organic growers perceived positively about organic farming and believed that it would enhance soil health, protect the environment and provide better employment to the rural poor.

2.8. Impact of the ban on livelihood options of farmers

Ban of chemicals that are used in agriculture would be a setback for active farmers who had been following chemical intensive farming, unless the transition is planned. At the same time, ban on chemicals would provide consumers with safe food. In this regard, Chen (1997) found that though the ban of chemicals would increase food quality and safety, reduction in usage of chemicals would enhance the cost of agricultural production. He also observed that consumer food costs has increased by 45 per cent after implementing a complete ban on chemical inputs.

It is also widely reported that transition to organic farming would reduce the yields considerably. Halberg *et al.*, (2006) indicated that organic farms yielded 20-45 per cent less compared to intensive high-input farming.

Reiterating this, Acs *et al.,* (2007) reported that the farmers had to survive the economically challenging two year transition period with lower yields sold at conventional prices. In the long run, conversion will become profitable.

Analysing the reasons for adoption, Lukas and Cahn (2008) found that adverse experiences with conventional farming such as waning of natural assets, high costs for organic inputs, prevalence of pest, diseases and weeds, and the health issues due to the excess application of chemical inputs motivated farmers to adopt organic agricultural practices.

Opposing the arguments that there would be negative consequences of transition to organic agriculture, Smukler *et al.* (2008) indicated that the conversion from conventional to organic method of production was found to be very effective on a large-scale even in an area conquered by conventional agriculture.

In this regard, FAO (2009) was found to hold the view that the success of a particular method of production whether it is organic or inorganic mainly depended on the site and crop specific factors, labour availability, availability of marketing opportunities, agronomic factors, etc.

Regional differences in the impact of conversion to organic agriculture as explained by Panneerselvam *et al.,* (2011) showed that while most farms in Madhya Pradesh and Uttarakhand were in the post-conversion period and experienced yield increase, the farms in Tamil Nadu were in the conversion period and experienced yield reduction.

Patil *et al.,* (2012) in a study conducted in Mysore found that yield and profit were similar in organic farming compared to conventional agriculture except for commercial crops like cotton and coconut which registered lower profits. However, the risk of indebtedness was found to be similar for both types of crop production in Mysore. On the other hand, Sasidharan (2015) reported that high incidence of pest and disease was encountered after conversion to organic farming.

2.9. Nature and extent of adoption of organic farming practices

Rate of conversion to organic farming is dependent on the nature and extent of adoption of organic practices by different categories of farmers. Review of literature on adoption would help us identify the trends in adoption as well as the major factors that determine the rate of adoption. With regard to adoption of various practices recommended in organic agriculture, Kavitha (1998) found that majority (67.50%) of the respondents had medium level of adoption on neem based technologies followed by 16.67 per cent and 15.83 per cent farmers with high and low levels of adoption respectively.

As regards the factors that determine adoption, Naidu and Venkataramaiah (2001) revealed that annual income and farm size were found to be significant and positively correlated with adoption. It was also found that large farm size was an empowering variable for the adoption of new inventions.

Jaganathan (2004) found that extent of adoption was mainly influenced by knowledge, orientation towards environment and awareness. It was also observed that majority (64%) of the respondents had medium level of adoption followed by low (19%) and high (17%) levels of adoption.

Kavaskar and Govind (2005) reported that the mean adoption score of the respondents on the usage of organic manures, micronutrients and bio fertilizers was found to be very low with 32.49, 7.08 and 5.0 per cent respectively.

Svotwa *et al.*, (2008) in his study found that majority of the farmers were using decayed and dried leaves as fertilizers.

Emphasising the importance of integrating different sectors in promoting organic agriculture, Pattanapant and Shivakoti (2014) stated that integration between government and other sectors should be made mandatory to increase farmers' adoption on organic agriculture. They also underlined the need to conduct campaigns exclusively for consumers regarding organic agriculture, price policy, research and development policy and education policy.

While discussing the issues involved in popularising organic agriculture in the uplands in Philippines, Landicho *et al.*, (2014) observed that majority (50.85%) of the farmers were using organic fertilizers, while a few will make use of botanical pesticides. This observation also reiterated the regional differences in the pattern of adoption of organic practices.

2.10 Institutional support available for the transition

Several authors have mentioned the importance of robust institutional support in promoting organic agriculture on a wider scale. As opined by Lohr and Park (2002), strengthening of institutional and infrastructure support during conversion period would help farmers in adopting organic technologies on a regional basis.

Significance of technical support to foster organic agriculture was emphasised by Svotwa *et al.*, (2007). They proposed that training programmes should be provided to the extension workers who work closely with the farmers in order to enhance adoption of organic agriculture. The importance of training was pointed out by Wen *et al.*, (2009) who observed that training played an important role in encouraging farmers to adopt organic agriculture.

Constance and Choi (2010) in a study conducted in U.S. revealed that intensified institutional support only would facilitate adoption of organic agricultural practices. Similar to the previous observations, Oelosfe *et al.*, (2010) reported that the transition to organic agriculture was strongly dependent on the type of support available to farmers.

Emphasising again on training, Jadhav and Bhatnagar (2012) concluded that farmers should be provided with awareness as well as training programmes on latest technologies to improve their farm productivity and sustainability.

Paneerselvam *et al.*, (2012) found that inadequate institutional support would act as a major hurdle in adopting organic technologies. He further explained that a government scheme that could assure premium price and

recompense yield loss during conversion period would definitely encourage Indian farmers to adopt organic agriculture on a large scale.

Several authors were found to focus on the financial support required to promote organic agriculture. For example, Ather (2013) while arguing for the need for organic farming in India revealed that adequate financial support is an inevitable thing in promoting organic farming.

Similarly, Landicho *et al.,* (2014) reported that the adoption of organic agriculture was faced with challenges such as the lack of financial and technical capability of farmers, problems on the quality of organic produce and all the other aspects related to marketing. They also emphasised the need to review the institutional support system for adopting organic agriculture and enhancing the capabilities of small scale farmers. Palsovaa *et al.,* (2014) proposed to provide financial incentives as compensation for the loss of income from decreased production.

While explaining the institutional requirements to promote organic farming, Azam (2015) pointed out the significant role of government agencies in promoting organic farming, particularly by appointing experts to deal with marketing, plant protection, certification etc., which would reduce the total cost of cultivation.

2.11. Attitude of farmers towards organic farming practices

Even in the most ideal environment, lack of positive attitude would adversely affect adoption. Since adoption of organic agriculture involves the risks of profitability, this has been pointed out as a very important factor by several authors. For example, Nath (2002) revealed that mass media, education, innovativeness and economic motivation had positive and significant rapport with attitude.

Organic farmers at large have shown positive attitude towards alternate methods of production as they are convinced about the environmental

sustainability of those methods. Jaganathan (2004) reported that majority of the respondents (64%) had a favourable attitude towards organic farming practices.

Chouichom and Yamao (2010) had also found that organic farmers showed a favourable attitude towards organic farming, whereas the inorganic farmers showed hesitant attitudes due to their lack of motivation.

2.12 Personal and socio-economic attributes of stakeholders

Since all the above mentioned variables are likely to be influenced by various socio economic and personal attributes, a detailed review of the literature on the relationship between these attributes and the dependant variables has been attempted.

2.12.1 Age

Many authors have established the relationship between age and adoption of innovations as done by Ogunyemi (2005), who found that adoption on any new technology will vary inversely with age.

Solomon (2008) reported that the average age of farmers was found to be 51 years which indicated that the older people would be actively involved in farming activities than the younger ones.

Svotwa *et al.,* (2008) found that majority of the organic farmers were aged, generally regarded as resource poor, and are not able to afford the cost of synthetic pesticides and inorganic fertilizers. To a vast majority, agriculture was as major source of income.

Adebayo and Oladele (2013) in their study revealed that majority of the respondents adopting organic practices were of age 40-49. Another study conducted by Oyesola *et al.* (2011) found that 90 per cent of the respondents were between the age group of 40-70 years whereas youth constituted only 10 per cent.

Mala and Maly (2013) indicated that the transition to organic agriculture and its implementation of organic agriculture were negatively influenced by the higher age of farmers and the high productivity of labour.

Pattanapant and Shivakoti (2014) found that younger farmers had perceived the impact of organic farming more positively and were more likely to adopt organic practices.

Singh *et al.* (2014) reported that as age increased one's capacity to provide labour diminished. Hence it showed a negative impact on adopting organic practices.

Thippeswamy (2014) revealed that majority 63.8 per cent of the farmers who adopted organic farming practices belonged to middle age, followed by young 24.3 per cent and old age 11.9 per cent.

2.12.2. Gender

Gender differences in organic farming is quite significant as reported by authors who had found varying roles of men and women in farming. Dipeolu *et al.*, (2006) found that the farming operations were mainly undertaken by the males and thus the majority belonged to males and the post harvesting operations were performed by females.

Svotwa *et al.*, (2008) in a study conducted in Juru communal area found that female farmers (79%) were more actively engaged in organic farming operations than male.

Nandi *et al.*, (2015) observed that majority of the respondents were male (94%) while only 6% were female who adopted organic farming practices.

2.12.3. Education

Generally, education has been found to play an important role in determining the extent of adoption. Better education might help farmers understand and judge the possible impact of organic farming clearly.

Singh (2009) stated that majority (60%) of farmers were educated either up to high school or intermediate level.

Lami and Abraham (2013) found that 91.3 per cent of the respondents had experienced primary education.

Pattanapant and shivakoti (2014) revealed that farmers who have low education have positive perceptions on the impact of organic agriculture on income and health, thus more likely to adopt organic agriculture.

Shaban (2014) concluded that education plays significant role in conversion to organic farming.

Thippeswamy (2014) found that organic farmers are those having relatively high education status and those having low education will adopt inorganic practices.

2.12.4. Farm size

Many studies have revealed that farm size is a major factor that influences the decision to adopt and continue organic farming.

Svotwa *et al.* (2008) reported that the farmers with an area less than one hectare were more likely to adopt organic farming technology.

Biswas *et al.*, (2011) in a study conducted in West Bengal stated that the average size of land holdings under organic farming was 0.60 ha.

Shaban (2014) revealed that production per unit area would be higher in farms having less area and this would motivate farmers to use excess chemical fertilizer to intensify the production per unit area to generate ample revenue for the farm families. Thus farm size was recognized as a major determinant in adoption of organic agricultural practices.

Thippeswamy (2014) found that organic farmers possessed more farm size (56.2%) than inorganic farmers (39%).

2.12.5. Family income

Many authors have observed that farming is generally perceived as less profitable and the annual income of most of the farmers is less.

Biswas *et al.,* (2011) in his study revealed that the family income was found to be lower in organic farms than that of inorganic farms.

Shaban (2014) found that family income was proved to be a major determinant of farmers' decision to switch over to organic agriculture. For majority (86%) farming was considered to be the only source of income.

2.12.6. Experience in farming and organic agriculture

Experience of farmers is found to be a major factor that determines the decision to adopt a practice that is different from previous practices. Landicho *et al.,* (2014) in a study conducted found that majority of the farmers had an average experience for one to three years mainly because of the training obtained from the Department of Agriculture and the local government units, since the implementation of Organic Agriculture Act in 2010. Relatively few farmers were observed to be engaged in organic practices for more than 10 years.

2.12.7. Social participation

Social participation refers to one's degree of participation in a community or society. Organic agriculture is propagated mostly by farmers with awareness on the advantages of organic farming gathered from their involvement in social activities and exposure to social and environmental issues.

In this regard, Adesope (2015) found that about 32.2 per cent of the farmers were members of cooperative societies whereas 67.8 per cent were not.

Ashhori *et al.,* (2016) while describing the factors of adoption of sustainable rice production practices observed that well-educated farmers and farmers with a large land area under cultivation, high income, access to machinery and farming

inputs, and high social participation were more likely to adopt conservation practices.

2.12.8. Extent of farming integration

Organic farming cannot sustain without organic inputs from live stock and poultry. This requires integration of agriculture with animal husbandry to a considerable extent. With regard to integration, Jaganathan (2004) in his study on organic practices in vegetable cultivation in Thiruvananthapuram district found that nearly three fourth of the respondents had medium level of livestock possession.

While Biswas *et al.,* (2011) reported that much difference were not visible in the average number of livestock per organic farm than inorganic, Kafle (2011) reiterated the importance of integration of farming with livestock in his study which reported that majority (98 %) of the farmers involved in organic farming practices possessed livestock.

2.12.9. Exposure to training

Even though organic farming is considered by many as going back to traditional means of agricultural production, farmers require training in new techniques and methods developed in organic farming. Training also would help farmers identify the problems and prospects of adopting organic agriculture.

In this regard, Lakshmi (2000) revealed that more than half of the respondents who adopt organic practices did not attend any training programmes.

Badodiya *et al.,* (2011) concluded that the farmers' perception on organic farming has increased up to 26.67 per cent after attending training programmes. Kafle (2011) also observed that trainings could encourage farmers in adopting organic farming practices.

Jadhav and Bhatnagar (2012) reported that awareness on latest technologies and right kind of training was very much significant in enhancing agricultural productivity and in maintaining sustainability.

The advantages of organic farming could be efficiently propagated by training as reported by Landicho *et al.,* (2014) who found that farmers started to realise their health and safety on the use of organic inputs mainly through the extension activities intended to transfer training programmes, seminars etc.,on organic agriculture.

Singh *et al.,* (2014) indicated that the training programmes that were provided on a group basis were found to have produced a positive impact on altering farmers' behaviour in adoption of organic farming practices.

2.12.10. Contact with extension agency

Needless to say, extension agencies are entrusted with the responsibility of propagating organic agriculture in the state, through exclusive schemes and programmes. Adoption of organic practices would therefore be influenced by the frequency with which a farmer seeks the assistance of extension agencies.

In this regard, Sarker and Itohara (2009) reported that the extension agents acted as the best source of information. The more the contact, more would be the effectiveness of the extension services provided by the agency.

Herath and Wijekoon (2013) also found that farmers who had more contact with extension agents were more likely to adopt organic farming practices.

2.12.11 Availability of organic inputs

Klonsky and Greene (2005) in their study on widespread adoption of organic agriculture in the US observed that conversion to organic farming would be possible only if organic inputs are widely available to farmers. Narayanan (2005) also reported that erratic supplies of organic inputs and low levels of

awareness of cultivators were found to aggravate the unavailability of quality organic inputs.

Charyulu and Biswas (2010) in a detailed analysis of organic input production and marketing in India observed that absence of recognized and established organic input marketing channels led to the problems of poor quality and adulteration of organic inputs in India. They further explain that conventional as well as modern input dealers and retailers were not found to show interest to deal with organic inputs marketing because of low demand and lack of distribution network.

Kondaguri *et al.,* (2014) found that the major factor that discouraged the farmers from adopting organic agriculture was the unavailability of organic inputs.

2.13. Institutional factors contributing to adoption of organic farming

As in any farming situation, there are several institutional factors that influence adoption and diffusion of organic farming. Even while the decisions of the government to convert agricultural production into organic methods, it do not materialise for want of congenial institutional support and policy environment. The following is the review of the major institutional factors that would hinder the transition to organic agriculture.

In this regard, Restrepo (1997) reported that the major limiting factors in extensive conversion to organic farming were the inadequacy of human resources, commercial and economic stress, land possession problems, and lack of revelation from the universities who could be training organic farming professionals.

Emphasising on the support to be extended to farmers during the conversion period, Kshirsagar (2006) in his study reported that the period of transition from conventional farming to organic farming would be the most crucial period. According to them, this is mainly because of the lack of knowledge on organic

farming, lack of support during the three years of conversion, failure to provide premium prices, etc.

Promotional activities and motivation also played a role in conversion as observed by Murthy *et al.,* (2008). They observed that the experiences of organic farmers in the bordering districts and the articles in the print media motivated farmers to adopt new eco friendly farming methods.

Serra *et al.,* (2008) emphasised on the market support required to promote organic agriculture. They indicated that the premium price for the organic produce and the subsidies had worked as major power tools that motivated adoption of organic agriculture.

Pokhrel and Prasad (2009) found that inadequate research and extension services and also manpower particularly on production and marketing information and input supply have hindered promotion of organic agriculture.

Exploring the motivational factors that lead to adoption of organic farming, Stobbelaar *et al.,* (2009) observed that organic farmers were encouraged for nature conservation and had sturdy institutional links. They were more likely to concentrate on environmental safety rather than focussing on financial outcome like conventional farmers.

Constance *et al.,* (2010) found that the institutional support would facilitate organic adoption. In continuation of this, Constance and Choi (2010) in their study reported that for the pragmatic conventional producers, an increase in revenue would be a major facilitator of organic adoption.

The importance of instituting premium prices and market support has been pointed out by several authors. Kennvidy (2011) observed that the majority of farmers converted their conventional farms into organic farms due to premium prices on organic products. Mala and Maly (2013) also found that the high returns on cost and subsidies to promote organic agriculture would positively influence the implementation of organic farming technology.

Moumouni *et al.,* (2013) found that the major factors that affect the adoption of organic farming included institutional support, economic factors and availability of credit, apart from farmers' perceptions on organic modes of production.

Availability of labour was another factor that was found to influence diffusion of organic practices. Charyulu and Biswas (2010) described several protocols of organic farming are indeed labour intensive. Though they anticipated that this fact would go in favour of developing countries such as India where about 80 per cent farmers are small-holder farmers, it would be difficult to have such labour intensive practices in Kerala. In this regard, Singh *et al.,* (2014) indicated, labour availability and livestock holding had a positive impact on adoption of organic farming.

2.14 Constraints in implementing the ban on chemical inputs.

Even though organic farming has got many advantages, there are several constraints or drawbacks that pull back farmers from adopting organic practices.

Lukas and Cahn (2008) revealed that farmers faced the difficulty of provisionally lower yields for a conversion period of one to three years.

Svotwa *et al.,* (2008) reported that unavailability of labour, slow organic matter decomposition, bulky nature of organic manures and the lack of availability of organic fertilizers were found to be the major constraints.

In this connection, Aulakh *et al.,* (2009) indicated that lack of marketing facilities (67.1%) and complexity in controlling insect pest and diseases (60.2%) were found to be the top most constraints faced by the organic growers in Punjab state.

Dhaka *et al.*, (2009) reported that inconsistent information, fear of lower yields, prevalence of pest, disease and weeds, higher labour necessity, lack of established markets etc., were found to be some of the important major issues faced by farmers in adopting organic agriculture.

Constance and Choi (2010) in their study revealed that vagueness regarding organic production, marketing and organic certification hinder adoption of organic agriculture.

Panneerselvam *et al.*, (2012) found that production and marketing barriers were the main constraints in adoption of organic farming practices. In addition, lack of knowledge and lack of institutional support for the conversion were also found to act as major constraints.

Kondaguri *et al.* (2014) in his study observed that majority of the sample farmers had mentioned about the unavailability of labour as the major problem, followed by non-availability of organic manures and biopesticides, irregular and limited power supply, unavailability of seed material, high incidence of pests, disease and weeds etc., act as the major problems in organic paddy production.

Soltani *et al.*, (2014) in their case studies on organic agriculture among Iranian farmers indicated that the adoption rate of organic farming practices was very low among farmers. They further explained that though the farmers had strong motive for adoption, they faced challenges in accessing authenticated technical information, certification and credit support.

Deshmukh and Babar (2015) reported that the most important constraint experienced was the lack of ability of the government policy to take a concrete decision to promote organic agriculture.

2.15. Policy level support for adoption of organic farming practices

Several studies have explored the effectiveness of policy measures directed towards propagating organic farming. According to Pretty (1995), policies have long focused on generating external solutions to farmers' needs. This has encouraged dependencies on external inputs, though they are more costly, environmentally damaging, and therefore, economically inefficient when compared to the resource-conserving options.

Laafim and Albisu (1997) emphasised the need to draw up new policies to persuade innovative organic farming techniques among traditional farmers by public institutions.

According to Narayanan (2005) a suitable national agricultural policy giving a prominent place to organic farming should address issues like credit support during the transition period. This policy should also facilitate formation of linkages among the farmers, processors, consumers and traders, inspection and certification of organic products and increasing the public awareness of the benefits of organic agriculture as well as ill effects on the conventional system.

Dubey and Shukla (2014) reported that India lags far behind in the adoption of organic practices. According to them, the prerequisites to promote organic agriculture in the country were providing marketing opportunities, financial support, and government support to the producer as well as consumer, making certification procedures more liberal and affordable.

It is based on the review of literature, the variables and major observation points have been finalised.

RESEARCH METHODOLOGY

CHAPTER III
RESEARCH METHODOLOGY

Research methodology is the systematic and theoretical analysis of the procedures applied to a field of study (Kothari, 2004). Research methodology involves concepts such as research design, sample size and sampling procedures, data collection techniques and data analysis. This chapter briefly explains the methods and procedures used by the researcher for the study, which are presented under the following heads.

3.1. Research design

3.2. Locale of the study

3.3. Sampling procedure

3.4. Selection of variables

3.5. Operationalisation of variables

3.6. Measurement of variables

3.7. Tools used for data collection

3.8. Statistical methods used to analyse the data

3.1. Research design

Research design describes the overall framework in which the study is conceived and conducted. Parahoo (1997) defines research design as "a plan that describes how, when and where data are to be collected and analysed". It lays the foundation for conducting the research.

Since the study involved an analysis of the post implementation scenario of pesticide ban in Kasaragod District, e*x post facto* research was employed. *Ex post facto* research involves systematic empirical enquiry in which the independent

variables are not directly manipulated since they have already occurred or they are inherently not manipulative. The methodologies used for the study at different stages of data collection and analysis are explained below.

3.2. Locale of the study

Kasaragod District was purposively selected for the study as the implementation of the ban on chemicals and conversion to organic agriculture as part of the organic policy of the Government of Kerala was piloted in this district. (See Fig.2)

3.3. Sampling procedure

The sample included 90 farmers (30 farmers each of three major crops *viz.* Coconut, Banana and Rice) and 40 Extension Personnel (Agricultural Assistants, Agricultural Officers, ADAs, PAO).

Farmers were selected by means of multistage random sampling method. One grama panchayath each was randomly selected from all the six blocks in the district. Five farmers each from the exclusive lists of farmers cultivating the three crops mentioned above were selected to make a sample of 90 respondents. While the PAO, all the six ADAs and the officers of the grama panchayaths selected for the study were invariably included, rest of the sample were selected randomly from the list of Agricultural Assistants and Officers provided by the PAO. The grama panchayaths selected were Nileshwar, Pullur Periya, Kodom Belur, Chemmanadu, Mangalpady and Karadka.

3.3.1. Brief description of the area

Kasaragod, the northernmost district of Kerala, is endowed with rich natural resources and is renowned for its majestic forts, ravishing hills, rivers etc. The district is bordered on the north and the east by Dakshina Kannada and Coorg districts of Karnataka State respectively, on the south by Kannur district and on the west by the Lakshadweep Sea. The district consists of a total area of 1961 Sq km stretch over the North- West and South-East axis.

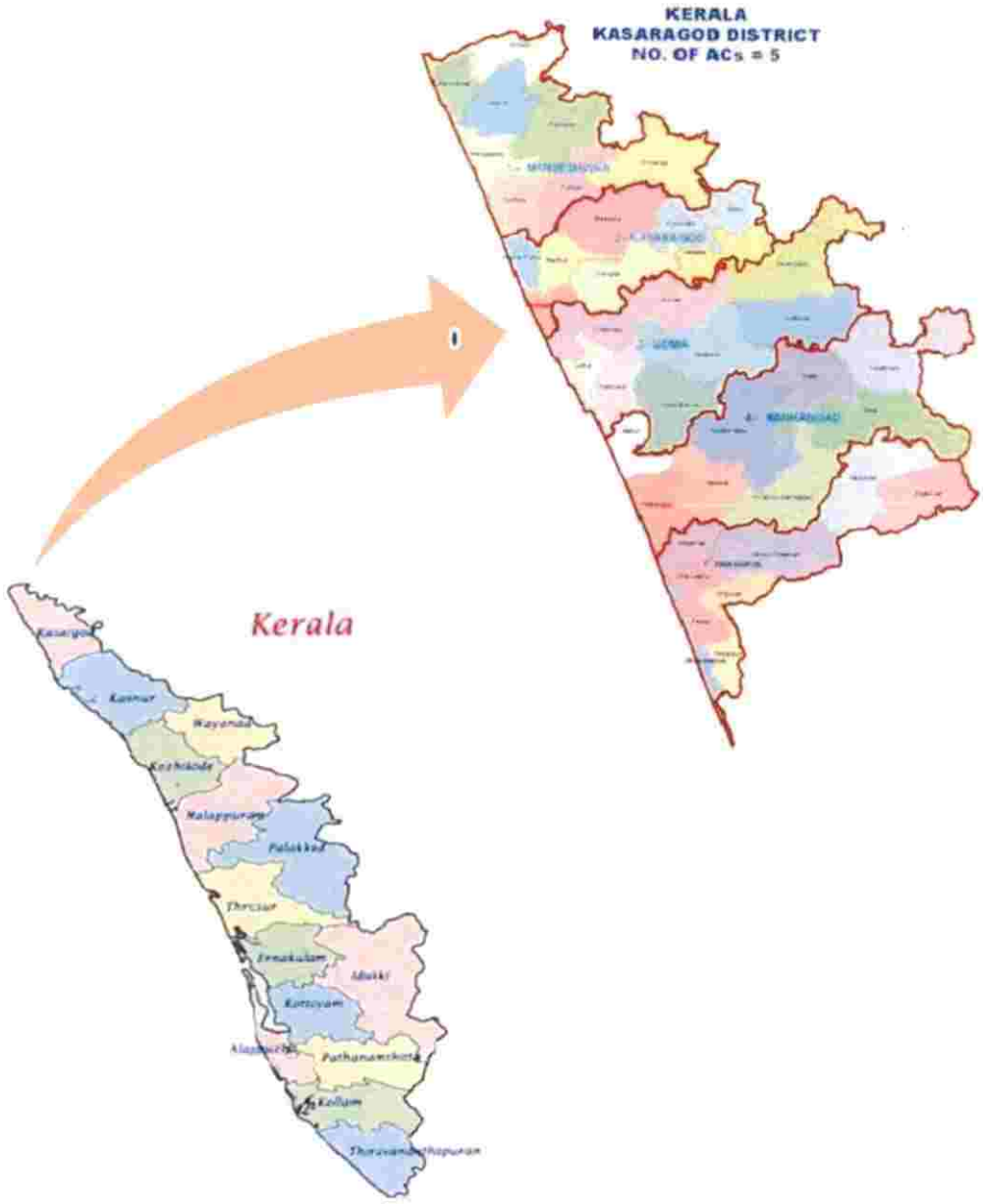

Fig. 2. Map of Kerala showing the locale of the study

Among the cultivated plants, coconut dominates all other varieties followed by arecanut and cashew. Jack fruit, mango tree, banana are other major crops cultivated. Paddy cultivation seems to be gradually vanishing. In the hilly areas rubber and cashew are the main crops. The coastal communities mainly depend on fishing for their livelihood.

3.4. Selection of variables

The important variables related to the study were selected based on review of literature and advices of experts. The independent and dependent variables selected are listed below:

Variables	Method of measurement
Independent variables	
Age	Government of India(GOI) census report(2011)
Gender	Arbitrary scores
Education	Scale used by Jayasree(2004)
Farming experience	Scale used by Jayasree (2004) was adopted and modified for the study
Experience in organic farming	Scale used by Jayasree (2004) was adopted
Annual income	Scale developed for the study
Farm size	GOK(2011) was adopted
Extent of farming integration	Scale developed for the study
Exposure to trainings	Scale followed by Jayawardana (2007) was adopted
Contact with extension agent	Scale used by Manoj(2000) was adopted and modified
Social participation	Scale followed by Pornpratansombat (2011) was adopted
Availability of organic inputs	Developed for the study
Institutional support	Developed for the study
Dependent variables	
Adoption	scale used by Jaganathan (2004) was adopted with slight modification
Perception	Methodology followed by Mokwunye *et al.*, (2012) was adopted
Attitude	Scale used by Magarvadiya and Patel, (2014) was adopted

3.5. Operationalisation of variables

The operational definition and scoring method used to quantify the variables selected for the study are explained below.

3.5.1 Age

Age was operationally defined as the number of years completed by the respondents. Respondents were categorised as per the classification procedure followed by Government of India (GoI) in its Census Report, 2011 as given below. Frequency and percentage analysis were used to classify the stakeholders.

Sl. No.	Category and scale
1	Young(<35 years)
2	Middle age(35-55 years)
3	Aged (>55 years)

3.5.2 Gender

Gender was categorised into male, female or transgender, and the frequency and percentage under each category were estimated.

3.5.3 Education

Education was operationally defined as the respondents' ability to read and write and also to attend formal schooling. Scale followed by Jayasree (2004) was adopted. It was subdivided into 'Illiterate' (Do not know how to read and write), 'can read and write', 'primary education', 'high school education', 'higher secondary', 'collegiate education' and 'masters degree and above'. The scores given to each category is given below.

Sl. No.	Education	Score
1	Illiterate	1
2	Can read and write	2
3	Primary education	3
4	High school	4
5	Higher secondary	5
6	Collegiate education	6
7	Masters degree and above	7

3.5.4 Farming experience

Farming experience was operationally defined as the number of years the respondent had engaged in farming activities at the time of investigation. Scoring procedure used by Jayasree (2004) was adopted and the stakeholders based on their involvement were classified into three categories, viz. low, medium and high, as given below.

Sl. No.	Farming experience
1	Less than 5 years (low)
2	5-10 years (medium)
3	More than 10 years(high)

3.5.5 Experience in organic farming

Experience in organic farming was operationally defined as the number of years the respondent had engaged himself in organic farming practices till the time of data collection.

Sl. No.	Experience in organic farming
1	Less than 5 years (low)
2	5-10 years (medium)
3	More than 10 years(high)

3.5.6 Farm size

Farm size was operationally defined as the total area of cultivable land owned by the respondents. The categorisation used by Government of Kerala (GOK, 2011) was adopted to classify the farmers based on their farm size as given below.

Sl. No.	Classification of farmers
1	Marginal farmers (< 1 ha)
2	Small farmers(1-1.99ha)
3	Semi- medium farmers(2-3.99 ha)
4	Medium farmers (4-9.99 ha)
5	Large farmers (>10 ha and above)

3.5.7 Annual income

Annual income was operationally defined as the total amount earned by the respondent and other family members from agriculture and other sources on a yearly basis. Scoring procedure followed by Vilas (2005) was adopted and the respondents were classified into three categories such as low, medium and high, as given below.

Sl No	Income categories
1	Low income (upto Rs.10000)
2	Middle income (Rs. 10000-50000)
3	High income (Rs. 50000 above)

3.5.8 Extent of farming integration

Extent of integration was operationally defined as the frequency of integration of various non crop components with cultivation of crops. The scoring procedure developed for the study is shown as follows.

Sl. No.	Category	Scores
1	No components	0
2	Livestock/ Poultry/Pisciculture	1
3	Livestock + Poultry	2
4	Livestock + Poultry +fish farming	3

3.5.9 Contact with extension agency

Contact with extension agency was operationally defined as the frequency of interactions between the respondent and the extension agent from any given public or private agency. Scoring procedure developed for the study is given below.

Sl No	Frequency of contact	Score
1	Often	3
2	Rarely	2
3	No contact	1

3.5.10 Exposure to training

Exposure to training was measured as the frequency of training programmes on organic farming attended by a farmer in terms of the number of training sessions attended. Scale used by Jayawardana (2007) was used for the study.

Sl. No.	Category	Scores
1	No training	1
2	Less than 8 trainings	2
3	More than 8 trainings	3

3.5.11. Social participation

Social participation was operationally defined as the participation in any kind of social organisation and was scored as given below. Scale followed by Pornpratansombat (2011) was adopted and modified for this purpose. Frequency and percentage of the respondents who had participated in organisational activities were estimated.

Sl. No.	Category	Scores
1	Participation in activities by social organisations	2
2	No participation in activities by social organisations	1

3.5.12 Availability of organic inputs

Availability of organic inputs was defined operationally as the frequency of availability of organic inputs required by a farmer in a given period of time. Based on the mean and standard deviation obtained, availability was categorised into low, medium and high.

Sl. No.	Category	Scores
1	Low (Mean-S.D.)	1
2	Medium (Mean ± S.D.)	2
3	High (Mean + S.D.)	3

3.5.13 Institutional support

Institutional support was defined operationally as the status of services availed by the farmer from different public sector agencies involved in agriculture in support of organic agriculture. This was measured by a check list of items against which the status of availability was recorded as 'availed' or 'not availed' for which scores '2' and '1' were accorded respectively. The score on institutional support was estimated by summating the scores for each item.

Sl. No.	Category	Availed (2)	Not availed(1)
1	Infrastructure support		
2	Subsidy		
3	Trainings		
4	Exposure visits		
5	Seminar and classes		
6	Demonstration plots		
7	Support from private agencies		
8	Marketing support		
Total			

3.6. Measurement of dependent variables

The dependent variables selected for the study included perception on ban of chemical inputs, perception on various dimensions of sustainability, nature and extent of adoption of organic practices and attitude towards organic farming.

3.6.1 Perception on ban of chemical inputs

Ban and Hawkins (1996) defined perception "as a process by which a person receive information or stimuli from his environment and transform it into physiological awareness". In that sense, perception is nothing but the way in which something is understood or interpreted. This study attempted to find out the degree of perception of respondents on the ban of chemical inputs, following the scale developed by Oyesola *et al.,* (2011). The scale included 13 statements with positive as well as negative implications. Responses were categorised into a five-point Likert scale such as SA (Strongly Agree), A (Agree), U (Undecided), D (Disagree), and SD (Strongly Disagree). Positive statements were assigned scores

5,4,3,2 and 1 respectively and reversed scoring was applied for negative statements so that a respondent could secure a maximum score of 65 and a minimum of 13. On the basis of this, mean score of the sample was calculated and respondents were categorised into two groups, one with unfavourable perception (< mean) and the other with favourable perception (mean and above). Score of extension personnel were also classified similarly.

3.6.2 Perception on various dimensions of sustainability of organic agriculture.

Perception on sustainability of organic farming practices was measured by soliciting responses on 16 statements which included both positive as well as negative connotations. The methodology followed by Oyesola *et al.,* (2011) was adopted for the study. The responses were marked on a five-point Likert scale viz. SA (Strongly Agree), A (Agree), U (Undecided), D (Disagree), and SD (Strongly Disagree). Positive statements were assigned scores 5,4,3,2 and 1 respectively and reversed scoring was applied for negative statements so as to make a maximum possible score of 80 and minimum score of 16. On the basis of this, mean score of the sample was calculated and respondents were categorised into two groups, one with unfavourable perception (< mean) and the other with favourable perception (mean and above) as done above. Score of extension personnel were also classified similarly.

3.6.3 Nature and extent of adoption of organic farming practices

According to Rogers and Shoemaker (1971), adoption is "making full use of a new idea as the best course of action available". In this study the term adoption refers to the degree to which the farmers had actually adopted various organic farming practices. Adoption index developed for the study was used to measure the extent of adoption of organic farming practices. The score of adoption was measured by using the scale by Jaganathan (2004) with slight modification. A total of 20 organic farming practices were identified and the farmers responses were quantified as 'adopted', 'partially adopted' and 'not adopted' with scores 2,

1 and 0 respectively. The total score that could range from 40 to 0 was calculated by summing up the scores of individual items. The total adoption index for each farmer is calculated using the formula given below:

$$Adoption\ index = \frac{Respondents\ total\ score}{Total\ possible\ score} \times 100$$

3.6.4 Attitude towards organic farming practices

Attitude shall be defined as the predisposition or tendency to respond positively or negatively towards a certain idea, object, person, or situation. To measure the attitude of farmers towards organic farming practices, the method used by Jaganathan (2004) was adopted with slight modification. A total of 14 statements were selected and the farmers' responses were marked and categorized into a five point continuum as 'Strongly Agree', 'Agree', 'Undecided', 'Disagree' and 'Strongly Disagree' with scores 5,4,3,2 and 1 respectively for positive statement and in the reverse order for negative statements. Summation of scores obtained by an individual for each of the total 14 statements would be the attitude score. The scores would range from a maximum score of 70 to a minimum of 1.

3.6.5 Demand side and supply side constraints faced by respondents in implementing the ban on chemical inputs.

Constraints faced by farmers and extension personnel in the back drop of the decision of the government to ban chemical pesticides were identified based on review of literature, consultation with experts and scientists and a pilot study. The relative importance ascribed to each constraint was stated on a three point continuum viz. 'Very Important', 'Important' and 'Less Important' with scores 3, 2 and 1 respectively. The score of each constraint was calculated by multiplying the frequency of occurrence with the weightage and the constraints were then ranked based on the scores thus obtained.

3.7 Tools used for data collection

A structured interview schedule was prepared by reviewing the previous research studies and through consultation and discussion with the experts and professionals in the field of agricultural extension. A pilot study was conducted in order to check the validity of the interview schedule in a non-sample area. The final interview schedule was prepared after making necessary modifications, additions and deletions based on the pilot study. Data on historical evolution of events and policies have been collected through review of reports, government orders etc,

Suitable parametric and non parametric statistical methods were used to analyse the data collected. Results have been presented as mean values, standard deviation, frequency, percentage, correlation, multinomial logistic regression test and Kruskal Wallis as required by the type of data, inferences drawn and context of interpretation.

3.8 Statistical methods used to analyse data

Statistical tools used in the present study for analysing the data are given below.

3.8.1 Mean

Mean values of scores related to the variable selected for the study were used to compare different groups and categorise respondents.

3.8.2 Percentage analysis

Percentage analysis was done to find out the trends in socio economic characteristics and to make comparisons.

3.8.3 Kruskal Wallis one way Analysis of Variance

Kruskal Wallis one way ANOVA method was used to measure the significant difference among the farmers of different crops with respect to the dependent variables selected for the study.

3.8.4 Spearman rank correlation

Spearman rank correlation was done to find out the factors that affect the adoption, perception and attitude of the respondents.

3.8.5 Paired't' test

This was used to analyse the significance of difference between two groups with respect to a given variable. This was also used to find out whether an intervention had made any significant change after wards.

3.8.6 Independent sample't' test

The test was used to compare the perception, adoption, and attitudes of organic and inorganic farmers with varying sample size. Data were analysed using SPSS.

3.8.7 Multinomial logistic regression (MLR)

Multinomial logistic regression was performed to analyse the nature of influence of various independent variables on dependent variables. The data were analysed using SPSS.

Photographs of the survey held at different locations of the study are given overleaf.

Plate 1. Data collection from rice farmers of Kodom Belur panchayath

Plate 2. Data collection from banana farmers of Pullur Periya panchayath

Plate 3. Data collection from coconut farmers of Nileshwar muncipality

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

This chapter describes the findings that have emerged out of this study. The inferences drawn from the results are also discussed alongside. The findings of the study have been presented under the following sub headings.

4.1. Context of imposing ban on chemical pesticides and introducing organic agriculture in Kasaragod District: A historical perspective
4.2. The course of transition into organic agriculture in Kasaragod District
4.3. Perception of respondents on ban of chemical pesticides
4.4. Perception of respondents on various dimensions of the sustainability of organic agriculture
4.5. Impact of the ban on livelihood options of farmers
4.6. Nature and extent of adoption of organic practices
4.7. Nature of institutional support extended to farmers
4.8. Socio economic profile of respondents
4.9. Factors affecting adoption of organic farming practices
4.10. Demand side and supply side constraints in implementing the ban on chemical pesticides and promotion of organic cultivation

4.1. Context of imposing ban on chemical pesticides and introducing organic agriculture in Kasaragod District: A historical perspective

This section discusses the specific contexts in which chemical pesticides in agriculture were banned and organic agriculture was made mandatory in Kasaragod District. This part of the study has been done by methods of historical research employing description of major events that had led to the ban of agriculture chemicals in the District, chronologically. The logic behind each of these major steps has also been explained from documents and other evidences from different sources.

Kasaragod District had been in news on account of the incidence of highly debilitating congenital diseases such as cerebral palsy, hydrocephalus, epilepsy, mental retardation, etc, widely reported from different places. These places were reported to be affected by the aerial spray of endosulfan, a pesticide that was widely used against the tea mosquito attack in cashew plantation during 1978. The Plantation Corporation of Kerala (PCK) which own about 3500 ha of cashew plantations in eleven villages *viz.* Enmakaje, Badhiyadukka, Kumbadaje, Bellur, Karaduka, Muliyar, Ajanur, Pullur-Periya, Kallar, Panathadi, and Kayyur-Cheemeni of Kasaragod district used to conduct aerial spraying of endosulfan thrice, first at the time of flushing, second at early stage of flowering and third at the time of fruit set in cashew.

The Plantation Corporation used to spray the chemical at the rate of 3500 litre per one round spray (Mahapatro and Panigrahi, 2013). Later, in 1979 it was reported that newly born calves in the area showed stunted growth and deformed limbs. In the 1990s, some deformities were reported in humans, which led to the assumption that these deformities could be attributed to aerial spraying of endosulfan in these areas. Reports on media and a well organised public outcry grew into agitations and protests against the use of endosulfan. In response to numerous suits filed against the PCK and the government, the Honourable High Court of Kerala banned aerial spraying of endosulfan in 2001. Subsequently, the use and sale of endosulfan in Kerala was banned since 2002 (Vijayan, 2011). Further, in the light of widely reported incidences of congenital malformation from the district, Govt. of India and Govt. of Kerala appointed several commissions to make detailed studies on this issue. The details of committees thus formed are listed below chronologically.

Table 4. Timeline showing details of committees and the details of the reports on the consequences of endosulfan spray in Kasaragod District

Sl. No.	Year	Individual/Committee/Forum	Findings
1	1979-80	**Shree Padre**- local farmer and an active freelance Journalist reported health issues in Kasaragod District	Reported the birth of four calves in a farmer's house with deformed limbs
2	1997	**Dr YS Mohan Kumar** published an article in *Kerala Medical Journal* in February 1997	Reported the occurrence of central nervous system related ill- healths, cancer *etc.* in Padre
3	1998-2000	Smt. **Leelakumari Amma**-Agricultural Assistant, Periya Krishibhavan complained about health issues	Reported that her son's voice gradually changed into feminine- filed complaint
4	1999	**'Thanal'** submitted the first report to the district collector	Documentation and examination of health disorders and demanding ban on aerial spraying of endosulfan
5	2000	**Kerala Sastra Sahithya Parishath (KSSP)** conducted an extensive survey of houses covering 4000 houses	Found 750 houses with health disorders
6	2000	Punchiri Sports and Arts Club, Muliyar conducted series of agitations and protest against PCK	Filed case against this issue, but they were not successful in obtaining a verdict against PCK
7	2000	Endosulfan Spray Protest Action Committee (ESPAC)- farmers, villagers and youngsters agitated against PCK	Nil
8	2001	Hosdurg Munsif Court baned the use of endosulfan in Kasaragod	Ban as a result of the case filed by Smt. Leelakumari Amma and aerial spraying was blocked
9	2001	Centre for Science and Environment(CSE) New Delhi submitted report on the "contamination of endosulfan in the villagers"	Found traces of pesticide in all the samples
10	2001	Kerala Agricultural University published report on "Investigating the environmental effects of aerial sprayed endosulfan in Perla area of Kasaragod" headed by **Dr Abdul Salam**.	Concluded that there was no easy and reliable method to assess chemical residues in the environmental samples and suggested "need based spraying"
11	2001	**STED** (Science, Technology and Environment Department) submitted report to GoK on "the suspected spreading Of unusual diseases In Enmakaje grama Panchayath and adjoining areas of Kasaragod District"	Recommended implementation of sustainable agricultural practices

Sl. No.	Year	Individual/Committee/Forum	Findings
12	2001	**FIPPAT** (Fredrick Institute of Plant Protection And Toxicology) in association with PCK conducted study on "evaluation of residues of endosulfan in human blood, cow milk, fish, water, soil and cashew leaves."	Concluded no endosulfan residues had been found out
13	2001	Government of Kerala imposed ban on use of endosulfan in cashew plantations in the state	Nil
14	2001	Report from ESPAC (Endosulfan Spray Protest Action Committee) - White Paper on "investigating the environmental effects of aerial sprayed endosulfan in Perla area of Kasaragod" published by KAU	Report argued against the findings of KAU report
15	2001	Thanal's report, "Long term monitoring the impact of pesticides on the people and ecosystem"(LMIPPE) published	Concluded that health problems are due to endosulfan
16	2001	Dr. Achuthan Committee report published	Recommended ban on aerial spraying of pesticides in PCK areas of Kasaragod district.
17	2002	Report of a fact finding mission by Pesticide Action Network Asia and Pacific (PANAP) published	Concluded ban on endosulfan
18	2002	Report of the National Institute of Occupational Health, Ahmedabad ("investigation of unusual illnesses allegedly produced by endosulfan exposure in Padre Village of Kasaragod District") study carried out by **Dr H.N Saiyed**	Reiterated that the cause of unusual illnesses is endosulfan
19	2002	**Kerala High court** bans the use of endosulfan in the state of Kerala, pending a decision from the **Central Insecticides Board (CIB)**	Ban on endosulfan in Kerala
20	2003	The Ministry of Agriculture, Government of India setsup a committee under **Dr O P Dubey** to investigate the issue	Concluded that "there was no correlation between use of endosulfan and the health issues"
21	2003	Report on 'Health hazard of aerial spraying of endosulfan in Kasaragod district, kerala,' headed by **Dr P.K. Sivaraman-**.	Stated endosulfan is the reason for problems
22	2003	IMA report on "The Endosulfan Controversy in Padre Village"	
23	2004	Report by the committee appointed by central government headed by **Dr C D Mayee** to relook the **Dr O.P. Dubey** Committee report	Stated ban on endosulfan
24	2004	Kerala State Pollution Control Board announces temporary ban	Suspended the use of endosulfan in the state before making a final decision

Sl. No.	Year	Individual/Committee/Forum	Findings
25	2005	A workshop conducted by the Kasaragod District Panchayath along with Thanal and other organizations for remediation and relief activities	Endosulfan Victims Relief and Remediation Cell was intended to establish
26	2005	**Dr A Sukumaran** published his report on Geographical Mapping of Mental retardation and physical deformities and a case control study of mental retardation in Kasaragod district of Kerala	Concluded chronic exposure to persistent organic pollutants
27	2005	Gazette notification issued by union ministry of agriculture, withholding sale and use of endosulfan in Kerala.	Central government announced ban on endosulfan
28	2006 - 2010	Endosulfan Victims Relief and Remediation Cell formed	Efforts were made by the cell to record the details of victims and ensure aids to them
29	2010	Kerala State Pollution Control Board (PCB) issues notification to ban endosulfan	Ban announced under provisions of Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. - on violation imprisonment up to six years and fine will be imposed
30	2010	National Human Rights Commission supported the ban on endosulfan	Legislative and administrative action for ban
30	2011	Endosulfan enlisted under persistent-organic pollutant category to be banned worldwide	Nil
31	2013	Dr. K. M. Sreekumar and Dr. K.D. Prathapan, KAU criticised the ban on account of the unscientific methods and wrong assumptions of various studies.	Reported that no valid data to prove the high incidence of malformations in the sprayed areas existed to compare the situation in unsprayed areas

The table above shows the committees and reports that have been prepared and published in connection with endosulfan issue. It is to be specially noted that debates on the etiology of these deformities are still on with several agencies involved in this long drawn process. The government has come out with several special rehabilitation packages to aid the victims of these diseases in Kasaragod District. Majority of these reports have tried to establish a correlation between the aerial spraying of endosulfan and the incidence of congenital deformities and other diseases in different villages in Kasaragod District. There had also been

allegations that normal scientific procedures and statistical analysis to prove the etiology of diseases had not been followed rigorously. There were a few parallel reports which questioned the logic of attributing congenital disorders to the use of this pesticide (Sreekumar and Prathapan, 2013) without scientific proof. They had pointed out that these diseases had been reported widely even in places where the pesticide had never been used.

However, an analysis of the timeline shows that the issue was kept alive by activists and the agencies who had relied on reports that established a cause-effect relationship between pesticide spray and incidence of various diseases in the district. It could be assumed that the government chose to ban chemical pesticides with the intention of protecting a greater common interest, even while the studies remained inconclusive in establishing the relationship between endosulfan and incidence of diseases.

4.2. The course of transition into organic agriculture in Kasaragod district: A time line of interventions

As understood from the context of pesticide ban in Kasaragod district, several interventions have taken place before the orders to introduce organic agriculture was finally implemented in the district. The government had issued several orders successively to implement the ban and promote organic agriculture in Kasaragod District. It is important to examine the pathway of this transition in order to understand the adequacy of intervention by the government to create a suitable environment for introducing the new regime of agriculture. This would also help us understand the dynamics of transition to organic agriculture, under the aegis of a government. It should be noted that the decision to transform agriculture in Kasaragod into organic included several steps for which substantial institutional support was required.

The phases of transition into organic agriculture in Kasaragod District, as decided and implemented by the Department of Agriculture are presented here. Along with this, the issues identified have also been described.

After declaring Kasaragod as organic district, a special scheme for organic farming was implemented in the district. The Government of Kerala issued an order (G.O.(M.S)No.116/2011/Agriculture) which banned the use of red, yellow and few blue labelled pesticides such as Carbofuran, Phorate, Methyl Parathion, Monocrotophos, Methyl Demeton, Ediphenphos, Tricyclazole, Oxythioquinox and herbicides such as Anilophos, Paraquat, Thiobencarb and Atrazin in the district. Since then, such pesticides were not allowed for use in the district.

This was followed by G.O. (Rt) 135/2013/AD dated 23.1.2013 through which the government accorded administrative sanction for the implementation of the project for organic farming in Kasaragod District during 2012-13. The main objectives of the proposed scheme were as follows.

- To make agriculture remunerative, sustainable and respectable
- Recovering soil fertility and productivity
- Establishment of model farms
- Ensuring agricultural bio-security and food and nutritional security
- Establishment of organic villages with the active participation of farmers and farmer groups/clusters.
- Reduced use of agrochemicals
- Ensuring cluster/ group based farming approach for prosperity
- Biodiversity based ecological farming will be promoted
- Organic certification
- Promotion of human health

These objectives were planned to be accomplished in a phased manner spanning a period of two years in selected panchayaths. Initially, 19 panchayaths were selected for the implementation of the scheme. The main components under this scheme were:

- Creation and empowerment of clusters with appropriate infrastructure for practicing organic farming
- Organic manure production

- Providing soil testing service
- Practicing animal husbandry
- Involvement of work force
- Establishing eco shops
- Monitoring and supervision

As directed by the government, Krishibhavans would implement the scheme with Agricultural Officers (AO) as implementing officers at the panchayath level. Block level monitoring and supervision would be done by Assistant Director of Agriculture (ADA). Deputy Director (DD) and Principal Agricultural Officer (PAO) would implement at the district level. Field managers and field assistants would assist the implementation of the programmes. Agricultural Technology Management Agency (ATMA) will also be involved in the programme. The implementation would be marked by several awareness creation programmes and subsidies for compost preparation. Accordingly, several awareness building programmes were implemented in the district. Subsidies to the tune of Rs. 247.5 lakh were also distributed to farmers during that year.

As per government order TP (2) 20707/13dated15.05.2013, the government accorded sanction for implementing the scheme on organic farming. During the financial year 2013-14, 24 more panchayaths were added to the list of operational areas under this scheme with the objective of converting 1000 ha of land in each of the 41 Krishibhavans in the district. The scheme had also added up some components which were not implemented in the previous financial year. The components thus added were training programmes and exposure visits, strengthening of parasite breeding station, supply of bio-control agents and establishment of demonstration plots. As understood from the responses of implementing officers, the initial year of implementation focused only on accomplishment of physical targets, which was done hurriedly. The real needs of the farmers were not properly addressed. However training programmes were implemented frequently in almost all Krishibhavans.

The scheme for organic farming was accorded continuous administrative sanction as per G.O. (Rt) No.1724/2014/AD dated 20.09.2014 during 2014-15. The programme implemented in 2014-15 had wider objectives and additional components as given below.

- Establishment of model organic panchayaths
- Promotion of Participatory Guarantee System (PGS)
- Providing support for cultivation of green manures and legume cultivation
- Seminars, discussions, trainings and exposure visit for promoting organic cultivation
- Residue analysis of farm produce to find the presence of harmful chemicals
- Constitution of organic farming monitoring committees
- Preparation of 'Package of Practices (POP)' for organic farming
- Documentation, transportation and awards

This was followed by G.O. (Rt) No. 60/2015/AD dated.12.01.2015 through which the government accorded administrative sanction for implementing 'organic farming and 'safe to eat' food production in 2015-16'. In that particular year emphasis was given to 'safe to eat' food production for which an amount of Rs 161.6 lakhs was allocated, without adding any new component to the existing objectives. The latest order in this regard issued in 2016-17 (G.O. TF (2)16075/16 dated 18.04-2016) accorded sanction for the scheme on 'Good Agricultural Practices and 'safe to eat' food production. Interestingly, the title itself indicates a wide change in the concept of organic farming. It can be seen that more emphasis has been given to Good Agricultural Practices (GAP) and safe to eat production instead of organic farming, which is defined in different ways by followers of different schools of thought. Detailed review of the programme indicated that there had been considerable changes in objectives in the new approach, which are listed as follows

- Farming should be made remunerative, respectable and sustainable
- Ensure agricultural biodiversity, food and nutritional security
- Creation of organic villages including farmer and farmer groups

- Ensuring locally available organic inputs through promoting own farm manure production units
- Ensuring marketing facilities and profitability
- Support for organic certification

A detailed review of the programmes implemented from 2012-13 till 2016-17 indicated that the implementation had not been uniform as there had been several shifts in emphases during this period. However, the government has apparently focussed on providing institutional support required by farmers. Since the programme of conversion to organic agriculture had not evolved naturally as an outcome of the changing awareness of farmers, its implementation had not been duly supported by the farming community. Moreover the farming community was constrained by lack of adequate support required to sustain chemical free agriculture.

4.3. Perception of respondents on ban on chemical pesticides

Perception is conceived "as a process by which a person receives information or stimuli from his environment and transforms it into physiological awareness" (Ban and Hawkins, 1996). Perception is nothing but the way in which something is understood or interpreted.

Perception of the farmers and department personnel on ban of chemical pesticides seemed to be important since the success of the approaches adopted by the implementing agencies largely depend on the perception of stakeholders.

The table below shows the frequency and percentage of the respondents who had favourable and unfavourable perception on ban on chemical pesticides.

Table 5. Distribution of respondents based on the perception on ban of chemical pesticides

	Farmers (n=90)			**Extension officials** (n=40)		
Category	**Score range**	**Frequency**	**Percentage**	**Score range**	**Frequency**	**Percentage**
Unfavourable	Less than 39	61	67.8	Less than 39	30	75
Favourable	39 and above	29	32.2	39 and above	10	25
	Mean = 35		**S.D = 7.9**	**Mean = 35**		**S.D = 6**

From Table 5 it is clearly observed that majority of the farmers (67.8%) had unfavourable perception towards ban on chemical pesticides. Farmers with favourable perception constituted only 32.2 per cent. Even though contribution of agriculture in Kerala has reduced drastically, many are depending upon agriculture as the main source of income and livelihood. For this category with agriculture as the main livelihood option, it might not have been possible to compromise their returns. It could be presumed that immediate ban of chemical pesticides had created fear among farmers about the possibility of huge yield loss due to incidence of pest and diseases. This finding is in agreement with Taneja (2014), who suggested that the ban could impact on farmers' yield by 50 per cent and could negatively affect their income.

Farmers who were engaged in commercial crop production did not have any other option during high incidence of pest and diseases than using chemical pesticides. As already stated, perception on organic farming differs with different people. Even though Kasaragod had been declared as organic district in 2012, the ban existed only for chemical pesticides and not for chemical fertilizers. The category having favourable perception might have presumed that the ban of chemical pesticides would be beneficial from the safety point of view. However, they might not have considered the impact of the ban on chemical fertilizers while formulating their perception. This could also be due to the various reports that project serious health issues caused by chemical pesticides.

Accordingly, majority (75%) of the extension personnel had unfavourable perception and 25 per cent had favourable perception on ban of chemical pesticides. The reason might be that they were not able to recommend effective control measures against high incidence of pest and diseases. The ban was imposed in the district out any prior preparedness and the extension personnel who were the implementing officers were not able to recommend effective alternative ways to control pests and diseases.

4.3.1 Perception on the ban on chemical pesticides – A comparison against farmers doing different crops

The perception of farmers cultivating crops such as rice, banana and coconut were compared using Kruskal Wallis one way ANOVA shown below.

Table 6. Mean rank of Kruskal Wallis test on perception of respondents on ban on chemical pesticides

(n=90)

Sl. No	Crops	Mean Rank
1	Rice	41.78
2	Banana	52.22
3	Coconut	42.50
	$\chi^2_{(2)}$ = 2.99 p= 0.162	

Considering the difference in the organic practices that could be adopted for different crops and the varying impact of ban of chemicals on different crops, further analysis was done to find out whether the farmers who used to cultivate different crops differed with respect to their perception on ban on chemical pesticides. The result of Kruskal Wallis one way ANOVA represented in Table 6 shows that there is no significant difference in the perception score of farmer groups cultivating rice, banana and coconut. The findings indicate that there is no difference among these farmer groups with regard to their perception.

4.4. Perception of respondents on various dimensions of the sustainability of organic agriculture

Perception of selected respondents towards various dimensions of the sustainability of organic agriculture with respect to their frequency and percentage is shown below.

Table 7. Distribution of respondents based on the perception on sustainability of organic agriculture

Category	Farmers		(n=90)	Extension officials		(n=40)
	Score range	Frequency	Percentage	Score range	Frequency	Percentage
Un favourable	Less than 48	3	3.3	Less than 51	9	22.5
Favourable	48 and above	87	96.7	51 and above	31	77.5
	Mean= 56	S.D= 4.9		Mean= 57		S.D= 6.1

From Table 7 it is understood that majority of the farmers (96.7%) had favourable perception on sustainability of organic farming practices whereas 3.3 per cent had unfavourable perception towards sustainability of organic farming practices. Extension personnel who had favourable perception belong to 77.5 per cent and 22.5 per cent of them had unfavourable perception on sustainability of organic farming practices. The serious health issues that have been reported widely made farmers aware of the ill effects of the chemicals and had a favourable perception towards sustainability on organic farming. This has also found out by Landicho *et al.,* (2014) that majority (77%) of the farmers recognised the quality of organic products, 17 per cent recognised their health and safety on the use of organic inputs and also 6 per cent of the farmers realised the importance of enhancing soil fertility.

With regard to extension personnel, majority (77.5%) had a favourable perception on sustainability of organic agriculture whereas 22.5 per cent were having unfavourable perception. Even though organic farming is found to be safe, the economic feasibility of organic farming on a large scale basis is yet to be proved. Even though they are the implementing officers, it is interesting to note that they are not sure about the practicality of organic farming. This has been clearly understood from the attitude of the extension personnel shown in Table 19, which revealed that majority of the respondents, are having moderate level of attitude towards imposing programme on organic farming in the district. The various dimensions of sustainability in this context refer to the feasibility of organic farming mainly economical, environmental and social.

4.4.1. Perception on economic, environmental and social dimension of sustainability of organic agriculture

Perception on various dimensions of sustainability such as economic, environmental and social were scored accordingly and categorised into low, medium and high perception levels shown below.

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4.4.1.1. *Economic dimension*

Different perception levels have been classified on the basis of economic dimension of sustainability of organic agriculture

Table 8. Distribution of respondents based on the perception on economic dimension of sustainability of organic agriculture (n=90)

Category	Score range	Frequency	Percentage
Farmers			
Low perception (<Mean- S.D.)	<6.48	3	3.3
Medium perception(Mean ± S.D)	6.48-11.66	68	75.5
High perception (>Mean + S.D)	>11.66	19	21.1
	Mean= 9.07	**S.D.= 2.59**	
Extension personnel			
Low perception (<Mean- S.D.)	<9.71	5	12.5
Medium perception(Mean ± S.D)	9.71-14.64	25	62.5
High perception (>Mean + S.D)	>14.64	10	25
	Mean= 12.18	**S.D.= 2.469**	

The result showed that majority (75.5%) of the farmers had medium level of perception on the economic dimension of organic farming. Farmers with high and low perception constituted 21.1 per cent and 3.3 per cent of the total sample respectively. This indicated that majority was not sure whether they would be able to get profit while conversion into organic farming. Regarding the extension personnel, majority (62.5%) belonged to medium level of perception whereas 25 per cent and 12.5 per cent belonged to high and low perception categories. This might be because extension personnel were not sure about the feasibility of organic agriculture with respect to economic dimension.

4.4.1.2. *Environmental dimension*

Perception on the basis of environmental dimension have been categorised as shown below.

Table 9. Distribution of respondents based on the perception on environment dimension of sustainability of organic agriculture (n=90)

Category	Score range	Frequency	Percentage
Farmers			
Low perception (<Mean- S.D.)	<26.7	7	7.7
Medium perception(Mean ± S.D)	26.7-30.4	37	41.1
High perception (>Mean + S.D.)	>30.4	46	51.1
	Mean= 28.60	**S.D= 1.84**	
Extension personnel			
Low perception (<Mean- S.D.)	<25.62	4	10
Medium perception(Mean ± S.D)	25.62-33.02	30	75
High perception (>Mean + S.D.)	>33.02	6	15
	Mean= 29.32	**S.D= 3.70**	

The result indicates that majority (51.1%) has high level perception regarding the environmentally sound dimension of organic farming. Farmers who have medium level perception belong to 41.1 per cent whereas only 7.7 per cent has low level perception regarding the sustainability of organic farming on environmental dimension. Majority of the extension personnel were having medium level of perception (75%) followed by high (15%) and low (10%) level perception. This clearly indicates that most of the respondents were aware of the environmental benefits of organic methods of production.

4.4.1.3. *Social dimension*

Perception on social dimension have been categorised as shown below.

Table 10. Distribution of respondents based on the perception on the dimension on social acceptability of organic agriculture (n=90)

Category	Score range	Frequency	Percentage
Farmers			
Low perception (<Mean- S.D.)	<16.16	8	8.8
Medium perception(Mean ± S.D)	16.16-20.66	52	57.7
High perception (>Mean + S.D.)	>20.66	30	33.3
	Mean= 18.41	**S.D= 2.25**	
Extension personnel			
Low perception (<Mean- S.D.)	<15.57	5	12.5
Medium perception(Mean ± S.D)	15.57-20.73	18	45
High perception (>Mean + S.D.)	>20.73	17	42.5
	Mean= 18.15	**S.D= 2.58**	

In this case, majority (57.7%) of the farmers had medium level perception regarding the social dimension of organic farming whereas 33.3 per cent had high level and 8.8 per cent had low level perception. In all the above cases it is understood that farmers were not sure of the sustainability of organic farming in various dimensions. With respect to extension personnel, it was found that majority had medium level perception than high and low level perception.

Perception on ban of chemicals and sustainability affect the adoption of organic farming practices to a considerable extent. It was found necessary that adoption of organic agriculture by the respondents required careful examination to delineate the factors that determine the rate of adoption.

4.4.2 Perception on various dimensions of sustainability of organic agriculture- A comparison against farmers doing different crops

Farmer groups cultivating different crops were compared with respect to their perception on various dimensions of sustainability to find out whether there existed any difference in their perception on various dimensions of sustainability of organic agriculture.

Table 11. Mean rank of Kruskal Wallis test on perception of respondents on various dimensions of the sustainability of organic agriculture

(n=90)

Sl. No.	Crops	Mean rank
1	Rice	35.73*
2	Banana	54.28*
3	Coconut	46.48*
	$z^2_{(2)}$ = **7.67** **p**=0.022	

The result of Kruskal Wallis one way ANOVA represented in Table 11 showed that there was statistically significant difference in scores of perception among the farmer groups cultivating rice, banana and coconut, on various dimensions of sustainability of organic agriculture.

In this case χ^2 value obtained was $\chi^2_{(2)} = 7.675$ (p=0.022) with a mean rank perception score of 35.73 for rice cultivating farmers, 54.28 for banana cultivating farmers and 46.48 for coconut farmers. The rank scores also showed that banana farmers had perceived organic farming to be more sustainable whereas for rice farmers, perception on sustainability of organic agriculture was low, which implied that rice farmer considered organic farming to be less sustainable from the point of view of economic profits.

Different farmers groups were also compared with respect to these dimensions using Kruskal Wallis test which as shown below.

Table 12. Comparison of farmer groups based on different dimensions of sustainability

Sl. No	Crops	Mean rank
	Economic dimension	
1	Rice	44.80
2	Banana	45.98
3	Coconut	45.72
	$\chi^2_{(2)} = 0.03$ p=0.98	
	Environmental dimension	
1	Rice	38.55
2	Banana	49.50
3	Coconut	45.72
	$\chi^2_{(2)} = 3.74$ p= 0.15	
	Social dimension	
1	Rice	29.38
2	Banana	62.63
3	Coconut	44.68
	Significant at 1% level $\chi^2_{(2)} = 24.82$ ** p= 0.00	

Comparison of farmer groups based on different dimension indicated that with respect to economic and environment dimension, no significant difference was observed. Perception on economic and environmental dimension was found to be same among different farmers groups. But regarding social dimension, significant difference was obtained, which showed that there existed some

variation in perception among different farmer groups. Banana farmers were found to have more perception on social dimension compared to other groups. They found to have a wrong notion that banana cultivated through organic methods of production would be tastier with more nutritional quality than that produced through inorganic methods. This might be the reason for the high perception about social dimension by banana farmers.

4.5. Impact of the ban on livelihood options of farmers

Impact of the ban on livelihood options of farmers was measured in terms of cost of cultivation (paid out cost) and yield of major crops, before and after conversion to organic farming. Out of the total farmers, those who adopted organic agriculture were selected for measuring the impact, which is presented in Table 13.

Table 13. Change in paid out cost and yield of different crops before and after conversion to organic farming

Crop	Cost and yield/ annum	Mean		t test	Sig.
		Before	After		
Rice	Cost (per acre in Rs.)	19050	20650	2.32*	.046
	Yield(per kg)	1900	1500	4.29**	.002
Banana	Cost(per plant)	132.8	148.3	1.51	.145
	Yield (per plant)	10.6	7.8	8.55**	.000
Coconut	Cost (per palm)	130	150	4.58*	.001
	Yield per palm	6400	6330	2.09	.056

** Significant at 0.01 level * Significant at 0.05 level

The results of't' test showed that there was significant difference in the cost and yield of crops before and after conversion to organic farming. For paddy, annual mean cost of production per acre before adopting organic agriculture was found to be Rs.19050 which had increased to Rs. 20650 while adopting organic methods. This clearly indicated that organic farming had increased the cost of production in paddy by 8.4 per cent as compared to inorganic methods. As understood from the direct responses of the farmers, this increase could be attributed to the labour intensive practices involved in organic agriculture. Organic methods of production warranted constant surveillance of pests or

diseases and frequent weeding, which would evidently increase the cost of production. However, as far as yield of paddy was concerned, yield before conversion was reported higher than the yield after conversion, according to majority of farmers. Enquiries on the reason for the decrease in production revealed that most of the respondents were in the initial stages of conversion, the period of gestation, which might extend upto 3-4 years for the yield to stabilise. The average experience of farmers in organic cultivation was found to be three years, as explained in the section on socio-economic profile of farmers. The apprehensions of farmers in adopting organic methods in the nature of the ban might have also contributed to the yield reduction. Lack of availability of organic inputs in large quantities to compensate the nutrient availability from inorganic fertilizers also had been pointed out by respondents. This observation was endorsed by responses of agricultural officers as well. The mean yield of paddy per acre before conversion was found to be 1900 kg, which had been significantly reduced to 1500 kg. Annual income from paddy had also been worked out which showed 21 per cent reduction after adopting organic methods of production.

Considering banana, no significant difference could be observed in the cost of production before and after the adoption of organic farming. However in the case of yield, highly significant difference could be observed before and after conversion. The mean yield before conversion was 10.6 kg per bunch, which was found to get reduced to 7.8 kg under organic methods of production. This also could be due to the reduction in the availability of sufficient nutrients that usually happened in the initial years of conversion.

Coconut being a perennial plant, the annual mean costs per palm was found to have significant difference, before and after conversion. Increase in the cost of production in organic farming could be mostly due to the manual methods of application of organic inputs compared to inorganic method of production. But as far as yield was concerned, no significant difference between the two scenarios could be found. This could be because of the fact that the cost for inorganic inputs was very less compared to that of organic manures. During conversion they had to purchase manures in bulk quantities which would automatically increases the cost

of production. As stated earlier, another critical factor that had significant influence on the overall cost of production was the 'labour cost'. However the mean yield of coconut was found to reduce after conversion to organic agriculture. Since it was not statistically significant, it implied that yield was not severely affected as a result of conversion. This could be mostly because of the perennial nature of the crop, which required at least three years to reflect the impact of nutrients on its yield.

4.6. Nature and extent of adoption of organic farming practices by farmers

As stated elaborately in the review, the success of the programme on organic farming would depend on the nature and extent of adoption of organic farming practices by farmers.

The extent of adoption of organic farming practices by the farmers was measured using an adoption index developed by Sriram (1997) and was categorised as shown below.

Table 14. Distribution of farmers based on the extent of adoption of organic farming practices.

Category	Farmers (n=90)		
	Score range	**Frequency**	**Percentage**
Low (<Mean-S.D)	<57.1	51	56.6
Medium (Mean ±S.D)	57.1-59.7	4	4.4
High (Mean +S.D.)	>59.77	35	38.8
	Mean= 58.4	**S.D= 1.3**	

From Table 14 it is understood that majority of the respondents (56.6 %) had low level of adoption of organic farming practices. Farmers who had high and medium level of adoption constituted to 38.8 per cent and 4.4 per cent respectively. As it might happen in following the package of practices, farmers would not be able to follow each and every practice in organic method of production. Another reason could be high wages for carrying out these operations. Higher cost of available organic inputs could be another reason. The low adoption rates were in accordance with the trend in sales of major fertilizers in the district, as observed from various randomly selected fertilizer depots of co-operative societies from 2013-14 to 2015-16 (Table 15).

Table 15. Trend in sales of major fertilizers in Kasaragod district during 2013-14 to 2015-16

Particulars (Kg)/year	2013-14	2014-15	2015-16
Urea	5050	16000	8500
Potash	5900	24000	27000
Factomphos	11250	56000	19500

During 2013-14 to 2015-16, an increasing trend could be observed in the sales of fertilizers among which, sales of potash was found to increase over the years. It indicated that, even though Kasaragod District had been declared as organic district, farmers were still using chemical fertilizers at an increasing rate. In the case of pesticides also, there had been an increasing trend in sales of major pesticides in the district as shown below.

Table 16. Trend in sales of major pesticides in Kasaragod district during 2013-14 to 2015-16

Particulars (Nos.)/year	2013-14	2014-15	2015-16
Round up	3	30	70
Malathion	18	33	25
Indofil	33	50	50

This trend clearly indicated the use of pesticides in Kasaragod district by the farmers. Use of 'round up' was found to be increasing over the years, and it clearly implied the unavailability of effective organic herbicides to control weeds. As understood from the literature, organic farming requires intensive application of huge quantities of organic matter for ensuring stable nutrient supply to crops. This would require step by step interventions to convert both crop production and animal husbandry. This fairly long gestation period would compel farmers to find alternatives to cope with the loss of income during this period.

Extent of adoption was measured in terms of different categories of practices such as cultural method, *in situ* organic manuring, *ex situ* organic manuring, physical method and biological method. It was understood that in cultural methods, timely irrigation was carried out by majority of the farmers who

cultivated different crops. Mulching or incorporation of stubbles had also been followed by a vast majority of different farmer groups.

With respect to manuring, *in situ* manuring was found to have high adoption rates and majority of the farmers were found to adopt green leaf manuring.

With regard to *ex situ* organic manuring, application of farm yard manure (FYM), application of ash/cow dung slurry and green leaf manuring were found to have high adoption rates followed by poultry manure, oil cakes, vermi /rural compost and biofertilizers. Such higher levels of adoption could be attributed to local availability of organic manures such as FYM, dried leaves *etc.*

Regarding the physical/mechanical method, hand weeding or mechanical weeding were found to be followed by all the respondents (100%) of all farmer groups, whereas use of light/pheromone traps was found to be adopted by a very small proportion of farmers.

Biological method for controlling pest, disease or weed showed only low adoption rates compared to other methods. Rhizome treatment with cowdung and ash was followed by 80 per cent of banana farmers whereas usage of botanicals for plant protection was found to be adopted by 47 per cent in banana followed by 37 per cent in coconut and 3 per cent in rice. Usage of botanicals for plant protection, seed treatment of biofertilizers and conservation of natural enemies were found to be adopted the least. The percentage of the farmers adopting different organic practices are shown in Table 17.

Table 17. Nature of adoption of organic farming practices by the farmers

Sl. No.	Organic practices	Rice(%)	Banana(%)	Coconut(%)
1	**Cultural method/ecological method**			
A	Summer ploughing	86.60	76.66	73.33
B	Selection of good seeds	100.00	83.33	83.33
C	Resistant/tolerant variety	43.33	0.00	0.00
D	Timely irrigation	96.66	93.33	93.33
E	Crop rotation	40.00	0.00	0.00
F	Intercropping system	0.00	80.00	86.66
G	Mulching/incorporation of stubbles	100.00	20.00	100
2	**Insitu organic manuring**			
A	Insitu incorporation of crop residues	100	83.33	90
B	Raising green manure and incorporation	63.33	83.33	33.33
3	**Exsitu organic manuring**			
A	Application of FYM	93.30	100	100
B	Application of vermi/rural compost	33.33	33.30	36.66
C	Application of poultry manure	46.66	46.66	53.33
D	Application of oil cakes	46.66	36.66	40
E	Green leaf manures	96.66	83.33	90
	Biofertilizers	16.66	20	26.66
	Application of Cowdung slurry	56.66	80	70
	Panchagavya and Jeevamrutham	0	6.66	0
	Coirpith compost	0	0	3.33
4	**Physical /mechanical method**			
A	Hand /mechanical weeding	100	100	100
B	Collection and destruction of pests and disease affected plants	90	93.33	33.33
C	Use of light traps	16.66	3.33	6.66
5	**Biological method**			
A	Field sanitation	0	0	80
B	Sucker treatment with biofertilizers	0	20	0
C	Rhizome treatment with cowdung and ash	0	80	0
D	Use of sand, clay or tar	0	0	13
E	Seed treatment with biofertilizers	47	0	0
F	Bordeaux mixture	0	0	17
G	Use of biocontrol agents	7	3	3
H	Use of botanical pesticides	3	47	37
I	Conservation of natural enemies	17	0	0

Since ash/cow dung was locally available, it could be used by majority of the farmers. But biofertilizers had to be purchased from outside. Moreover they were not much aware of biofertilizers and their advantages. Most of the farmers were not aware that the powder inside the packet contained a living organism.

Most of them also did not know that these materials had to be used before the expiry date.

With regard to botanicals, though it was easier to make such solutions for foliar spray, they were not widely adopted due to ineffectiveness of these formulations to control pests and diseases. No such botanicals have been found yet to control weeds. A farmer who depends on agriculture as the only source of income would always want immediate effect for his intervention in farm, which would be possible only through the application of chemical pesticides. Here, while converting to organic mode, such farmers should have been ensured easy access to alternate means of livelihood to sustain during the gestation period.

4.6.1 Adoption of organic practices - a comparison among farmers cultivating different crops

Analysis was done to find out whether adoption had changed according to crops. Farmer groups were compared based on their adoption index using Kruskal Wallis test, the results of which are presented below (Table 18).

Table 18. Mean rank of Kruskal Wallis test on extent of adoption of organic farming practices (n=90)

Sl. No.	Crops	Mean rank
1	Rice farmers	51.22
2	Banana farmers	43.43
3	Coconut farmers	41.85
	$\chi^2_{(2)} = 2.229$ p=0.328	

The result of Kruskal Wallis one way ANOVA represented in Table 18 showed that there was no statistically significant difference in the adoption scores among the farmer groups cultivating rice, banana and coconut. In this case, the obtained χ^2 value was $\chi^2_{(2)} = 2.229$, (p=0.328).

Absence of any difference among farmers of important crops with respect to adoption indicated that the adoption was equally high, medium or equally low.

Here in this case, mean adoption index of 58.4 showed fairly low amount of adoption, which was above the expected value 40. That is, even though the observed value was more than the mean value, there would not be any significant difference among the three categories of farmers with respect to adoption.

The sustainability of adopting organic agriculture practices for each of these crops has not been estimated separately. It is seen that all these crops have been prior to be brought under the organic regime, without working out the specific recommendation regime for each crop.

It could also be noted that the ban on chemical pesticides and fungicides had mostly affected rice and banana. The amount of organic inputs required also varied from crop to crop. The direct results of conversion into organic agriculture was initially visible in rice, banana and only slowly visible in perennials. Naturally, these changes would have repeated in the pattern of adoption of organic agriculture considerably. But the results showed that such changes had not perceptibly decided the adoption of organic agriculture by farmers in the district, due to various reasons yet to be fully explored.

The scores are indication of the extent of differences among farmers with respect to adoption of organic practices. It was interesting to note that even while there were differences among farmers on the perception levels and attitude, adoption scores did not show any significant differences, suggesting that adoption of organic practices were not significantly high in any one group. This trend would explain the difficulty in adopting organic practices in the major production systems in Kasaragod District.

4.6.2. Attitude of respondents regarding the implementation of organic farming in the district

Though majority of farmers registered low adoption (Table 14), attitude of the respondent towards declaration of Kasaragod district as an organic district followed a different pattern as shown in Table 19.

Table 19. Distribution of respondents based on their attitude on organic farming practices

Category	Farmers (n=90)			Extension officials (n=40)		
	Score range	Frequency	%	Score range	Frequency	%
Less favourable (<Mean-S.D)	<45.05	6	6.66	<22.37	4	10
Moderately Favourable (Mean± S.D)	45.05-60.55	63	70	22.37-29.83	24	60
Very favourable (>Mean+S.D)	>60.55	21	23.3	>29.83	12	30
	Mean=52.80	**S.D= 7.75**		**Mean=26.10**	**S.D=3.73**	

As indicated from Table 19, majority of the farmers (70 %) had moderately favourable attitude towards implementation of organic farming in the district. Farmers who had very favourable and less favourable attitude constituted 23.3 per cent and 6.66 per cent of the sample respectively. The reason behind this attitude was explored from the responses of farmers. In fact, organic farming was imposed upon the farmers of Kasaragod through an executive order, not by any consensus of the farming community. This declaration was marked by a sudden ban of red, yellow and a few blue labelled pesticides. In fact, this had affected many farmers who used to cultivate crops for commercial purpose. Since the sales of red and yellow labelled pesticides were prohibited, the cooperative fertilizer depots could not sell these products. However, these chemicals were available for purchase from Mangalore in Karnataka, the bordering state of Kasaragod and Kannur district bordering south. Farmers realised the perils of indiscriminate use of chemical pesticides which would also be very helpful in controlling serious pest infestations. The high percentage of respondents with moderate attitude truly reflected this confusion. Only 23.3 per cent of the farmers were observed to have maintained highly favourable attitude towards organic farming. They were not clear about the practicality of organic farming on a commercial basis.

Similarly, majority (60%) of the extension personnel also had only 'moderately favourable attitude' towards organic farming practices. Extension

personnel who had highly favourable and less favourable attitude contributed only 10 per cent and 30 per cent of the samples respectively. Extension personnel as implementing officers of various development schemes would be held answerable to the public as well as the department. Failure to deliver sound results in terms of production and profit would be a major concern of the officers. In fact, many field level issues could not be solved by organic measures alone, which would invite criticism from the farming community. Majority of the officers were not much concerned about the feasibility of absolute organic methods in dealing with massive pest and disease infestation and nutrient related issues. Most of the extension personnel were of the opinion that Kasaragod district was yet to become fully organic, which implied that farmers were still using inorganic pesticides and in spite of the standing orders, extension officials recommended chemical pesticides/fertilizers in critical situations.

4.6.3. Comparison of different farmer groups based on their attitude on organic agriculture in the district

Farmer groups were compared with respect to their attitude on implementation of organic agriculture using Kruskal Wallis test as shown below (Table 20).

Table 20. Mean rank of Kruskal Wallis test on attitude of the respondents towards organic farming (n=90)

Sl. No.	Crops	Mean rank
1	Rice	44.55
2	Banana	51.38
3	Coconut	40.57
	$\chi^2_{(2)} = 2.64$	p=0.267

Considering the differences in organic practices by different crops, further an alysis was done to find out whether the farmers cultivating different crops differed one another with respect to attitude. The result of Kruskal Wallis one way ANOVA represented in Table 20 showed that there were no significant differences in the scores of attitude obtained by farmer groups cultivating rice,

banana and coconut, with the obtained χ^2 value of $\chi^2_{(2)} = 2.641$ (p=0.267). This implied that the farmer groups cultivating rice, banana and coconut did not differ one another in their attitude towards organic farming. These results reflected the trends observed in adoption. The farmers were found to be unconvinced about the feasibility of organic farming in these crops. In fact, experiences gathered over a period of five years since the policy was implemented had not significantly changed their attitude towards organic agriculture.

4.7. Nature of institutional support extended to farmers

Even though Kasaragod district is declared to be organic, it is important to find out whether there exists adequate support mechanism for this transition or not. The nature of support available was analysed and their frequency and percentage are shown below.

4.7.1. Subsidy

Institutions were found to provide farmers with subsidy to promote organic agriculture. The table below shows the extent to which farmers received subsidy for organic agricultural practices.

Table 21. Distribution of respondents based on the subsidy obtained for organic farming (n=90)

Category	Frequency	Percentage(%)
Not availed	80	88.8
Availed	10	11.2
Total	**90**	**100**

Majority (88.8%) of the farmers have not availed any kind of subsidy for conversion to organic farming.

4.7.2. Training programmes

Respondents who attended training on organic farming activities are categorised as shown below.

Table 22. Distribution of respondents based on the participation in training programmes on organic farming (n=90)

Category	Frequency	Percentage (%)
Not availed	44	48.8
Availed	46	51.2
Total	**90**	**100**

Farmers who attended training on organic agriculture constituted 51.2 per cent and those who didn't participate in training activities came to about 48.8 per cent.

4.7.3 Organic manures

Respondents who have availed any support for organic manures has been classified as shown below

Table 23. Distribution of respondents based on the availability of organic manures (n=90)

Category	Frequency	Percentage (%)
Not availed	50	55.5
Availed	40	44.5
Total	**90**	**100**

Majority of the farmers (55.5%) had not availed any support for organic manure production whereas 44.5 per cent had availed support for organic manure production.

4.7.4 Support from private agencies

Distribution of respondents who got support from private agencies as organic inputs or as any other components is shown below.

Table 24. Distribution of respondents based on the private support (n=90)

Category	Frequency	Percentage (%)
Not availed	86	95.5
Availed	4	4.45
Total	**90**	**100**

Several private institutions were reportedly providing organic inputs to farmers. Frequency of farmers availing this opportunity is shown above. As seen from Table 24, 95.5 per cent of the farmers were found not to receive any kind of support from private agencies.

4.7.5 Marketing support

Respondents were classified based on the incidence of availing marketing support as shown below.

Table 25. Distribution of respondents based on the marketing support (n=90)

Category	Frequency	Percentage (%)
Availed	4	4.5
Not availed	86	95.5
Total	**90**	**100**

It is clear from Table 25 that majority (95.5%) have not availed any kind of support for marketing during the transition period.

4.7.6 Financial assistance provided by the Government of Kerala (GoK)

As part of the policy of the government, the support mechanisms included financial assistance to farmers, the details of which are given below (Table 26)

Table 26. Financial assistance provided by the GOK during 2012-13 to 2016-17 under the scheme 'organic farming' in Kasaragod District (in Lakhs)

Sl. No.	Particulars	Amount (in Lakhs)				
		2012-13	2013-14	2014-15	2015-16	2016-17
1	Extension activities	112.5	125.75	123	92	219
2	Organic manure production	247.5	247.5	83.65	63.75	182.5
3	Infrastructure facilities for input production and marketing	30	55	656.5	0	132.99
4	Administrative support	16.1	32.2	56.35	5.85	111
	Total	**406.1**	**460.45**	**919.5**	**161.6**	**645.49**

This part of the study projects out the nature of institutional support made available to farmers during the past five years after declaring Kasaragod as

organic district. Trends in financial assistance accorded by the government through the organic farming scheme on various components are shown below (Fig.3).

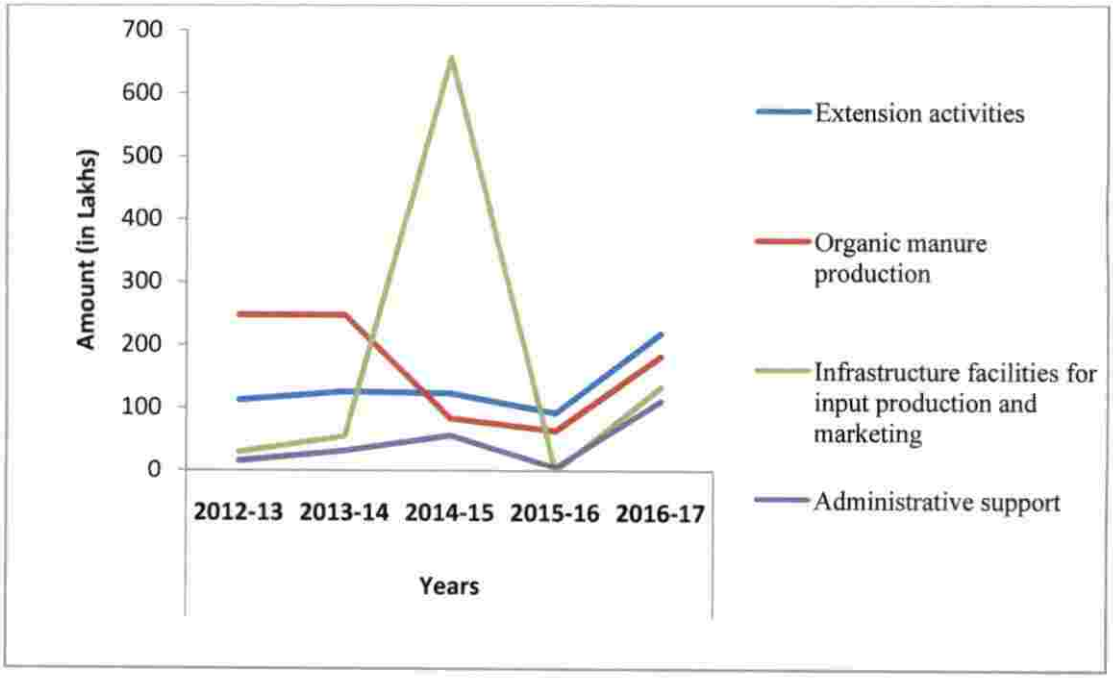

Figure 3. Graphical representation of financial assistance accorded for the respective components from 2012-13 to 2016-17

From the above graph it is clearly understood that during 2012-13 more amount was allotted to organic manure production compared to other components, in which the cost for preparing rural and vermi compost was given on a subsidy basis to each Panchayath. About 200-300 selected farmers in each Panchayath were given rural compost @ Rs.4500/- per pit and vermi compost @ Rs.7500/-. Additional pits were given based on the necessity over the years. For carrying out extension activities Rs. 112.5 lakhs were allotted. As administrative support, two temporary posts of field managers and field assistants and BSc Agriculture graduates and VHSE certificate holders were appointed respectively. The main drawback of this method is that subsidy would be allotted merely on the basis of an inspection by the field assistant or field manager. Since, subsidy to the tonne of Rs.4500 is given per pit, most of the farmers who do not follow organic methods of production would also apply for the subsidy. However, after initial enthusiasm,

shown during the inspection, most of the people hesitate to continue, because of the lack of further monitoring.

From the above graph it is evident that, the amount allotted for production of organic manures was found to be same for the years 2012-13 and 2013-14. But, it suddenly decreased to 83.65 lakhs in 2014-15 and 63.75 lakhs during 2015-16. In 2016-17, substantial increase in amount was noticed. In 2014-15, more emphasis was given on infrastructure facilities for input production and marketing. In 2015-16 no such allocations were made by the government.

4.8. Socio-economic characteristics of respondents selected for the study

Since adoption of any new practice is found to be greatly influenced by the socio-economic and psychological characteristics of the farmer, an analysis was done to draw out a profile of the farmer's who were contacted for data collection to find out whether their socio-economic characteristics influenced the level of adoption and other parameters related to their perception on organic agriculture. The socio-economic profile of the respondents is described below.

4.8.1 Age

Respondents are categorised into groups *viz.* young (<35 years), middle aged (35-45 years) and aged (>45 years). Groups and their respective frequency and percentage are shown below (Table 27).

Table 27. Distribution of respondents based on their age (n=130)

Category	Farmers(n=90)		Extension personnel(n=40)	
	Frequency	Percentage	Frequency	Percentage
Young (<35 years)	2	2.2	14	35
Middle age (35-45 years)	16	17.7	21	52.5
Aged (>45 years)	72	80	5	12.5
Total	**90**	**100**	**40**	**100**

Distribution of respondents based on their age showed a noticeable difference in participation in farming operations between the young and aged population (See Table 27). While 76.3 per cent of the farmers belonged to 'aged' group, only 23.3 per cent came under middle age category. The average age of the farmers were found to be 55. These findings are in agreement with the findings of Svotwa *et al.,* (2008) who indicated that the farmers above the age 51 years are actively involved in farming operations, around the world.

This trend shows that the youth are not ready to venture into this field. Youth usually prefer to move on to white collar jobs. As widely stated (Coleman, 2007), low returns from agriculture had been demotivating the youths as well as some of the traditional farmers from venturing into agriculture. This could also be attributed to the prolonged nature of agriculture to yield results, which involved hard work and unpredictability of getting profits. While other sectors pay comparatively better remuneration, the tribulation and hardship involved in agriculture tend the youth to abandon agriculture for better prospects. Greater participation of aged farmers could be because of the fact they were not familiar with other means of livelihood (Singh *et al.,* 2014) and were compelled to continue their legacy of farming as reflected by most of the farmers.

4.8.2 Gender

As understood from the distribution of respondents based on their gender, males contributed 72.2 per cent and females formed only 27.7 per cent of the sample. This has been more or less the trend with extension personnel as well, with male forming 52.5 per cent and female forming 47.5 per cent.

Table 28. Distribution of selected respondents based on their gender (n=130)

Category	Farmers(n=90)		Extension personnel(n=40)	
	Frequency	Percentage	Frequency	Percentage
Male	65	72.2	21	52.5
Female	25	27.8	19	47.5
Other	0	0	0	0
Total	**90**	**100**	**40**	**100**

Segregation of farmers based on gender showed higher involvement of males (72.2 %) compared to females (27.7 %). As understood from local enquiries and general observations, this trend has been continuing for several years. As generally observed, contribution of women in agriculture varies according to crops. While rice and banana may involve more women in cultural and intercultural operations, perennials like coconut may not involve women as much as what could be seen in annual crops. The greater involvement of women in agricultural operations is not in agreement with the ownership of land. Here in this study, the farm has been selected based on their ownership of land, which may result only in predominance of men. Women would be mostly engaged in looking after families and other household chores which would deter them from spending much time in farming activities. These findings are in agreement with the Dipeolu *et al.*, (2006) who reported that the farming operations were mostly undertaken by males and the activities like processing, etc. were mostly done by females.

4.8.3. Education

Distribution of respondents based on education is shown in Table 29 below.

Table 29. Distribution of selected respondents based on their education (n=130)

Category	Frequency	Percentage
Farmers (n=90)		
Illiterate	0	0
Can read and write	5	5.5
Primary education	31	34.4
High school education	34	37.7
Predegree	16	17.7
Degree	3	3.3
Post graduate and above	1	1.1
Total	**90**	**100**
Extension personnel (n=40)		
VHSE	16	40
Graduate	19	47.5
Post graduate and above	5	12.5
Total	**40**	**100**

It is clearly observed from Table 29 that majority of the respondents (37.7 %) had high school education whereas primary education was found to be acquired by only 34.4 per cent of farmers. Farmers who possess predegree, degree and postgraduate contributed about 17.7 per cent, 3.3 per cent and 1.1 per cent respectively. Farmers who could just read and write formed 5.5 per cent of the respondents. Distribution of farmers across different categories of educational qualification was in line with the general trend observed in our state. Highly educated people did not prefer to pursue agriculture. They were found to seek jobs other than agriculture. Since agriculture is continuously proving to be less remunerative due to the lack of adequate institutional mechanism to support farmers. Uncertainties in the prospects of pursuing agriculture as a career deter a vast majority of the young people in the state from adopting it as their livelihood option. Only the older generation was found to continue in the sector. Under this circumstance, it should be examined how well the youth could be attracted to adopt agriculture as a career. It is also important to find out whether adoption of organic agriculture would motivate people to remain in this sector.

4.8.4. Farming experience

Experience of farmer was measured in terms of number of years a farmer had been engaged in agriculture related activities. Experience of extension personnel was defined in terms of their occupational experience as Agricultural Officer (AO) or Assistant Agricultural Officer (AAO). Distribution of respondents across different categories of experience is presented in the Table 30.

Table 30. Distribution of selected respondents based on their experience

Category	Frequency	Percentage
Farmers(n=90)		
Less than 10 years	12	13.3
10-20 years	21	23.3
More than 20 years	57	63.3
Total	**90**	
Extension personnel(n=40)		
Less than 5 years	19	47.5
5- 10 years	12	30
More than 10 years	9	22.5
Total	**40**	**100**

Almost in full agreement with the pattern of distribution of farmers based on age, the distribution of farmers based on experience showed majority being included in the category of 'experience above 20 years' (63.3%). Farmers with less than 10 years of experience formed about 13.3 per cent of the sample and those with experience between 10 to 20 years contributed 23.3 per cent. Traditional farmers who were previously engaged in farming activities were found continue in farming and the young farmers were not found to venture into this field. Most of the traditional farmers who still preferred to concentrate on agriculture attributed their decision to their commitment to agriculture.

4.8.5 Experience in organic farming

Here in this study, experience in organic farming was defined in terms of the number of years since they had actively started organic agriculture. While considering the factors that affect adoption of organic practices and the perception on sustainability, firsthand experience in the farming was found to matter significantly. Experience in organic farming was categorised as shown below. Frequency and percentage in each of these categories is presented in Table 31.

Table 31. Distribution of farmers based on their experience in organic farming (n=90)

Category	Frequency	Percentage
No experience	49	54.4
Less than 5 years	17	18.8
5 – 10 years	16	17.7
More than 10 years	8	8.89
Total	**90**	**100**

It was found that majority (54.4%) of the farmers did not have any experience in organic farming. Farmers who had experience less than 5 years were 18.8 per cent whereas 17.7 per cent had 5 to 10 years of experience. Farmers with more than 10 years contributed to 8.89 per cent. Average experience of organic farmers was found to be three years which indicated that most of them were in different stages of conversion to organic farming.

4.8.6 Annual income

Farmers were categorised into low, middle and high income categories based on their annual income. The frequency and percentage of farmers involved in each category is given in Table 32.

Table 32. Distribution of farmers based on their annual income (n=90)

Category	Frequency	Percentage
Low income (<10000)	9	10
Middle income(10000-50000)	51	56.7
High income(>50000)	30	33.3
Total	**90**	**100**

While majority of the farmers (56.7 %) belonged to middle income group, 33.3 per cent were found to be in high income group and 10 per cent of the farmers belonged to low income category. Average annual income of the farmers was found to be Rs. 60,000.

4.8.7 Farm size

Farm size was operationalised as the area of the cultivable land owned by farmer based on which farmers were categorised into five different groups as shown in Table 33. Frequency and percentage of distribution of farmers across these five categories are shown in Table 33.

Table 33. Distribution of farmers based on their farm size (n=90)

Category	Frequency	Percentage
Marginal (below 1 ha)	60	66.7
Small farmers(1-2 ha)	20	22.3
Semi medium farmers(2-4 ha)	5	5.5
Medium farmers(4-10 ha)	5	5.5
Large farmers (10 ha and above)	0	0
Total	**90**	**100**

In agreement with the distribution of small and marginal farmers in Kerala as well as the country as a whole, 66.7 per cent of the farmers were found to be

marginal and 22.3 per cent as small farmers with 1 - 2 ha in their possession. Semi medium and medium farmers with farm size 2-4 ha and 4-10 ha respectively, contributed to 5.5 per cent of the sample each. The predominance of small and marginal farmers showed that large scale farming was decreasing, and the development approaches should be mostly oriented to the needs of small and marginal farmers. The pattern of adoption of organic farming based on farm size seemed to be an important point of observation with respect to feasibility and profitability.

4.8.8. Extent of farming integration

Since organic agriculture needed integration of agriculture with allied enterprises such as animal husbandry for ensuring supply of organic inputs, sustainability of organic agriculture would depend on the extent of integration of farming particularly with livestock. The extent of integration is shown in Table 34.

Table 34. Distribution of farmers based on their extent of farming integration (n=90)

Category	Frequency	Percentage
No components	24	26.6
Livestock	17	18.9
Poultry	14	15.6
Pisciculture	1	1.2
Livestock + Poultry	33	36.6
Livestock + Poultry + Pisciculture	1	1.1
Total	**90**	**100**

While 36.6 per cent of the farmers had livestock and poultry combined together, livestock or poultry or pisciculture alone was found to be maintained by 18.9 per cent, 15.6 per cent and 1.2 per cent respectively. Farmers who did not have any component constituted 26.6 per cent of the sample. Farmers having livestock combined with poultry and pisciculture together constituted 1.1 per cent. Among the total respondents only 1.1 per cent of the farmers were rearing fish as an independent enterprise or with livestock and poultry. It is clearly evident that 26.6 per cent of the farmers did not have any kind of animal husbandry

component integrated into their farming activities. This points out the need to be encourage integrated farming eventually with livestock components to supplement the organic inputs required for organic farming. Lack of livestock was reportedly due to the constraints in managing livestock for fodder and the drudgery involved in the enterprise.

4.8.9. Contact with extension agency

Since the programme of conversion into organic farming was an officially sponsored programme to motivate farmers to switch over to organic production, it was presumed that contact with extension agency would be influencing the adoption of organic practices and the attitude towards ban on chemical intensive farming. Distribution of farmers based on different levels of interaction with extension agents is given below in Table 35.

Table 35. Distribution of farmers based on their contact with extension agency (n=90)

Category	Frequency	Percentage
Often	54	60
Rarely	29	32.2
No contact	7	7.8
Total	**90**	**100**

It is observed that majority (60%) of the farmers had contact with the extension agent quite often. Farmers who had 'rarely' or 'never' contacted extension agencies contributed to 32.2 per cent and 7.8 per cent of the sample respectively. Majority who had frequent contact with extension agency would be aware of the new schemes or services implemented by the development agencies. It was further reported that some farmers had active contact with extension agents, weekly or sometimes even daily. Farmers who reported to contact the extension agency 'rarely' would be aware of the schemes only at the time of implementation of schemes from peers. Those farmers who did not contact any extension agency did not have first hand information on the promotional programmes and schemes of organic farming. This had been mainly due to the difficulty in accessing

agricultural institutions like Krishibhavan for which, farmer had to spent time and money.

4.8.10. Exposure to training

Official records had shown that the department of agriculture had provided the farmer with different training programmes on various dimensions of organic agriculture in the district.

Distribution of farmers based on the frequency of exposure to training on organic agriculture is shown in Table 36. Exposure to training was measured in terms of the number of training programmes attended by the farmers since the district was declared organic by the government in 2012.

Table 36. Distribution of farmers based on exposure to training on organic agriculture (n=90)

Category	Frequency	Percentage
No training	2	2.2
Less than 8 trainings	83	92.2
More than 8 trainings	5	5.6
Total	**90**	**100**

While majority of farmers (92.2%) had attended less than eight trainings, only 5.5 per cent of the farmers was found to have attended more than eight training programmes. Only 2.2 per cent had not been part of any training programme. This indicated that exclusive training programmes on organic farming were conducted by various agencies, particularly the Krishibhavans.

4.8.11. Social participation

Promotion of organic farming in Kasaragod District was historically an outcome of the public agitation on the plight of endosulfan victims. Several voluntary organisations had participated in the public activism for ban on chemicals. It was against this background, enquiry was made to find out whether social participation of farmers had any bearing on their decision to adopt organic agriculture.

Farmers were grouped into 'two' on the basis of their membership in organisations. Distribution of farmers based on social participation is given below.

Table 37. Distribution of farmers based on their membership in different organisations. (n=90)

Category	Frequency	Percentage
Participation in activities by social organisations	50	55.5
No participation in activities by social organisations	40	44.5
Total	**90**	**100**

While majority of (55.5%) farmers were found to have membership in organisations 44.5 per cent did not have any kind of membership in any of the organisations.

4.8.12. Availability of organic inputs

Availability of organic inputs was measured as the frequency of availability of different organic inputs used by a farmer.

Table 38. Distribution of selected farmer respondents based on the reported availability of organic inputs (n=90)

Category	Farmers (n=90)		
	Score range	Frequency	Percentage
Low (<Mean-S.D)	<1.49	13	14.5
Medium (Mean ±S.D.	1.49-3.67	60	66.7
High (Mean +S.D.)	>3.67	17	18.8
	Mean= 2.58	**S.D= 1.09**	

From the above table it is understood that majority (66.7%) of the farmers reported medium level of input availability. While 18.8 per cent reported high level of input availability, low input availability was reported by 14.5 per cent of the farmers. In agreement with the extent of farming integration (see Table 30), majority of the farmers were found to own combinations of livestock and poultry. This shows that the available organic inputs were mostly generated from their own farm and that must be the reason for reporting medium availability by most of the farmers. Farmers with more than two animals and poultry birds *etc.*were found to have high availability of organic inputs.

4.9. Factors affecting adoption of organic practices by farmers in Kasaragod District

Since adoption is affected by several socio psychological and economic factors, an attempt was made to find out the factors that might be affecting the adoption of organic agriculture by farmers. Correlation between adoption of organic practices (measured in terms of adoption index) and the major socio – economic, psychological and extension related variables are shown in Table 39 below. Correlation analysis was done in order to find out the factors that are responsible for adoption of organic practices.

Table 39. Factors affecting adoption of organic practices

Variables	Spearman Rank correlation (r)	Sig.
Age	-.246**	.019
Experience in farming	-.234**	.027
Experience in organic farming	-.193*	.068
Social participation	.221**	.036
Availability of input	.252**	.016

**Sig. at 5%level *Sig. at 10%level

Among the selected variables *viz.* age, experience in farming, experience in organic farming, social participation and availability of organic inputs were found to have significant relation with adoption of organic practices by farmers in Kasaragod District. Age of farmers was observed to have significant and negative correlation with adoption which indicated that as the age increased the possibility of adoption got decreased. Aged farmers were less likely to adopt organic practices. In this case majority (80%) of the farmers were aged, hence the adoption rates were found to be very low for the majority (56.6%). It would be difficult for the farmers to change the practices that they had been following for a long time. But as far as young and middle age were concerned, they would be much more informed of the serious ill effects of chemicals. Aged farmers had been following chemical intensive agriculture for a long time and were convinced that inorganic inputs would give more yield compared to organic inputs. This finding is in agreement with Pattanapant and Shivakoti (2014) who stated that

younger farmers would possess more positive perception on the impact of organic farming and were more likely to adopt organic practices.

The duration of their 'experience in farming' and 'organic farming' in particular were found to have significant and negative correlation with extent of adoption, which implied that as experience increased, the adoption of organic agriculture decreased. This is almost similar to the nature of correlation of adoption with age. Majority (63.3%) had 'experience' for more than 20 years in farming activities and their adoption was found to be low. This observation reiterates the finding of Singh *et al.,* (2014) who stated that, as experience increased, possibility of adopting organic or partial organic farming practices decreased.

Similarly, social participation was found to have significant and positive correlation with adoption which showed that with an increase in social participation, the extent of adoption also would increase. This is in agreement with Ramesh and Govind (2008) who revealed that social participation was found to have significant and positive correlation with adoption of organic practices. The frequency at which organic inputs had been made available had significant and positive correlation with rate of adoption, which implied that more the organic inputs are made available higher the adoption rate. This finding has immense policy level implications, which suggest that sustaining the drive to convert as production system into fully organic require immense supply of organic inputs.

4.9.1. Factors affecting farmers' perception on ban on chemical pesticides

Factors that are responsible for changes in perception on ban of chemical pesticides of farmers are shown below (Table 40).

Table 40. Factors affecting farmers' perception on ban on chemical pesticides

Variables	Spearman Rank correlation (r)	Sig.
Contact with extension agency	-.229**	.030

**Sig. at 5%level

As evident from the table, contact with extension agencies showed significant and negative correlation with 'perception' scores which implied that more the contact, lesser the scores on the perception on ban on chemical pesticides.

4.9.2. Factors affecting perception on various dimensions of sustainability of organic agriculture

Analysis of correlation between the socio-economic and psychological variables with farmers' perception on various dimensions of sustainability of organic agriculture showed that only 'age' and 'experience in organic farming' had significant and positive correlation(see Table 41). As explained earlier, economical, environmental and social dimensions of sustainability were subjected to the analysis. To explain it further, as age increased, farmers were found to have better perception of the dimensions of sustainability. It is interesting to note that even while the farmers' age and adoption had negative correlation, their perception on sustainability remained high, because of the conviction that organic agriculture if practiced would be sustainable. Positive correlation between experience in organic farming and perception of various dimensions could obviously be due to the fact that farmers who had voluntarily adopted organic farming must have been aware of the environmental sustainability of organic farming.

Table 41. Factors affecting perception on various dimensions of sustainability of organic agriculture

Variables	Spearman Rank correlation	Sig.
Age	0.198*	0.061
Experience in organic farming	0.246**	0.019

**Sig. at 5%level *Sig. at 10%level

4.9.3. Factors affecting attitude of farmers towards implementation of organic agriculture

Out of the 13 variables that were reviewed to be important, frequency of availability of organic inputs alone was found to have significant relationship with attitude. This implied that attitude was determined by the realisation of the

requirements of the farmers. Farmers who had assured supply of organic inputs had positive attitude towards the programme and those who did not have access to organic inputs had the tendency to view the programme negatively (Table 42).

Table 42. Factors affecting attitude of farmers towards implementation of organic agriculture

Variables	Spearman Rank correlation	Sig.
Availability of organic inputs	.187*	.077

*Sig. at 10%level

This observation points to the importance of ensuring organic inputs to the farmers as a prerequisite of the success of organic agriculture.

4.9.4. Factors affecting perception on ban on chemical pesticides

Correlation was performed to find out the factors that were responsible for perception on ban on chemical pesticides of extension personnel as shown below.

Table 43. Factors affecting perception of extension personnel on ban of chemicals pesticides

Variables	Spearman Rank correlation	Sig.
Age	.568***	.000
Occupational experience	.613***	.000

*** Sig. at 1%level *Sig. at 10%level

From the above table it is clear that age and occupational experience of the extension personnel had significant and positive correlation with perception on ban of chemical pesticides.

4.9.5 Factors affecting perception on various dimensions of sustainability of organic agriculture

Correlation of the independent variables with perception on various dimensions was conducted to find out the factors that were responsible for perception on sustainability of organic agriculture of extension personnel (Table 44).

Table 44. Factors affecting perception of extension personnel on various dimensions of sustainability of organic agriculture

Variables	Spearman Rank correlation	Sig.
Age	.274*	.088
Education	-.244*	.128
Designation	-.319**	.045

**Sig. at 5%level *Sig. at 10%level

Education and designation of extension personnel had significant and negative correlation whereas age showed positive correlation with perception on sustainability of organic agriculture. This indicated that on acquiring more education and status, perception on sustainability of organic agriculture decreased.

4.9.6. Factors affecting attitude of extension personnel towards organic agriculture

Correlation analysis was done in order to find out the factors that were responsible for attitude of extension personnel towards organic agriculture, the results of which are shown below (Table 45).

Table 45. Factors affecting attitude of extension personnel towards organic agriculture

Variables	Spearman Rank correlation	Sig.
Education	-.248*	.122
Designation	-.474***	.002

***Sig. at 1%level *Sig. at 10%level

The above table clearly shows that education and designation showed significant and negative relationship with attitude. Extension personnel with higher level of education and higher designation had lesser attitude towards organic agriculture. Even though they were the implementing officers most of the extension personnel were not supporting organic agriculture.

4.9.7. Factors that transform the levels of adoption of organic practices, perception on ban of chemicals and various dimensions of sustainability

Since the attributes of farmers related to adoption were found to have varying relationship with the socio economic and psychological characteristics of

farmers, it was decided to perform a multinomial logistic regression test to find out the factors that contributed to the probability of being included in different levels of the attributes. This would, in other words, help us find out the most contributory characteristics for being included in a higher level of attribute. This would indirectly give us cues on the most important factors that determine the probability or showing a given specific characteristic, which further implies that through manipulation of the contributory variable, the specific characteristic shall be changed considerably.

Based on adoption index values, farmers were classified into low, medium and high categories by estimating the frequency of respondents falling below 'mean-S.D' values of adoption indices; falling between 'mean- S.D' to 'mean + S.D' and finally those who fall above 'mean +S.D'.

Based on this classification, adoption index was coded and a multinomial logistic regression was run with the dependent variable as adoption and the explanatory variables such as age, gender, education, experience in farming, experience in organic farming, annual income, extent of integration, contact with extension agent, exposure to trainings, social participation, availability of organic inputs and extent of institutional support. The results of this analysis are shown in Table 46-52.

Table 46. Factors that transform various adoption levels in farmers, corresponding to the explanatory variables

Likelihood Ratio Tests				
	Model Fitting Criteria	**Likelihood Ratio Tests**		
Effect	**-2 Log Likelihood of Reduced Model**	**Chi-Square**	**df**	**Sig.**
Intercept	101.276	1.753	2	.416
Age	99.848	.325	2	.850
Gender	100.902	1.379	2	.502
Education	103.403	3.881	2	.144
Experience in farming	101.579	2.056	2	.358
Experience in Organic farming	103.312	3.790	2	.150
Farm size	101.292	1.770	2	.413

Likelihood Ratio Tests				
	Model Fitting Criteria	Likelihood Ratio Tests		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Annual income	99.689	.167	2	.920
Extent of farm integration	101.625	2.103	2	.349
Contact with extension agency	102.834	3.312	2	.191
Exposure to training	102.292	2.770	2	.250
Social participation	100.136	.614	2	.736
Availability of inputs	104.461	4.939	2	**.085***
Institutional support	100.948	1.425	2	.490
Perception on ban	100.358	.836	2	.658
Perception on sustainability	99.581	.059	2	.971
Attitude	103.144	3.622	2	.164

*Significant level at 10%

Table 47. Odds ratio and percent probability of matching

Level of adopters	Variables	Odds ratio	% probability
Low level to medium level	Experience in organic farming	1.377	57.93
	Attitude	1.262	55.79
Medium level to high level	Contact with extension agency	0.280	21.87
	Input availability	0.474	32.15

The analysis revealed that the two important explanatory variables namely 'experience in organic farming' and 'attitude' had the odds ratio of importance of one level of adoption to the next level. Among these explanatory variables, 'experience in organic farming' had an odds ratio of 57.93 per cent and attitude had 55.79 towards improvement of the farmer's adoption level from 'low' to 'medium'. The parameters *viz.* 'contact with extension agency' and 'availability of organic inputs' had only 21.87 per cent and 32.15 per cent probability respectively towards improvement from a medium level to a high level adoption level.

4.9.8. Perception on ban on chemical pesticides

The perception of farmers on ban on chemical pesticides were classified as having 'unfavourable' and 'favourable' perception. Multinomial logistic regression was run considering perception as dependent variable and age, gender,

education, experience in farming, experience in organic farming, annual income, extent of integration, contact with extension agency, trainings attended, social participation, availability of organic inputs and institutional support as explanatory variables.

Table 48. Factors that transform various perception levels in farmers, corresponding to the explanatory variables

Likelihood Ratio Tests				
+	Model Fitting Criteria	Likelihood Ratio Tests		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	Df	Sig.
Intercept	105.919	2.223	1	.136
Age	104.628	.933	1	.334
Gender	109.250	5.554	1	**.018**
Education	105.034	1.338	1	.247
Experience	103.886	.190	1	.663
Organic	103.852	.156	1	.693
Area	104.038	.343	1	.558
Income	103.958	.263	1	.608
Animal	104.379	.683	1	.408
Extension	106.985	3.289	1	**.070**
Trainings	105.200	1.504	1	.220
Social	105.662	1.966	1	.161
Input	105.226	1.530	1	.216
Institutional	103.710	.014	1	.904

** Significant at 5%level * Significant at 10% level

Table 49. Odds ratio and percent probability of matching

Level of adopters	Variables	Odds ratio	% probability
Unfavourable to favourable	Gender	0.179	15.18
	Contact with extension agency	2.116	67.90

The results indicated that among these explanatory variables, 'gender' and 'contact with extension agency' with odds ratio's 15.18 and 67.9 were found to be important in transforming farmers' unfavourable perception into favourable perception.

4.9.9 Perception on various dimensions of sustainability of organic agriculture

As mentioned above, perception on sustainability was also scored and classified as 'unfavourable' and 'favourable' perception. The results revealed that while considering perception as dependent variable, only 'age' and 'gender' were found to have importance in changing farmer's perception level from 'unfavourable' to 'favourable'. (Table 50)

Table 50. Factors that transform various perception levels in farmers, corresponding to the explanatory variables

Likelihood Ratio Tests				
	Model Fitting Criteria	Likelihood Ratio Tests		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	Df	Sig.
Intercept	97.920	.221	1	.639
Age	103.287	5.588	1	**.018**
Gender	108.997	11.298	1	**.001**
Education	97.711	.012	1	.911
Experience	99.468	1.770	1	.183
Organic	99.951	2.252	1	.133
Area	97.720	.021	1	.884
Income	99.376	1.678	1	.195
Animal	98.366	.667	1	.414
Extension	98.485	.786	1	.375
Trainings	98.296	.597	1	.440
Social	97.855	.156	1	.692
Input	99.049	1.350	1	.245
Institutional	100.346	2.647	1	.104

*Significant at 5% level **significant at 1% level

The odds ratio for the corresponding explanatory variables such as 'age' and 'gender' was 48.2 per cent and 6.62 per cent respectively (Table 51).

Table 51. Odds ratio and percent probability of matching

Level of adopters	Variables	Odds ratio	% probability
Unfavourable to favourable	Age	.931	48.2
	Gender	.071	6.62

4.9.10. Attitude of farmers

Attitude of farmers were scored and categorised into 'less favourable', 'moderately favourable' and 'very favourable'. Multinomial logistic regression showed that among the other explanatory variables, only 'age', 'gender', 'input availability', 'extent of farming integration' and 'exposure to trainings' were found to have influence in improving the attitude levels from 'less favourable' 'favourable'(See Table 52).

Table 52. Odds ratio and percent probability of matching

Level of adopters	Variables	Odds ratio	% probability
'Less favourable' to 'medium favourable'	Gender	.024	2.343
	Availability of input	.562	35.97
'Medium favourable' to 'very favourable'	Age	.894	47.2
	Gender	.077	7.14
	Extent of farming integration	.480	32.43
	Exposure to trainings	.755	43.01

The results revealed that gender and input availability with odds ratio of 2.34 and 35.97 were found to have importance in improving 'less favourable' attitude of farmers into 'moderately favourable' level whereas 'age', 'gender', 'extent of farming integration' and 'training' with odds ratios of 47.2, 7.14, 32.43 and 43.01 per cent respectively were found to have probability in improving the farmers attitude from 'moderate' to high.

4.10. Demand side and supply side constraints in implementing the ban on chemical pesticides and promotion of organic cultivation

Since the decision to ban chemical pesticides in agriculture was implemented in Kasaragod district with rigour, farmers as well as extension agencies had faced several constraints. It was widely reported that this decision which was taken in the wake of the public protests on the alleged impact of the aerial spray of endosulfan could not be implemented effectively due to several reasons.

Relative importance of the constraints faced by farmers at the time of implementing the ban was analysed based on the importance assigned to each of the different constraints reported from across the district by different stakeholders. Relative importance of constraints perceived by farmers is given in Table 53.

Table 53. Relative importance of constraints faced by farmers in implementing the ban on chemical pesticides

Sl. No.	Constraints	Score	Rank
1	Poor quality of the available organic inputs	245	I
2	Lack of availability of alternative organic pesticides to replace inorganic pesticides	239	II
3	Unavailability of organic inputs in time	224	III
4	High incidence of pest, disease and weeds	213	IV
5	High cost of production	203	V
6	Lower yield	200	VI
7	Lack of institutional support	188	VII
8	Shortage of labour	184	VII
9	Decrease in yield or income	173	IX
10	Higher risks in production	165	X
11	Required more quantity of organic inputs	154	XI
12	Low market price	153	XII
13	High cost of organic inputs	145	XIII
14	Lack of training	120	XIV
15	Lack of awareness	118	XV

It is evident that poor quality of the available organic inputs is the most important constraint faced by farmers due to the ban on chemical pesticides. Unavailability of effective alternative organic pesticides to replace inorganic pesticides, lack of availability of organic inputs in time, high incidence of pest, disease and weeds were ranked II, III and IV respectively. High cost of production, lower yield, lack of institutional support, labour shortage, low market price *etc.*, were also listed as constraints in the order of importance.

Exploring these constraints and the reasons thereof further, it could be seen that organic inputs with dubious origins and quality had dominated the market. The organic input market had lot of products from unauthentic agencies with ambiguous constitution and were used indiscriminately. The nutrient contribution

and utilities claimed by these producers were far below approved standards and expectations. This not only drained money from farmers, but also failed the intention of the ban. Adulteration of organic inputs was rampant.

However, farmers who possessed livestock did not have to face this problem. But for those who purchased it from external sources, the poor quality of products was a big problem. The immediate ban on chemicals had led to unavailability of effective alternate organic pesticides particularly at the time of high incidence of pest and diseases. Except a very few prophylactic organic control measures, others were not reportedly effective in the face of an intensive infestation of pests and diseases.

Unavailability of organic inputs in time was another major constraint faced by the farmers. Inspite of the several training and awareness programmes, the importance of making essential organic inputs available during vital agricultural operations in various seasons, had not been emphasised. Even while authorities tried to procure and distribute organic inputs, adequate quantity was not available in time. Even though some farmer groups organised by local self government tried to supply organic inputs, the real need of the farmer could not be met within stipulated time.

It was reported that after conversion to organic farming, there had been high incidence of pest and diseases because there were no effective ways to control pests, diseases as well as weeds. It was very well understood from the responses of the farmers that many of the farmers were struggling with pest and diseases which are shown below (Table 54.)

Table 54. Major pests reported in Kasaragod District, and organic and inorganic remedies found to be effective in different crops

Pest/Disease	No. of farmers affected (%)	Remedies (n=30)			
		Organic		Inorganic	
		N	%	N	%
Rice (pest)					
Rice stem borer	33.3(10)	2	6.6	3	10
Leaf roller	20(6)	4	13.3	0	0
Rice bug	26.6(8)	1	3.3	3	10
Banana(pest)					
Pseudostem weevil	93.3(28)	10	33.3	1	3.3

Pest/Disease	No. of farmers affected (%)	Remedies (n=30)			
		Organic		Inorganic	
		N	%	N	%
Coconut(Diseases/pest)					
Rhinoceros beetle	13.3(4)	2	6.6	0	0
Red palm weevil	6.66(2)	0	0	0	0
Eryophid mite	26.6(8)	0	0	0	0
Disease					
Stem bleeding	96.6(29)	13	43.3	0	0
Bud rot	3.3(1)	6	20	4	13.3
Leaf rot	66.6(20)	0	0	0	0

In rice, pest attack was observed to be the major problem and it was found that major pest reported widely was 'stem borer' followed by 'rice bug' and 'leaf roller'. Among 30 paddy farmers, 33.3 per cent was facing the problem of high incidence of stem borer. It is understood that only 6.6 per cent was using organic methods to control these pest, while 10 per cent of the farmers were opting inorganic methods to control it. This clearly showed that the remaining 25 per cent had not adopted any method to control stem borer. While 13.3 per cent farmers were using organic methods to control leaf roller, only 3.3 per cent of the farmers were using organic methods for controlling rice bug. It was observed that farmers were still purchasing and using Karate 5EC and Ballista from Mangalore (Karnataka) against rice stem borer.

In banana, infestation of pseudostem weevil was the main problem reported. It was observed that among 30 farmers, 93.3 per cent were severely affected by the attack of pseudostem weevil. In coconut the disease widely reported was 'stem bleeding'. Almost 96.6 per cent of coconut farmers had reported stem bleeding in Kasaragod district. Out of this only 43.3 per cent had adopted organic methods while 56.6 per cent was not found to adopt any method to overcome this problem.

Correspondingly, leaf rot and bud rot were reported widely from different regions of the district while 20 per cent were found to adopt organic methods, 13.3 per cent adopted inorganic ways to control bud rot. Based on the response of the farmers from Kasaragod district, it was understood that none of the farmers were using any organic method to control leaf rot which had affected 66.6 per cent of the farmers.

Lack of awareness and training secured the least ranks because institutions like Krishibhavans had already conducted regular training and awareness programmes on organic farming.

4.10.1. Relative importance of supply side constraints faced by extension personnel in implementing the ban on chemical pesticides

Similar to the analysis of demand side constraints of farmers, relative importance of the major supply side constraints in implementing the ban on chemical pesticides were also ranked in the order of importance assigned to each by the extension personnel(see Table 55).

Table 55. Supply side constraints faced by extension personnel in implementing the ban on chemical pesticides and promoting organic agriculture

Sl. No	Constraints	Score	Rank
1	Effective alternative organic pesticide to replace inorganic is not yet available	117	I
2	High incidence of pest, disease and weeds	112	II
3	Unavailability of organic inputs in time	105	III
4	Poor quality of the available organic inputs	98	IV
5	Unavailability of organic fertilizers/pesticides in market	95	V
6	Higher production risk	88	VI
7	Lack of credit support	85	VII
8	Lower yield	84	VIII
9	High cost of organic inputs	75	IX
10	High cost of production	74	X
11	Low market price	65	XI
12	Insufficient funds	51	XII
13	Lack of awareness and training	48	XIII

List of supply side constraints perceived by extension personnel and the corresponding ranks assigned to each showed that lack of effective alternative organic pesticides to replace inorganic materials was perceived to be the major constraint. High incidence of pests and diseases was reported as the next major issue. As for the extension personnel, it was their duty to transfer the technology and provide advisory to farmers. Absence of effective plant protection control measures in organic practices would affect the trust worthiness and fidelity of extension personnel as solution providers. 'Lack of supply of organic inputs in time' was assigned III rank. Poor quality of the available organic inputs in market,

higher risk, low market price *etc.*, were ranked in the order of importance subsequently. Lack of awareness and training were assigned least ranks because of their conviction that adequate training programmes had already been conducted in connection with the ban of chemical pesticides.

It was reported that after implementing the ban of chemical pesticides, extension officials were not in a position to confidently propose effective organic method to control field problems within a specified time. Even though the ban was in vogue, in certain emergency situations extension officials continued to recommend inorganic pesticides. It was also observed that higher pest and disease incidences were noticed after the ban. Again, supply of organic inputs through Krishibhavans, which was a major function of the department, was severely constrained by shortage of inputs. Extension personnel were particularly concerned about this issue as they were responsible to the farming community for supply of inputs to farmers.

4.10.2. Comparison of organic and inorganic farmers following organic and inorganic methods based on perception, adoption and attitude levels

Farmers who followed organic and inorganic methods in rice, banana and coconut were compared on the basis of their perception, adoption and attitude levels using independent sample't' test (See Table 56).

Table 56. Comparison between 'organic' and 'inorganic' farmers based on perception, adoption and attitude levels

Particulars	Mean		't' value	Sig.
	Organic farmers (n=42)	Inorganic farmers (n=48)		
Adoption	57.20	59.5	.862	.391
Perception on ban	36.667	33.87	1.67	0.97
Perception on sustainability	57.1429	55.37	1.73	0.86
Attitude	53.9286	51.81	1.29	1.98

To compare the adoption, perception on ban on chemical pesticides, perception on sustainability and attitude between organic and inorganic farmers, independent sample ' t ' test was employed. The result revealed that there had been no significant difference between 'organic' and 'inorganic' farmers in terms

of their adoption, perception and attitude. This indicated that the awareness building programmes to convince farmers of the positive outcomes of organic farming had not been effective. This also showed that the farming community needs to be convinced further, for converting agriculture in Kasaragod into fully organic.

SUMMARY

CHAPTER V
SUMMARY

The increasing concerns on environmental pollution resulting from over use of pesticides and health issues thereof have evoked great interest in organic agriculture worldwide. Following the widely reported issues of 'endosulfan' victims in Kasaragod, the Government of Kerala has banned the use of chemical inputs for plant protection in the district as a pilot initiative. This also forms part of the state policy which envisages phased conversion of entire agriculture in the state to organic practices in 10 years.

However, the pilot project in Kasaragod has evoked mixed response from stakeholders. While activists and a section of farmers support the ban on pesticides and conversion to organic agriculture, functional difficulties involved in forced transition are concerns for many. For instance, access to chemical inputs from neighbouring state is pointed out as a major issue. There had also been reports that several small and marginal farmers are turning away from agriculture due to losses caused by uncontrolled pests and diseases.

This necessitates a detailed assessment of the effectiveness of the alternate means for crop management and institutional framework suggested for implementing the policy. Experiences from the pilot project could suggest the gaps in research, extension and other support mechanisms including credit and market to facilitate enhancement of production and profit in the evolving system of organic agriculture. The present study entitled "Transition to organic agriculture in Kasaragod District: A multi dimensional analysis" with the objectives laid down, would help formulate an indicative programme for scaling up the pilot project and revisit the organic policy of the state.

- To characterise the process of transition to organic agriculture in Kasaragod District
- To find out the nature and extent of institutional support available for this transition.

- Perception of major stakeholders regarding the effectiveness of various interventions involved in the process
- Impact of the ban on major stakeholders
- Functional constraints in banning chemical inputs

The sample included 90 farmers (30 farmers each of three major crops *viz.* Coconut, Banana and Rice) and 40 Extension Personnel (Agricultural Assistants, Agricultural Officers, ADAs, PAO). Farmers were selected by means of multistage random sampling method. One grama Pachayath each was randomly selected from all the six blocks in the district. Five farmers each from the exclusive lists of farmers cultivating the three crops mentioned above were selected to make a sample of 90 respondents. The grama panchayaths selected were Nileshwar, Pullur Periya, Kodom Belur, Chemmanadu, Mangalpady and Karadka.

The independent variables taken for the study included, age, gender, education, experience in farming, experience in organic farming, annual income, farm size, extent of farming integration, exposure to training, contact with extension agency, social participation, availability of organic inputs and availed institutional support whereas perception of farmers on advantages of ban of chemical inputs, perception on various dimensions of sustainability of organic agriculture, extend of adoption of organic practices and the attitude of respondents towards implementation of ban on chemical inputs were taken as the dependent variable.

5.1 Salient findings

5.1.1 Context of imposing ban on chemical pesticides and introducing organic agriculture in Kasaragod District

It was in response to the widely reported issues of 'endosulfan' victims in Kasaragod, and the conclusions of several enquiry reports, the Government of Kerala has banned the use of chemical pesticides for plant protection in the district as a pilot initiative. The decision to declare the district as 'organic' is the

culmination of a series of about 31 major events from 1979-80 to 2013. An analysis of the timeline shows that the issue was kept alive by activists and the agencies who had relied on reports that established a cause-effect relationship between pesticide spray and incidence of various diseases in the district. It could be assumed that the government chose to ban chemical pesticides with the intention of protecting a greater common interest, even while the studies remained inconclusive in establishing the relationship between endosulfan and incidence of diseases.

5.1.2 The course of transition to organic agriculture in Kasaragod District

As per the recommendations of the committees on the endosulfan issue, Kasaragod was declared as organic district in 2012. Thereafter, the Department of Agriculture has adopted several measures to implement the project during the period from 2012-13 to 2016-17. Special scheme for organic farming was implemented in the district with the objectives of making farming sustainable, enhancing soil fertility, establishing model farms, creating of organic villages, avoiding the use of agrochemicals, cluster based farming and certifying organic produce. As directed by the government, Krishibhavans would implement the scheme with Agricultural Officers (AO) as implementing officers at the Pachayath level. Block level monitoring and supervision would be done by Assistant Director of Agriculture (ADA). Deputy Director and Principal Agricultural Officer would implement the programme at the district level. This was followed by several other orders in which additional components were also added up in subsequent years. In 2015-16, scheme with the objective of 'organic farming and safe to eat food production' has been introduced. In 2016-17, the programme emphasises 'good agricultural practices and 'safe to eat' food production instead of organic agriculture. A detailed review on the programmes implemented from 2012-13 till 2016-17 indicated that there has been no uniformity in these programmes as there were shifts in emphases during this period.

5.1.3 Perception of respondents on ban on chemical pesticides

- Majority of the farmers (67.8%) had unfavourable perception towards ban on chemical pesticides whereas 32.2 per cent of the farmers had favourable perception on ban on chemical pesticide
- Majority (75%) of the extension personnel had unfavourable perception and 25 per cent had favourable perception on ban of chemical pesticides
- No significant difference in perception was observed among farmer groups cultivating rice, coconut and banana

5.1.4 Perception of respondents on various dimensions of sustainability of organic agriculture

- While majority of the farmers (96.7%) had favourable perception on sustainability of organic farming practices, merely 3.3 per cent had unfavourable perception towards sustainability of organic farming practices
- Majority (77.5 %) of the extension personnel had favourable perception and 22.5 per cent of extension personnel had unfavourable perception on sustainability of organic farming practices
- While majority (75.5%) of the farmers showed medium level of perception on the economic dimensions of organic farming, 21.1 per cent and 3.3 per cent had high and low levels of perception
- With regard to environmental dimension, majority (51.1%) had high level perception while 41.1 per cent had medium level and 7.7 per cent had low level perception
- In case of social dimension, majority (57.7%) belonged to medium level whereas 33.3 per cent and 8.8 per cent were found to have high and low level perception respectively
- Farmers cultivating rice, coconut and banana showed difference among themselves in their perceptions on sustainability

5.1.5 Impact of the ban on livelihood options of farmers

- For paddy, annual mean cost of production per acre has increased by 8.4 per cent after conversion to organic farming. The mean yield and annual income from rice have significantly reduced by 21 per cent after adopting organic methods of production
- For banana no significant difference could be observed in the cost of production after the adoption of organic farming whereas the mean yield and annual income have reduced by 26.4 per cent after conversion to organic agriculture
- In coconut, the annual mean costs per palm was found to have increased on being converted to organic farming, whereas the mean yield of coconut was found to be reduced, after conversion to organic agriculture. However, the change in yield (1.09 %) was not statistically significant which implies that yield was not severely affected as a result of conversion

5.1.6 Nature and extent of adoption of organic farming practices by farmers

- Majority of the respondents (56.6 %) showed low level of adoption of organic farming practices whereas farmers who had high and medium level of adoption were in the proportion of 38.8 per cent and 4.4 per cent respectively
- Cultural practices in organic mode were found to be highly adopted by farmers, out of which mulching was carried out by 98.9 per cent of the farmers
- While *insitu* manuring was found to have been adopted by majority (96.7%), *exsitu* organic manuring like application of farm yard manure (FYM) was found to have high adoption rates (97.8%) followed by poultry manure(48.9%), oil cakes(41.1%), vermi/rural compost(34.4%) and biofertilizers (2.2%)
- Hand weeding or mechanical weeding was found to be done by majority (100%) of the farmers whereas use of light/pheromone traps were followed by only 14.4 per cent

- Biological method for controlling pests, diseases or weeds was found to have low adoption rates as compared to other methods
- Cow dung slurry spray was followed by 70 per cent of the farmers whereas usage of botanicals for plant protection found to have 43.3 per cent followed by seed treatment of bio-fertilizers (21.1%) and conservation of natural enemies (8.9%) respectively
- No significant difference exists among rice, coconut and banana famers with regard to adoption of organic practices

5.1.7 Attitude on implementation of organic farming in the district

- Majority of the farmers (70 %) had moderately favourable attitude whereas farmers with very favourable and less favourable attitude constitute 23.3 per cent and 6.66 per cent of the sample respectively
- Majority (60%) of the extension personnel had moderately favourable attitude towards organic farming practices. Extension personnel who had highly favourable and less favourable attitude were in the proportion of 10 per cent and 30 per cent respectively
- No difference was found to exist among the rice, coconut and vegetable farmers with respect to attitude towards organic practices

5.1.8 Nature of institutional support extended to farmers

- Majority (88.8%) of the farmers were not found to receive any kind of subsidy for the conversion to organic farming
- Farmers who attended training on organic agriculture formed 51.1 per cent and farmers who have not participated in training activities constituted 48.4 per cent
- With regard to private support, 95.5 per cent of the farmers had not received any kind of support from private agencies
- Majority of the farmers (95.5.5%) had not received any kind of marketing support for the transition to organic agriculture and adjust with the ban on chemicals

- Financial assistance provided by the GoK during 2012-13 to 2016-17 under the scheme organic farming showed that there had been no uniformity in these programmes as there had been shifts in emphases during this period

5.1.9 Profile of respondents

- It was found that 80 per cent of the respondents were aged followed by 17.7 per cent in the middle age category and 2.2 per cent were young. For extension personnel, 52.5 per cent were middle aged
- About 72.2 per cent belonged to male category whereas female constituted only 27.7 per cent. In the case of extension personnel, 52.5 per cent were males and 47.5 per cent were females
- Segregation of farmers and extension personnel based on education showed that 37.7 per cent of the farmers had high school education. In the case of extension personnel, 47.5 per cent were found to be graduates, 40 per cent had VHSE qualification and 12.5 per cent had post graduation and above
- About 63.3 per cent of farmers were having farming experience for more than 20 years, 23.3 per cent had experience of 10-20 years and 13.3 per cent had less than 10 years of experience. Extension personnel with an occupational experience of less than 5 years constituted majority (63.3 %) followed by 30 per cent having 5-10 years of experience and 22.5 per cent having an experience of more than 20 years
- Majority 54.4 per cent were not found to have any previous experience in organic farming whereas 18.8 per cent had experience of less than 5 years followed by 17.7 per cent (5-10 years) and 8.89 with more than 10 years of experience respectively
- Majority of the respondents belonged to middle income category (56.6%), whereas 33.3 per cent in high income category and 10 per cent in low income category
- About 66.6 per cent of the farmers belonged to the category of marginal

farmers with an area less than 1 ha, 22.2 per cent possessed 1-2 ha land and 5.5 per cent belonged to the semi medium and medium category

- While livestock combined with poultry was found to be present in 36.6 per cent of farms, 18.8 per cent had livestock alone. Poultry alone was found to be owned by 15.5 per cent of the farmers. Total integration with livestock and poultry and pisciculture was found to be owned by 1.1 per cent
- About 60 per cent had frequent contact with extension agencies whereas 32.2 per cent had contacted extension agencies only rarely. It was also found that 7.77 per cent had no contact with any extension agencies
- Majority (92.2%) had attended less than 8 training programmes whereas 5.5 per cent had participated in more than 8 training programmes and 2.2 per cent had not participated in any of the training programmes
- About 55.5 per cent had participated in activities conducted by the social organisations whereas 44.4 per cent was not found to have association with any social organisation
- About 66.6 per cent of farmers reported medium availability of organic inputs whereas 18.8 per cent had experienced high availability and 14.4 per cent had not availed organic inputs substantially
- Based on institutional support availed, about 41.1 per cent was reported to have availed medium support from institutions, and 30 per cent had low and 28.8 per cent had high levels of support

5.1.10 Factors affecting adoption, perception and attitude of farmers in Kasaragod District

- It was found that among the selected variables *viz,*age, experience in farming, experience in organic farming, number of training programmes attended, social participation and availability of organic inputs were found to have significant relation with adoption of organic practices by farmers in Kasaragod District

- Contact with extension agency was found to have significant and negative correlation with perception on ban on chemical inputs
- Age, and experience in organic farming were observed to have significant and positive correlation with perception on various dimensions of sustainability of organic agriculture
- Availability of the organic inputs was found to be the only factor responsible for the attitude of farmers towards organic agriculture
- Experience of the extension personnel had significant and positive correlation with perception on ban of chemical pesticides
- Education and designation of extension personnel had significant and negative correlation with perception on sustainability of organic agriculture
- Education and designation were the major factors influencing the attitude of extension personnel between which significant negative correlation was observed
- Experience in organic farming and attitude of the farmers were the major factors that were found to transform various adoption levels in farmers with respect to explanatory variables. Contact with extension agency and availability of organic inputs were the factors that transformed medium level of adoption to high level
- Contact with extension agency played significant role in transforming unfavourable perception to favourable perception on ban on chemical inputs
- Experience in organic farming and attitude of the farmers were the major factors that were found to transform various adoption levels in farmers with respect to explanatory variables
- Various attitude levels of farmers were found to change from less favourable to medium favourable by the influence of the variable 'availability of organic inputs'. Transformation from medium category to to 'very favourable' could be attributed to 'extent of farming integration' and 'exposure to training'

5.1.11 Demand side and supply side constraints in implementing the ban on chemical pesticides and promotion of organic cultivation

- Poor quality of available organic inputs, lack of availability of alternative organic pesticides to replace inorganic pesticides, unavailability of organic inputs in time, high incidence of pest, disease and weeds, high cost of production, were found to be major constraints associated with farmers in which lack of training and awareness form the least
- In rice major pest that is widely reported is rice stem borer(33.3%), for which 10 per cent of the farmers were using inorganic methods of control and only 6.6 per cent were found to adopt organic methods of control
- In banana, attack of pseudostem weevil has been widely reported for which 33.3 per cent were using organic methods and only 3.3 per cent were using inorganic methods of control
- In coconut, stem bleeding was found to be the most common disease followed by bud rot and leaf rot
- Lack of effective alternative organic pesticide to replace inorganic pesticide, high incidence of pest, disease and weeds, unavailability of organic inputs in time, poor quality of the available organic inputs etc., were the major constraints mentioned by the extension personnel
- Farmers practicing organic methods of production and those using inorganic ways for production were not found to significantly differ between each other based on adoption, perception and attitude

5.1.12. Recommendations

- Decrease in production during the period of transition to organic agriculture will have to be compensated monetarily
- The prospects of getting premium prices for organic products should be explored
- The process of conversion to organic farming should be assisted by massive awareness and capacity building programmes
- Research and extension systems should be equipped with effective

alternative strategies to address calamities like severe infestations, nutrient deficiency, fall in prices etc.

5.1.13. Future line of research

The future line of research in this domain shall focus on the following issues:

- Studies on the feasibility of imposing ban on chemical inputs shall be conducted in various agro climatic regions and production systems across the state
- Precise analysis of the economic implication of ban on chemical inputs shall be attempted by including different types of farmers and other stakeholders
- The extension strategies required to foster organic agriculture shall be worked out
- The institutional mechanisms for promoting organic agriculture shall be closely examined by drawing experiences from across the world

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APPENDICES

APPENDIX - I

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
VELLANIKKARA

DEPARTMENT OF AGRICULTURAL EXTENSION
SCHEDULE FOR DATA COLLECTION

Transition to Organic Agriculture in Kasaragod District: A Multi dimensional Analysis

Serial No: Date:

1. Name of the farmer:
2. Address with Phone No.:
3. Age of the respondent:
4. Gender(*Male/Female*):
5. Education:*(Illiterate/can read and write/ primary education/ high school education/Predegree /Degree*)
6. Farming experience (No. of years): Experience in organic farming:
7. Farm size:

Type of land	**Owned (Acres)**	**Leased in(Acres)**	**Leased out(Acres)**
Garden land			
Wet land			
Total			

8. Annual income:

Sl. No.	**Sources of income**	**Annual individual income (In Rs.)**	**Annual family income (In Rs.)**
1	Agriculture		
2	Other sources (*Specify)*		
3.			
4.			
	Total		

9. Cropping pattern:

Sl No	**Crops cultivated**	**Varieties**	**Area (Acre)**	**Production**	**Productivity**	**Season**
1.	Seasonal crops *(specify)*					
a)						

b						
c)						
2.	Perennial crops (*specify*)					
a)						
b)						
c)						

10. Soil characteristics

1. Type of soil: *Laterite soil/red/river alluvium/clay/clay loam/sandy loam/any other (specify)*
2. Reaction: *Acidic/ Alkaline/ Neutral*
3. Topography: *Plain/ sloppy/ undulated*
4. Whether Soil Health Card is available or not: *Available/ not available*
5. Whether soil testing has been done or not: *Soil testing done / not done*

11. Animal husbandry components:

Sl No	**Components**	**Numbers**
1	Cow	
2	Goat	
3	Poultry	
4	Others(specify)	

12. Have you found any difference in the annual cost, yield and income after converting to organic farming? *If yes, specify.*

Sl. No.	**Crops**	**Cost(Rs./acre)**		**Yield (Kg./acre)**		**Income(Rs./acre)**	
		Before	After	Before	After	Before	After
1	Rice						
2	Banana						
3	Coconut						

13. Details of intercultural operations performed in crops and its cost of cultivation

Sl. No.	**Crops**	**Intercultural operations**		**Cost of cultivation (Per acre)**	
		Before	**After**	**Before**	**After**
Crop	**Paddy**				
1	Land preparation				
2	Seed and sowing				

3	Fertilizer application				
4	Plant protection				
5	Liming				
6	Weeding				
7	Rental value of own land				
8	Interest on working capital				
9	Miscellaneous				
Crop	**Coconut**				
1	Human labour				
2	Materials for fencing, shading and mulching				
3	Seedlings				
4	Fertilizer				
5	Plant protection chemicals				
6	Harvesting charges				
7	Tools and implements				
8	Land tax				
9	Miscellaneous				
Crop	**Banana**				
1	Preparation of land				
2	Planting				
3	Manures and fertilizers				
4	Irrigation				
5	Weeding				
6	Plant protection				
7	Supporting				
8	Harvesting				

14) Availability of organic inputs

1. List out the organic and inorganic fertilizers used with its source and price.

Sl. No.	Crops	Organic manures	Source		Price (Rs.)	Inorganic fertilizers	Price (Rs.)
			Owned	Purchased			
1	**Paddy**						
2	**Coconut**						
3	**Banana**						

2. Whether your soil is acidic. *(Yes / No).* If so, what are the soil amendments added?

Sl. No.	Crops	Soil amendments	Quantity/annual	Price/annual
1.	Paddy			
2.	Coconut			
3.	Banana			

3. Give the details of pest and disease incidence in your field? What control measure do you adopt for the eradication of pest/ disease incidence?

I) Pest incidence

Sl. No.	Crops	Pest	Control measure, quantity applied, source and price							
			Organic	Qty applied	Source	Price	Inorganic	Qty applied	Source own/external	Price
1.	Paddy									
2.	Coconut									
3.	Banana									

ii) Disease incidence

Sl. No	Crops	Disease	Control measure, quantity applied, source and price							
			Organic	Qty applied	Source	Price	Inorganic	Qty applied	Source own/external	Price
1.	Paddy									
2.	Coconut									
3.	Banana									

4. Do you get sufficient labour to carryout farming operations? *Yes/No*

Sl No	Crop	No. of labourers	Activities	Wages
1	Paddy			
2	Coconut			
3	Banana			

15) Infrastructure

1. Do you have any waste management unit in your farm?

Sl No	Assets	Numbers
1	Waste management units(Urban/Rural)	
2	Waste collection mechanism	
3	Recycling mechanism	

2. Do you have enough storage facilities available for stocking the produce? *Yes/No*

16). Credit

1. Have you availed any credit support for organic cultivation? *If so, specify*

Sl. No.	Crops	Purpose for which credit is availed (Specify the stage of initiation of organic farming)	Amount	Credit criteria (related to the scheme)	Source of credit
1	Paddy				
2	Coconut				
3	Banana				

17). Extension

1. Do you get proper awareness regarding organic agriculture? *Yes/No*

Sl. No.	Ways by which you became aware of organic farming techniques	Institution providing
1	Trainings	
2	Exposure visits	
3	Demonstration plots	
4	Seminars	
5	Exhibitions	
6	Cinema/television	
7	Social media	
8	Radio	
9	Magazines	
10	Newspaper or any others specify	

2. Have you participated in any kind of training programmes on organic agriculture? *If so, specify*

Sl. No.	Crops	Items for which training is obtained	No. of trainings attended
1	Paddy		
2	Coconut		
3	Banana		

3. Do you wish to get any additional training on specific subjects related to organic farming? (*Yes/No). If yes, specify*

Sl No	Article/crop	Theme

4. What is your opinion on the trainings obtained? *Very good/Good/Neutral/ Bad/ Very bad*

5. Do you have enough contact with extension agent? *Often /rarely/ no contact. If no, specify the reasons*

6. Does the extension agent provide adequate knowledge on organic farming? *If yes, specify*

Sl. No.	Extension agent	Ways through which knowledge is provided
1	Agricultural officer	
2	Agricultural Assistants	
3	Others	

7. Are you a member of any cluster? *If so specify*

Sl. No.	Name of cluster	Crops cultivated	Nature of support	Assistance

8. Are you a member of any organisation? *Yes/No*. What is the number of years since you have joined that organisation?

18). Marketing

1. Whether the organic products are getting premium price? *Yes/No*

2. Is there any organic produce procurement and selling centre (Ecoshops) in your panchayat? *If yes, specify no.*

3. State whether the ecoshop provided by the government is working properly or not. *If no, specify the reasons?*

4. Do you get fair prices in selling through eco shops? *Yes/No*

5. What are the organic products sold by you through the ecoshops?

6. What is the premium price you obtained while selling the organic products in ecoshops?

Sl No	Articles sold	Price in ecoshops	Price in markets

7. Periodicity of working of eco shops? *Daily, Weekly, twice a week, thrice a week*

8. Do you get organic certification? *Yes /No*

a) If yes specify the agency and the method, *if no, specify the reason*

Sl. No.	Cluster/individual	Agency	Method (ICS/PGS)

9. Do you get enough transportation facilities for marketing the organic products? *Specify the cost?*

Sl. No.	Crops	Cost for transportation

10. Any private/ other agencies supported you for doing organic farming? *If any, specify.*

Sl. No.	Crops	Agencies	Types of support

2. What all are the support provided by the Government?

Sl. No.	Types of support	Qty/Value

3. Problems found in organic farming? *Specify the area.*

Sl. No.	Problems found	Suggestions to improve

19). Perception of respondents on ban of chemical inputs

Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), Strongly Disagree (SDA)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	It is necessary to ban red and yellow labelled hazardous chemical inputs.					
2	It is necessary to ban all plant protection chemicals as a whole					
3	Yield can be sustained only with plant protection chemicals					
4	Plant protection chemicals are found to be very effective in controlling pest/disease/weed comparing to organic ways of control					
5	Chemical inputs are available at a faster rate than organic inputs					
6	Scientific application of plant protection chemicals will not harm environment as well as health of the people.					
7	If a pest /disease outbreak happens, we have to depend on neighbouring states for plant protection chemicals					
8	Ban on chemical inputs is not a permanent solution to sustainability. Govt should provide adequate quantity of organic inputs in time					
9	Ban on chemical inputs is not suited to Kerala situation					
10	Ban on chemical inputs discouraged the farmers from agriculture					
11	It is not possible to cultivate crop commercially without plant protection chemicals					
12	Cost of production will be higher when plant protection chemicals are banned					
13	Ban on chemical inputs will improve the health as well as environment status					

20). Perception of respondents on various dimensions of the sustainability of the organic agriculture

Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), Strongly Disagree (SDA)

i. Is organic agriculture economically viable?

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Market premium is obtained for the organic products					
2	Yield will be low in organic farming. Hence leading to food security					
3	Requires more number of labour, hence labour availability and high wage rate is a problem.					
4	Cost of production is high in organic farming					
5	Certification cost is not affordable by a small scale farmer					

ii. Is organic agriculture environmentally sound?

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Organic agriculture improves water and air quality by minimising the use of chemical inputs					
2	Sustainability in agriculture can be obtained through organic agriculture					
3	Soil flora, fauna, soil structure, soil health, etc. can be improved by organic farming					
4	Quality organic products can be achieved through organic farming that will improve the health status					
5	Organic agriculture reduces non renewable energy use by decreasing agrochemical needs					
6	Organic agriculture contributes to mitigating the green house effect and global warming through its ability to sequester carbon in the soil					
7	Organic farming is ecofriendly					

iii. Is organic agriculture socially acceptable?

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Organic products are safe to eat and taste better than inorganic products					
2	Organic products have better nutritional quality than inorganic products which will improve the					

	health status					
3	Cost of production is higher in organic farming					
4	Organic farming requires more manual works, hence provide employment opportunity to rural poor					
5	Subsidies are available for organic farming which will attract more farmers as well as youth in converting to organic farming					

21. Attitude of farmers towards organic farming practices

Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (DA), Strongly Disagree (SDA)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Organic farming improves soil fertility status of the soil					
2	It is worthful to adopt organic farming practices even by borrowing money					
3	Use of organic farming practices is only a waste of money and time					
4	The way our forefathers cultivated seems to be good					
5	Adoption of organic farming practices is practically not feasible					
6	It is possible to get good yield by adopting organic farming practices					
7	It is not profitable to adopt organic farming practices in crops like rice ,banana cultivation *etc.*					
8	Organic farming practices should be practiced by all farmers					
9	Adoption of organic farming practices is highly risky and hence it is not advisable to follow the same					
10	It is better to give more importance to other occupation than following organic farming practices					
11	Use of organic farming practices is essential for better quality of products					
12	It is not correct to support organic farming practices					
13	It is possible to solve our environmental problems through organic farming					
14	Organic farming practices have no advantages over conventional practices					

22. Nature and extent of adoption of organic farming practices for different crops

Put a (✓) in the respective column

Sl. No.	Practice	Have you adopted		
		Adopted	Partially adopted	Not adopted
I	**Cultural methods**			
1	Summer ploughing			
2	Selection of good seeds, sucker, mother palm			
3	Resistant variety			
4	Timely irrigation			
5	Crop rotation			
6	Intercropping system			
7	Mulching/incorporation of stubbles			
II	**Insitu manuring**			
1	Insitu incorporation of crop residues			
2	Raising green manure and incorporation			
III	**Exsitu manuring**			
1	Application of FYM			
2	Application of vermicompost/compost			
3	Application of poultry manure			
4	Application of oil cakes			
5	Green leaf manures			
6	Application of biofertilizers			
7	Ash/cowdung slurry			
8	*Panchagavya and Jeevamrutham*			
9	Coir pith compost			
IV	**Physical/mechanical methods**			
1	Hand/mechanical weeding			
2	Collection and destruction of pests(egg, larvae and pupae)and disease affected plants			
3	Use of light traps/pseudostem traps/pheromone traps			
V	**Biological methods**			
1	Field sanitation			
2	Sucker treatment with biofertilizers			
3	Rhizome treatment with cowdung and ash			
4	Use of sand,clay or tar			
5	Seed treatment with biofertilizers			
6	Bordeaux mixture			
7	Use of biocontrol agents			
8	Use of botanical pesticides			
9	Conservation of natural enemies			

23). Constraints in implementing the ban on chemical pesticides

Put a (✓) in the respective column (Very important (VI), Important (I) and Less Important (LI))

Sl. No.	Statements	VI	I	LI
1	High incidence of pest, disease and weeds			
2	Lower yield			
3	High cost of organic inputs			
4	Higher production risk			
5	Labour shortage and high labour wage			
6	Unavailability of effective alternative organic pesticide			
7	Availability of organic inputs in time			
8	Poor quality of the available organic inputs			
9	Lack of institutional support			
10	High cost of production			
11	Required more quantity of organic inputs			
12	Organic farming has decreased the families' income			
13	Low market price			
14	Lack of awareness			
15	Lack of training			

APPENDIX - II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
VELLANIKKARA
DEPARTMENT OF AGRICULTURAL EXTENSION
SCHEDULE FOR DATA COLLECTION

Transition to Organic Agriculture in Kasaragod District: A Multi dimensional Analysis

Serial No: Date:

1. Name of the respondent *(Optional)*:
2. Age of the respondent:
3. Gender *(Male/Female)*:
4. Education *(VHSE, degree, post graduate, doctoral degree)*:
5. Occupation/designation:
6. Experience:
7. Attitude of major stakeholders regarding the implementation of organic farming practices. (Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree, Strongly Disagree)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Organic farming is the best solution for sustainability					
2	Organic farming leads to food security					
3	Adequate organic inputs should be provided at right time					
4	The Way in which organic farming scheme implemented is not appropriate					
5	Organic farming policy should be revisited and modified					
6	More input support/subsidies should be provided by the government					
7	Infrastructure facilities for the transition should be provided					
8	Kasaragod district has became fully organic					
9	Chemical recommendations are also provided if needed					
10	Chemical pesticides/fertilizers are available in the district					
11	Farmers are using chemical pesticides/fungicides during pest/disease outbreak					
12	Trainings and other extension activities undertaken by the krishibhavan was very effective and are able to create awareness among farmers and other people.					
13	Credit support during transition period should be given more emphasis					
14	Organic certification procedures should be made easier and affordable					
15	Ecoshops working in the panchayath is able to provide premium price for the organic products					
16	Adequate marketing facilities should be required more in order to support the farmers					

8. Perception of extension personnel on ban on chemical inputs

Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree, Strongly Disagree)

Sl. No.	Statements	SA	A	UD	DA	SDA
1	It is necessary to ban red and yellow labelled hazardous chemical inputs.					
2	It is necessary to ban all plant protection chemicals as a whole					
3	Yield can be sustained with plant protection chemicals					
4	Plant protection chemicals are found to be very effective in controlling pest/disease/weed comparing to organic ways of control					
5	Chemical inputs are available at a faster rate than organic inputs					
6	Scientific application of plant protection chemicals will not harm environment as well as health of the people.					
7	If a pest /disease outbreak happens, we have to depend on neighbouring states for plant protection chemicals					
8	Ban on chemical inputs is not a permanent solution to sustainability. Govt should provide adequate quantity of organic inputs in time					
9	Ban on chemical inputs is not suited to Kerala situation					
10	Ban on chemical inputs discouraged the farmers from agriculture					
11	It is not possible to cultivate crop commercially without plant protection chemicals					
12	Cost of production will be higher when plant protection chemicals are banned					
13	Ban on chemical inputs will improve the health as well as environment status					

9. Perception of extension personnel on various dimensions of the sustainability of the organic agriculture. Put a (✓) in the respective column (Strongly Agree (SA), Agree (A), Undecided (UD), Disagree, Strongly Disagree)

i. Is organic agriculture economically viable?

Sl No	Statements	SA	A	UD	DA	SDA
1	Market premium is obtained for the organic products					
2	Yield will be low in organic farming. Hence leading to food security					
3	Requires more number of labour, hence labour availability and high wage rate is a problem.					
4	Cost of production is high in organic farming					
5	Certification cost is not affordable by a small scale farmer					

ii. Is organic agriculture environmentally sound?

Sl. No.	Statements	SA	A	UD	DA	SDA
1	Organic agriculture improves water and air quality by minimising the use of chemical inputs					
2	Sustainability in agriculture can be obtained through organic agriculture					
3	Soil flora, fauna, soil structure, soil health, etc. can be improved by organic farming					
4	Quality organic products can be achieved through organic farming that will improve the health status					
5	Organic agriculture reduces non renewable energy use by decreasing agrochemical needs					
6	Organic agriculture contributes to mitigating the green house effect and global warming through its ability to sequester carbon in the soil					
7	Organic farming is ecofriendly					

iii. Is organic agriculture socially acceptable?

Sl. No.	**Statements**	**SA**	**A**	**UD**	**DA**	**SDA**
1	Organic products are safe to eat and taste better than inorganic products					
2	Organic products have better nutritional quality than inorganic products which will improve the health status					
3	Cost of production is higher in organic farming					
4	Organic farming requires more manual works, hence provide employment opportunity to rural poor					
5	Subsidies are available for organic farming which will attract more farmers as well as youth in converting to organic farming					

8. Constraints faced in implementing the ban on chemical inputs.

Put a (✓) in the respective column (Very important (VI), Important (I) and Less Important (LI))

Sl. No.	Statements	VS	S	M	L	NIL
1	High incidence of pest, disease and weeds					
2	Lower yield					
3	High cost of organic inputs					
4	Higher production risk					
5	Unavailability of effective alternative organic pesticide					
6	Unavailability of organic inputs in time					
7	Poor quality of the available organic inputs					
8	Unavailability of organic inputs in market					
9	Lack of credit support					
10	High cost of production					
11	Low market price					
12	Insufficient funds					
13	Lack of awareness and training					

TRANSITION TO ORGANIC AGRICULTURE IN KASARAGOD DISTRICT: A MULTI DIMENSIONAL ANALYSIS

by

SEENU JOSEPH

(2014 - 11 - 143)

ABSTRACT OF THESIS

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MASTER OF SCIENCE IN AGRICULTURE

Faculty of Agriculture

Kerala Agricultural University

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF HORTICULTURE

VELLANIKKARA, THRISSUR-680 656

KERALA, INDIA

2016

ABSTRACT

Following the widely reported issues of 'endosulfan' victims in Kasaragod and in view of the increasing concerns on the impact of indiscriminate use of pesticides, the Government of Kerala has banned the use of chemical inputs for plant protection in Kasaragod district, as a pilot initiative and declared it as 'organic district' in 2012. While activists and a section of farmers supported the ban and conversion to organic agriculture, a considerable section of the farming community and extension personnel were apprehensive of the functional difficulties involved in conversion. The present study attempted to characterise the process of transition to organic agriculture in Kasaragod District and find out the nature and extent of institutional support available for this transition. The study also explored the perception of major stakeholders about organic farming, impact of the ban and the functional constraints.

The sample included 90 farmers drawn at the rate of 30 farmers each of three major crops *viz.* Coconut, Banana and Rice. Multistage random sampling method was employed to select farmers from the six panchayats which were selected from the six blocks in the district. The sample also included 40 extension personnel from the department of agriculture. Data were collected by using structured interview schedules, questionnaires and consultative discussions.

A historical review showed that organic policy of the state and the pilot project evolved from the recommendations of various committees and commissions that had examined the reports on congenital malformations and diseases reported widely from Kasaragod since 1979. A detailed analysis of the special programme on organic farming implemented by the Department of Agriculture from 2012-13 to 2016-17 indicated that the interventions to sustain the ban and promote organic agriculture had not been uniform. Moreover, majority of the farmers (67.8%) and extension personnel (75%) had unfavourable perception about the ban on chemical inputs. However, 96.7 per cent of farmers and 77.5 per cent of extension personnel were found to perceive the dimensions of sustainability of organic agriculture favourably.

While the costs of production of paddy and coconut were found to increase in organic methods, no significant increase was observed in banana. However, both paddy and banana were registered reduction in yield by 21 per cent and 26.4 per cent respectively, on adopting organic agriculture. No significant difference could be obtained in the yield of coconut after conversion. As much as 56.6 per cent of the farmers had low levels of adoption of organic practices. Mulching, incorporation of residues, application of FYM *etc.*, were found to be adopted invariably across different crops.

Institutional support was found to be inadequate as majority of the farmers (88.8%) had not availed institutional support in terms of subsidy for organic manure production. However, training programmes had been widely conducted in several places. Among the different socio economic and psychological variables, 'attitude' was found to have significant role in transforming adoption level from low to medium. 'Contact with extension agency' and 'availability of organic inputs' were found to transform adoption levels from medium to high. Poor quality of organic inputs, lack of availability of alternate plant protection materials, unavailability of organic inputs in time, high incidence of pest, disease and weeds, high cost of production and low market price were found to be the major constraints identified by farmers. For extension personnel, lack of effective alternative organic pesticide to replace inorganic pesticide, high incidence of pest, disease and weeds, unavailability of organic inputs in time, poor quality of the available organic inputs *etc.*, were the major constraints.

The constraints faced by the farming community calls for monetary compensation for the losses during the transition period, establishment of organic manure production units, adequate mechanisms for quality assurance of organic inputs, integration of various farming components, establishment of a network of markets exclusively for organic products, institution of minimum support price *etc.* Extensive conversion into organic farming would not be sustainable unless institutional support is strengthened.