PERFORMANCE ANALYSIS OF ORGANIC PEPPER CULTIVATION IN IDUKKI DISTRICT

By

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(2014-11-186)

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KERALA, INDIA

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THESIS

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DECLARATION

I, hereby declare that this thesis entitled **"Performance analysis of organic pepper cultivation in Idukki district"** 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 any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellanikkara,
Date: 26-09-2016

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CERTIFICATE

Certified that this thesis entitled **"Performance analysis of organic pepper cultivation in Idukki district"** is a bonafide record of research work done independently by **Mr. Sreejith R (2014-11-186)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, associateship or fellowship to him.

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Introduction

1. INTRODUCTION

India is renowned as the land of spices as it produces 75 of the 109 spices listed by International Organization for Standardization (ISO). Spices are primarily farm products used as seasoning agentsused in fresh, ripe, dried, broken and powdered forms which contribute aroma, taste, flavor, colour and pungency to food. The country has a celebrated past,probably as old as its civilization, a satisfying present and a bright future with respect to production and export of spices. In fact, the geo-political destiny of India and in many ways the modern global economy itself is linked to the history of spice trade. Spice trade was once world's biggest industry and countless battles were fought world over for the control of spice routes. These wars saw the rise and fall of many empires and even led to the discovery of new continents.It was the lure of exotic spices, especially black pepper (*Piper nigrum*), popularly known as the king of spices, which was grown exclusively in Malabar coasts of Western Ghats that brought foreign traders to the Indian shores as early as 15th century(Joy *et al.*, 2002). Even the driving reason behind the formation of the British East India Company in 1600 was to compete with the Dutch spice trade in India which later transformed into the grand British Empire in India.

India continues to retain its position as the world's largest producer, consumer and exporter of spices over the years. The country accounts for 45-50 per cent of the share of the world trade in spices by volume and 25 per cent in terms of value (Mohan *et al*., 2013).This is made possible by the wide variation in climatic conditions that enable cultivation of a variety of spices. Spices are produced in all the states with the total area of cultivation of 3.21 million hain 2015-16 (Spices Board, 2016). Major spice crops of India are pepper, cardamom, clove, cinnamon, chilli, ginger, turmeric, coriander, cumin, fennel, fenugreek, garlic, nutmeg etc. which vary in terms of agro-climatic requirements for growth and the plant part used as spice. Bark, buds, flowers, fruits, leaves, rhizomes, roots, seeds, stigmas, styles and the entire plant tops are used as spice depending on the crop. The share of major spices in India's spice exports during 2015-16 is

presented in Table 1.1. It indicatechilli leads the export share and share of black pepper has been limited to 3.33 per cent.

Table 1.1 Share of major spices in Indian spice exports during 2015-16

Spices	**Export share**	
	Percent(%)	quantity (tonnes)
Chilli	41.2	347500
Mint Products	2.5	21150
Spice Oils and Oleoresins	1.3	11635
Cardamom	0.72	6100
Ginger	2.94	24800
Coriander	4.75	40100
Cumin	11.81	98700
Celery	0.69	5800
Fennel	1.82	15320
Fenugreek	3.95	33300
Garlic	2.67	22500
Tamarind	1.82	15350
Pepper	3.33	28100
Turmeric	10.49	88500
Curry powder/paste	3.15	26550
Nutmeg and mace	0.48	4050
Others	6.38	53800
Total	**100.0**	**843255**

Source: Spices Board (2016)

Historically, India had the reputation of producing the best quality pepper because of the favourable soil and climate in the traditional growing tracts in the southern states like Kerala**.** The quality of indigenous varieties grown in the area likeMalabar and Tellicherry were considered the best in the world. Though India exports about one third of its total production of pepper to as many as 80 countries, its hold over global trade is fast receding. This is because of the stiff competition faced from new pepper growing countries like Vietnam and Brazil. In 2015-16 Vietnam exported 132278tonnes of black pepper in contrast to the Indian export of 27000 tonnes (Pepper crop report, 2015). Comparison of the production trends of the two countries presented as Table 1.2 depicts the emerging gloom in the Indian pepper production scenario. The average yield of black pepper in India is about 280 kg/ha while in Vietnam it is close to 1500 kg/ha. This has been largely attributed to the high productivity of the mono-cropping system followed in countries like Vietnam which cannot be matched by the inter-cropping system of the Indian states.

The survey in Idukki and Wayanad, the two major pepper growing districts of Kerala, had also showed large yield gap between large and marginal farmers. The large farmers who can adopt most of the recommended managing practices were having more than 1200 kg yield per ha while the small farmers had less than 260 kg. The studies also indicated that the decrease in the profit during the period was mainly due to increased labour cost (Hema*et al.*, 2007). Moreover, efforts to maximize crop yield cannot be sustained in the long run without deterioration in soil health due to removal of crop residues and indiscriminate use of chemical fertilizers. All these can make an adverse effect on the livelihood of pepper farmers. Therefore a sustainable approach for the development of the crop through organic farming that emphasis safe to health quality of the produce has been a major concern for the policy makers during recent years.

Table 1.2 Comparison of Black Pepper production in India and Vietnam

Year	Black pepper production (in tonnes)	
	India	Vietnam
1985	19536	1335
1995	24541	17900
2015	28100	133569

Source: Pepper crop report, 2015

Organic Farming

The word organic was used for the first time in a book *Look to the land* by Lord Northbourne published in 1940 (Kuepper, 2010). It referred to the processes that occurred in an ecosystem and was not in relation with use or avoidance of chemicals. However, later in the twentieth century the term was used by the movement that started in Europe to reverse the ill effects of conventional input intensive agriculture. Initially the type of farming was termed humus farming as the method mainly relied on composting, crop rotation with forage crops and adding lime and other amendments to adjust the humus of the soil. It provided the opportunity to integrate modern technology with traditional farming practices like green manuring, biological pest control and weed management by limiting the use of synthetic fertilizers and pesticides. In fact the publication of *Silent spring* by Rachel Carson in 1960s which forecasted the dangers of chemical inputs used in agriculture gave organic movement the much needed impetus. During the course of time many forms of alternative agriculture that relied on natural inputs were evolved like “back to the land”, “natural farming”, “zero budget farming” and

"bio dynamic farming". Among these organic farming was the method which gained wide publicity and accepted throughout the globe.

The main principles on which organic farming is based are health, ecology, fairness and care (IFOAM, 2005). Principle of health states that the method of farming should sustain and safeguard the health of every component of the ecosystem. Principle of ecology emphasizes the utilization of available nutrients and recycling of nutrients. The principle of fairness deals with providing equal opportunities and impartial recognition to all the individuals in a society. The principle of care stress that the practices involved in organic farming should be good enough to sustain the current and future generation.

It is in this pretext IFOAM (2005) defined organic farming as a production system that sustains the health of soil, ecosystem and people. It is considered as a production system which tries to eliminate the hazards due to use of chemical and synthetic inputs. These inputs are replaced by measures to improve soil health and fertility through nutrient recycling and site specific management.

Organic spice production in India

In contrast to "safe to eat foods" and "green foods" which do not have definitive standards or guidelines, organic method of farming is based on clear cut practices and measures to ensure quality of the produced outputs. This has great significance for organic spice productionin India as it can effectively utilizeits advantage of having niche markets in spices. Moreover, there is growing demand for organically produced foods in Europe, US, Japan and Australia. Worldwide consumer food preferences and life styles are also changing in favour of organic foods that are free from chemical contaminants. Therefore, in order to remain market driven and customer centric organic spice production started receiving focused attention from 2004-05 when National Project on Organic Farming (NPOF) was launched in India. But the state governments failed to formulate specific standards and policies for promoting and supporting organic production of different crops. Another major constraint was the shortage of accredited

certifying agencies and the accessibility of these agencies to small and marginal farmers.

This lead to the initiation of the Indian Competence Centre for Organic Agriculture (ICCOA) which consisted of NGOs, individual farmers and Govt. agencies. Now it has been renamed as International Competence Centre for Organic Agriculture (ICCOA) and has more than 2 lakh registered organic farmers. National Accreditation Body (NAB) which comprises of members from Govt. of India, APEDA and different national commodity board was also initiated to formulate regulations for certification procedures and authorization to certifying agencies in the country. However, high cost and non-availability of quality inputs for organic farming was a serious impediment faced by farmers. Also the recognition of organic farming as a sustainable method of farming that ensured a stable production through eco-friendly practiceswas seldom reflected in the mainstream extension activities.

Despite these constraints the rate of growth recorded by India in organic farming over the last ten years has been quite remarkable. In 2007 Indian exports of organic products was 19,000 t of more than 35 different products compared to an organic product export of more than 1.2 lakh MT with more than 130 products in 2015-16. The production of organic products from India also recorded an increase to2.0 million MT from an area of 4.72 m ha (APEDA, 2015). The achievements in organic farming were reflected in organic spice production also in terms of increase in area and production. The Spices Board has been encouraged in promoting non-governmental organizations and farmers' groups to adopt organic farming techniques.

This helped India to be ranked 10^{th} on acreage under organic production with the highest number of 6.5 lakh organic producers in the world. Classification of organic producers in India showed three categories that consisted of urban people with commercial interest, educated farmers and the innovative farmers (Narayanan, 2005).

Status of black pepper production

Black pepper popularly called as the 'Black Gold' is one of the most important spice crop, both nationally and internationally. The spice had high demand across the European countries from the medieval period and high quality of Indian pepper had significant influence on the market. In its efforts to retain its reputation on pepper quality India has achieved the distinction of being one of the few countries that produce pepper organically with an average export of 100 tonnes per year. Organic pepper marketed internationally under free trade regimes provided stable and profitable prices for pepper farmers across the country.

India has a total area of more than 1.22 lakh ha under pepper with the production estimated at 70,000 tonnes in 2014-15. Among the states producing black pepper Kerala has the maximum area and production. Pepper covers more than 80,000 ha that accounts for around 50 percent of the total pepper area. The estimated production for 2015 is 28,000 tonnes from the state. Karnataka is the second major producer of the spice accounting for 20 percent of the total area under the crop with an area of 28,000 ha. The production from Karnataka is more than that of Kerala and is estimated at 33,000 tonnes in 2015 (Spices board, 2016). According to Government of Kerala (GOK) estimates for 2015,Idukki district has the maximum area under pepper production with more than 50% of the total area under black pepper in the state.

Table 1.3 Production status of major pepper growing states of India

State	Area (ha)	Production (tonnes)	Productivity (tonnes/ha)
Kerala	80000	28000	.1
Karnataka	28000	33000	.76
Tamilnadu	3009	10500	3.48

Unstable production and high volatility of prices are the major challenges faced by the pepper farmers throughout the country. The area under pepper almost doubled during a period of twenty years from 1981 to 2001 when the area increased from 1.01 lakh ha to more than 2 lakh ha. The production also increased from 20,000 tonnes to more than 60,000 tonnes during the period. However, in 2015there is recorded decrease in area to 1.22 lakh ha but the production is estimated at 70,000 tonnes. In 2014 the production was very low recording only less than 36,000 tonnes (GOK, 1983, 1993, 2001, 2015).

Volatility in prices in pepper is largely influenced by domestic demand, international prices, and export from other competing countries like Vietnam. The price per kg for black pepper was Rs.33 in 1990 and it increased to more than Rs.230 by 1999. Again by 2005 the price got reduced to less than Rs.70 (Sajitha, 2012) and then it steadily increased and in 2015 the price is recorded at more than Rs.650. But the current high price is the result of reduction in the supply of pepper due to reduction in total area under pepper (Spices board, 2016).

It is in this context of uncertainty of prices and pressures of high quality standards, the concept of organic farming assumed significance for pepper growers. This is all themore important considering the fact that the adoption of organic farming practices provided an opportunity for small and medium farmers of the state to participate in international trade and realize better prices (Parvathy, 2015). However, no systematic study has been carried out in the state to assess the acceptance of the organic farming and the technological innovations followed by the organic black pepper farmers. Hence in the wake of the gaining prominence of organic pepper cultivation it was decided to conduct an exclusive study of organic pepper growers indicating the adoption of organic practices by them. The study is based on the premise that adoption of organic practices increases the export potential and thereby reduces the price risk associated with the domestic market.

Scope and importance of the study

As specialized organic black pepper cultivation is based on the interrelationships that exist between soil, plants, animals and other living organisms in an ecosystem,an understanding of the system is essential in deciding on the practices to be followed. As such it demands an altogether different approach compared to conventional pepper cultivation studies in assessing the appropriateness, introduction, acceptance and application of technological innovations. It warrants systematic documentation of various practices and constraints associated with organic farming in pepper that would enable effective policy implementation. Also the institutional support of leading extension agencies in the state to promote organic pepper cultivation need to be analyzed.Thus the results from the study are expected to provide a multi-dimensional view into the status of organic pepper in the state and also to point out the field level challenges faced by the organic pepper farmers. These could help to formulate efficient policy recommendations and targeted interventions to streamline organic pepper production in the right direction.These can definitely address effective means of attaining the triple objectives of economic efficiency, environmental safety and food safety for all members of the society.

Objectives of the study

In this back drop the study has been designed with the following specific objectives:

1. To document organic practices adopted by farmers in pepper cultivation
2. To make a comparative analysis of role of different institutions in supporting organic pepper cultivation
3. To analyze the marketing channels of organic pepper used by farmers
4. To record constraints experienced by organic pepper farmers

Limitations of the study

The study was conducted as part of post graduate research work and had the inherent limitations of time and resources. Moreover, it was based on the responses of farmers in Idukki district of Kerala and hence generalizations need not be completely accurate. The normal errors inherent in social surveys like bias in reporting the data, inadequacy of information; common limitations of statistical analysis etc might also have some effect on the study. In spite of these limitations, maximum care has been taken to make the study as objective and systematic as possible.

Presentation of thesis

The thesis will be presented in five chapters. The first chapter deals with introduction, giving the need, objectives, importance, scope and limitations of the study. The second chapter provides the theoretical orientation and review of important literatures published related to the study. The third chapter describes the materials and methods used for analyzing the study including the operationalization of concepts, measurement procedures of variables and the statistical tools used. The fourth chapter is intended for the results of the study and the discussion thereon. The fifth chapter deals with conclusion and summary of the thesis.

Review of literature

2. REVIEW OF LITERATURE

The literature review is a focused discussion which encompasses the summary of the studies that have been conducted about the topic under research which helps to determine and decide the methodology to be used for the study. This chapter is intended to review the past studies that are relevant for the topic under study based on the objectives and the methodology selected. The review of the important literature is presented under the following sub-heads:

2.1. Conceptual definition and advantages of organic farming

2.2. Scenario of pepper cultivation

2.3. Adoption of organic practices

2.4. Use of organics in soil fertility management and plant protection

2.5. Institutional support to organic farming

2.6. Economics and marketing of black pepper

2.7. Constraints faced in organic farming

2.1 Conceptual definition and advantages of organic farming

Shiva *et al.* (2004) reported that compared to pre-pesticide era the damage due to pests are more in the pesticide era. Before the wide spread application of pesticides the damage due to pests were 5 to 10 percentage while after starting the wider application of pesticides the damage level increased to about 30 percentage thus marking about three fold increase.

Bhattacharyya *et al.* (2012) stated that the pesticide residual amount in crop plants, animal tissues and irrigation water are more than the maximum permitted level. The fertilizer use cannot be considered as an essential component for productivity as many crops along hill sides and road sides can be observed productive despite the application of any kind of fertilizers. Organic farming may

seem expensive but the hidden costs associated with the conventional systems are not calculated.

Deenik (2005) explained that the concept of organic farming rests in the fact that human health is tied with the health of the environment. Feeding the soil is similar to feeding the plant and soil is the foundation of all the farming activities. He suggested that an effective organic farming system should be based on the principles of diversity, nutrient cycling, sustainability and integrated disease and pest management.

According to IFOAM (2005) organic farming is a production system that sustains health of soil, ecosystems and people and states that it is a method of farming which relies on ecological practices, biodiversity and cycles adapted to local conditions rather than use of inputs with adverse effects.

Ramesh *et al.* (2005) stated that organic farming is specifically designed farming systems aiming at social and economical sustainability. He states that in intensive input systems transforming to organic farming reduces yield but in rainfed traditional systems organic farming has increased yield. The evaluation of 208 projects showed that organic farming when introduced marked an increase of 5 to 10 percentage yield increase in case of irrigated systems and 50 to 100 percentage increase in case of rainfed areas.

Rhoads (2009) defined organic farming as an integrated farming system that strived for a high level of longevity or sustainability to ensure an adequate food supply for future generations. Organic farming can be viewed as a soil movement which began early in 20^{th} century when people began experimenting to increase farm productivity without the use of chemical fertilizers or intensive application of inputs. He also stated that organic farming can bring diversity to farming systems and ensures safety of food it produces.

Sowmya (2014) reported that organic farming system primarily aimed at keeping the soil alive with the use of organic wastes and other biological materials

along with beneficial microbes to release nutrients for building a sustainable ecosystem.

Morgera *et al*. (2014) defined organic farming as a system for crop, livestock and fish farming which emphasizes on natural farming techniques and is concerned not only with the production techniques but also with the end product and its processing.

Treadwell (2015) defined organic farming as the proactive, ecological management strategies that enhance and maintain soil fertility, prevents soil erosion, maintain and promote biological diversity and minimizes the risk to human and animal health and natural resources.

Based on the above findings organic pepper grower was operationally defined for the study as one who has taken up cultivation of black pepper following the principles of agro-ecology through scientific or natural farming processes with the exclusive use of organic inputs.

2.2 Scenario of pepper cultivation

According to Nirmal and Ravindran (1992) the major cause of low yield in pepper in India compared to other countries with high productivity was the prevalence of the local cultivars. They suggested replacing the local cultivars with high yielding varieties with good adaptability and quality attributes for bettering the production status of pepper in the country.

Madan (2000) has reported that black pepper has contributed significantly to the rural economy of both Kerala and Tamilnadu. Despite fluctuating market prices the pepper production was spreading to new areas because the farmers were hoping to get increased income from their new investments. The author also insisted on the importance of producing clean pepper and mentioned that the step towards this goal should happen from the farmers field itself.

Ravindran (2000) opined that the low pepper productivity in India despite the long history of production can be attributed to the casual way of pepper

production. Most of the farmers are unwilling to adopt intensive cultivation practices and usually plant the crop and do not follow any cultivation practices. This casual approach is mirrored in the productivity of the crop in the area.

Joy *et al.* (2002) quoted that the history of India is influenced largely by spices. The richness in flavor of the pepper attracted the Arabs and Europeans to India from the 15th century onwards and about 75 per cent of the pepper production comes from Kerala alone.

Anandaraj (2008) stated that the pepper is cultivated as a monocrop in countries with high productivity such as Malaysia and Indonesia while in areas of low production like India and Srilanka pepper is grown as an intercrop in arecanut or coconut gardens. He also mentioned that the lower export rate of pepper from India is mainly due to competition from other countries like Malaysia and also due to internal consumption rate.

Sajitha (2012) stated that the pepper production which was about 61 thousand tonnes in 1980 has declined to about 42 thousand tonnes in 2010. The area under production has also drastically decreased from 202 thousand ha to 171 thousand ha during the period.

Murugan (2012) reported that the temperature increase in the cardamom hill areas has a negative influence on the productivity of spices. The increase in the mean temperature coupled with intermittent rainfall caused increase in the pests and disease incidence. Small but significant increase in the productivity of small cardamom and pepper were observed during the period after 2000 but the pepper showed negative trend in productivity.

Rosli *et al.* (2013) based on an experiment conducted in Malaysia has shown that most of the farmers adopt scientific practices in the area aiding to their high productivity. While all the farmers included in the sample adopted pest and weed control measures, more than 90% of the farmers adopted other measures such as mounding, pruning and disease control.

Yogesh and Mokshapathy (2013) reported that Kerala accounts for more than 95% of the area and production of pepper in India. The report shows that the average productivity of the spice crop in India is 306 kg per ha while in other major pepper growing countries like Thailand, the productivity is close to 4000 kg per ha. India having about 40% of the world area under pepper is contributing only 27% of the total production.0

Sajitha (2014) has stated that black pepper production remains to be one of the important source of income for the rural households across our country and about 2.5 lakhs farm families are small and marginal farmers and their income is more or less associated with the production of black pepper and its market price. The study also showed that the area under pepper in central Kerala increased by about 684% during the time period of 1960 to 2008 while in southern Kerala the area decreased by more than 5000 ha. in the period from 1980 to 2008. However in all these regions there is a steady decline of productivity which adversely affects the advantages obtained from increase in area.

Sowmya (2014) has said that the pepper production was showing a positive growth up to 2005 and the trend became negative thereafter. The minimum area under pepper was recorded in 2008 and the maximum area was in 2005. Karnataka showed increasing rate of growth in area under pepper during the period from 2005 to 2010 but in Kerala during the period the crop showed negative trends and the area reduced considerably. The one of the main reasons for the negative trend in Kerala may be due to the farmers changing to other high valued crops for better income.

For the present study organic pepper production has been conceptualized as a strategy for improving the income of farmers through better market price for the produce to compensate the receding productivity.

2.3. Adoption of organic practices

Loganandhan (2002) stated that more than 50 percent of the farmers adopted organic farming because of awareness on environment safety and ill effects due to the use of chemical pesticides.

Balachandran (2004) found that more than half of the organic farmers are small and marginal farmers and based on his study reported that less than 45 percentage of the farmers are having land holding between 2 and 25 acres.

Jaganathan (2004) found that level of market perception and attitude towards the adoption of the organic practices had a positive relation with the decision to adopt organic practices. The study says that 55 percent of the respondents had medium level of market perception.

Ogunyemi (2005), stated that age can be a limiting factor for adoption of organic practices as older people may not be able to adopt new practices or carry out intensive labour operations.

Genius *et al.* (2006) revealed that average land size of non-adopters is 3.65 ha and 3.07 ha for total land adopters. The results indicated that the adopters of organic practices had higher off farm income when compared to non-adopters. The farmers receiving extension support is more than 70 per cent for adopters while it is less than 17 per cent for non-adopters.

Patel (2008) observed that 38 percentage of respondents received high school education and around 60 per cent of farmers had less than three years of experience in organic farming on a study conducted on organic vegetable farmers. He stated that about 23 per cent of farmers had more than six years of experience in organic farming.

Ferto and Forgacs (2009) stated that organic farmers are younger than conventional farmers. The authors reasoned that older farmers are more conservative and therefore more resistant to adoption of organic farming.

Kafle (2011) reported that study on adoption of organic farming in vegetables in Nepal huge majority of the organic farmers had less than 2 ha. of land and farming was their main occupation and income source..

Oyesola *et al.* (2011) reported that the mean age of the respondents is above 50 and age of majority of the respondents are between 40 and 70 and the youth comprises only 10 percentage in a study conducted about farmers perception on organic farming. The study also found that 80 percent of the farmers received formal education and only less than 20 percent of the respondents had received no formal education.

Rana *et al.* (2012) found that age and access to extension agents are major problems that affected adoption process in the country. He stated that older farmers have less interest and motivation to adopt modern practices compared to young farmers. Farm size was another major factor influencing the adoption decision. The adopters have larger area when compared to non-adopters.

Makitie (2013) stated that lack of knowledge about advantages of adopting improved practices is one of the major barrier against adoption decisions. Lack of proper credit support and favourable government interventions are also barriers against innovation decisions.

Rosli *et al.* (2013) found that farm visits and training had a negative relation to adoption of pruning technique but it is not significant because of very small number of respondents who has attended visits and training.

Anupama (2014) observed that more than 50 percentage of farmer had more than 25 years of farming experience and about 40 percentage had experience of 11 to 25 years. Farmers with experience of less than 10 years was only 5 percentage.

Dinis *et al.* (2014) found out that adoption of sustainable practices increases with increase in land holdings. They also concluded that farmers relying

on family labour had adopted more sustainable practices and found out that there was a 13 % reduction in adoption when the farmers rely on external labour.

Azam (2015) reported that conventional farmers are more illiterate than organic farmers. The study found that while about 70 % of conventional farmers had only primary education more than 50 % of organic farmers had highschool level or advanced education.

Parvathy and Waibel (2015) reported that the main motivational factor for converting to organic farming was assurance of a minimum price. Other factors include deteriorating soil and human health and low price of income. The study found that a shorter distance to market and access to off farm income increases adoption rate. Organic farmers in general have a better income status than non-adopters.

Sharma and Kaur (2015) found that 40 percentage of the tribal people accurately followed procedures for filling compost pit. More than 60 percentage of respondents followed green manuring in winter season and about 45 percentage adopted the practice during rainy season.

Ullah *et al.* (2015) stated that age, education and land tenure status has a positive effect on the adoption decision of organic farming. Availability of the irrigation facility also has a positive relation with adoption decision. He also states that early adopters have better access to water, ability to seek and find higher market prices and a strong attitude towards conventional farming problems.

2.4 Use of organics in fertility management and plant protection

Rajan and Sharma (2000) has stated that the incidence of foot rot in black pepper is substantially high when inorganic supplements are used compared to organic inputs. While the incidence rate was recorded at about 90 percentage in case of inorganic inputs it was less than 20 percentage when organic inputs were used.

Stephen and Nybe (2003) reported that organic manures and bio fertilizers improved the characters associated with yield of pepper considerably. While the leaf characters were moderately influenced the other traits like intermodal length and number of berries were considerably improved.

Kshirsagar (2006) reported that organic farmers possess more livestock population than conventional farmers owing to the high demand of organic inputs. The study on organic sugarcane producers showed that input cost for manuring is almost double under organic farming as compared to inorganic farming but the cost for plant protection inputs are 20 percentage lower for organic farming. The report also states that the lower cost for manures in inorganic farming can be attributed to the fact that they replace manures with chemical fertilizers.

According to Kallas *et al.* (2009) organic farmers use inputs with the view that the environment should not be harmed while the inorganic farmers are less conscious about the environment safety. The results also shows that organic agriculture are labour intensive as compared to conventional systems.

Pattanapant and Shivakoti (2009) reported that reduction of cultivation cost by avoiding use of chemical inputs was a major motivation for farmers to shift to organic method of cultivation. A large amount of produce is consumed at household level and therefore avoiding hazardous chemicals was also a reason for shifting to organic method.

Charyulu and Biswas (2010) concluded that many farmers in the country has very limited awareness about the advantages of organic farming. Farmers lack technical knowledge about compost making and its preparation. Government intervention and policy formulations are essential for bringing the farmers more into organic farming.

Ramesh *et al.* (2010) reported that about 12 different inputs are used by organic farmers as manures and about 10 different inputs for plant protection. The average cost of production under organic agriculture is 11.7 percentage compared

to conventional system due to the replacement of external inputs by farm inputs. Higher microbial activity can be seen in the fields where organic inputs are applied.

Pratap *et al.* (2012) reported that application of 30-50 per cent of total nutrients in organic form helps in a long term build up of soil fertility. Promoting vermi composting and other biological methods can improve the nitrogen use efficiency of the soil.

The demand for bio-fertilizers is just above 4 lakh MT but the supply is only 65 thousand MT and the demand for organic manures is 710 million tonnes but the production only reached 105 million tonnes. The report shows that Karnataka is the highest consumer of bio-pesticides with usage recorded at more than 1400 MT in 2014 and Kerala stands at the third position with usage at more than 650 MT (MoA, 2015).

The use of organic manures has a negligible effect on adoption of organic farming when treated independently but has a higher magnitude when the attitude towards environmental health and safe food are analyzed. Farmers with orientation towards organic farming will promote themselves to use organic pesticides or integrated pest management (Olabisi *et al.,* 2015).

2.5. Institutional support for organic farming

Kannan *et al.* (2010) reported that the adoption of organic practices increased with increased awareness through trainings and mass media exposure. The results showed that the percentage of farmers with high awareness level of advantages organic practices increased from 26 percentage to 79 percentage after receiving training and exposure visits. After receiving proper orientation majority of the farmers adopted the organic farming in a scientific manner.

Glendenning *et al.* (2010) reported that insufficient funds for training and capacity building limit the performance of the extension agents. The linkage at state level between various agencies is very weak and it limits the information

flow between the departments. Another constraint is the duplication of innovative projects between various departments due to lack of convergence.

Sajitha (2012) revealed that government had carried out instructions to rejuvenate 60,000 ha of pepper plantations in Idukki district within five years under NHM in 2009. According to the norms farmers with maximum 5 acres are only eligible for subsidy. The results further showed that 51 percentage of marginal growers in Idukki and 43 percentage of marginal growers in Wayanad didn't received any subsidies.

Parvathy and Waibel (2015) reported that Peermade development society is the largest NGO functioning in the Idukki district and promotes organic farming of pepper in a positive way. The data showed that more than 50 percentage of the certified farmers were concentrated on or near Peermade. The NGO provide necessary support in transition period and also provide support trainings. They also assist in annual inspection procedures for verifying organic certification.

2.6 Economics and marketing of black pepper and related crops

Garibay and Jyoti (2003) based on their study stated that 90 % of the traders and exporters believed that upper class customers are interested in buying organic products. None of the respondents believed that lower middleclass is interested in using organic products.

Jaffee (2005) advocated that since the use of pesticides are more in spice in raw form usage of the same will not be entertained international food market. Also, the presence of heavy metals in small amounts is found in spices people are more cautious about the health hazards due to raw intake.

Hema *et al.* (2007) found out that there was more than 80 percentage chance that average yield of black pepper in Karnataka was under trend line. The study also found that Kerala also had a negative trend in yield and area which reflected on the national average.

Subervie (2008) observed that instability in crop prices affects developing countries in a large scale than developed countries. She also mentioned that poor infrastructure development and financial resource allocation makes farmers more vulnerable to income risk due to crop damage.

Anoopkumar (2012) reported that crops such as pepper and coffee showed great instability in domestic prices in monthly as well as annual trends. The main observation he made was that the instability associated with these crops is due to the association with international price.

Yogesh and Mokshapathy (2013) observed that India stands second in the total import of pepper after Vietnam. Import of pepper in India increased by about three folds in the period between 2001 and 2010.

Desai (2014) reported that Indian markets showed unusual price during 2012-13 hike as supply was far less than the demand. He also mentioned that pepper had been reduced to the status of an investment crop. Further the demand of pepper remained price inelastic creating huge gap between supply and demand.

Hameedu (2014) based on his study on cardamom in Kerala reported that production cost of 1 kg of dried cardamom is more than Rs. 360. Local traders cost about Rs.14 per kg and cost inccurred for wholesaler is about Rs.19 per kg.

Regeena (2016) stated that export of pepper decreased from almost 20 tonnes in 2010 to 15 tonnes in 2013 but the value of export almost doubled in the same period. Percentage share of pepper in total quantity of spices exported became half during the period from 2008 to 2013.

Hena (2016) stated that major problem with export of pepper in India is that the country has to face competition from other countries. Low productivity together with high production cost makes it difficult to compete with other exporting countries like Vietnam.

2.7 Constraints faced in organic pepper farming

Sriram (1997) stated that most of the organic farmers had identified labour shortage as the most important constraint while adopting organic practices. Lack of technical guidance in the application of bio-control agents was also identified as an important constraint.

Badodiya *et al.* (2011) stated that major constraint faced by organic farmers was high cost of production due to high cost for inputs. He recorded lack of quality inputs and difficulty in adopting organic practices as other major constraints faced by organic farmers.

Rana*et al.* (2012) reported that low productivity in pepper forces the pepper farmers to shift to other crops. Lack of credit support restricted farmers from adopting organic practices. Another important constraint identified was lack of proper extension support to organic farmers.

Ganapathy *et al.* (2014) stated that labour shortage is the most important problem faced by black pepper farmers. He mentioned that fluctuation in price is also a major constraint faced by the farmers. Lack of credit facility was also identified as a major constraint for adopting intensive practices.

Hena (2016) stated that low productivity is an immediate concern for pepper farmers in India. Another important constraint identified was lack of proper information delivery mechanism to farmers. Lack of awareness on export standards was also recorded as an important constraint.

Methodology

3. METHODOLOGY

The chapter enunciates the methods and procedures used in this study which are presented under the following sub-heads.

3.1. Location of study

3.2. Selection of sample

3.3. Selection of organic practices in pepper cultivation

3.4. Selection of criteria for the classification of organic pepper growers

3.5. Selection and measurement of variables

3.6. Methods of data collection

3.7. Statistical tools used

3.1. Location of study

The study was carried out in Idukki district of Kerala. The district was purposively selected due to the following reasons.

1. Idukki has the maximum share of 51.03% of the total area under pepper cultivation in the state.
2. Suitable agro-climatic conditions in the region favor production of good quality pepper.
3. Major research and extension agencies in spices like Cardamom Research Station of the Spices Board, Peermedu Development Society (PDS) and Eco-development Society (PDS) that are actively involved in the popularization of organic pepper cultivation are located in the district.

3.1.1 Idukki district

Idukki is the second largest district of Kerala after Palakkad and geographically lies between 9.9189^0N latitude and 77.1025^0E longitude in the

Western Ghats. Demographically it has the lowest population of 11.07 million in the state (Census of India, 2011). Total area of the district is 4.36 lakh ha and more than 90% of land area is covered by mountains and forests. The land utilization pattern of the district is given as Table 3.1.which shows that the total cropped area is 60.31%.

Table 3.1 Land utilization pattern of Idukki district

Particulars	**Area (ha)**	**Percentage to total geographical area**
Total geographical area	436328	100
Forest land	198413	45.47
Land put to non- agricultural uses	12700	2.91
Barren and uncultivable land	1833	0.42
Permanent pastures and grazing land	0	0.00
Land under miscellaneous tree crops	248	0.06
Cultivable wasteland	2321	0.53
Fallow other than current fallow	1220	0.28
Current fallow	1647	0.38
Marshy land	0	0.00
Still water	10480	2.40
Water logged area	1	0.00 (negligible)
Social forestry	1355	0.31
Net area sown	206110	47.24
Area sown more than once	57061	13.08
Total cropped area	263171	60.31

Source: Directorate of Economics and Statistics, Kerala(2014-15)

3.1.2 Climate

Climate in the district is showing diverse range from east to west. While the western part comprising of mid lands show a moderate climate the eastern part

comprising of highlands have a temperate climate. Temperature variation ranges from 1^0 C to 27^0 with minimum seasonal variation. The average rainfall in the area is above 3000 mm with the major share coming from south-west monsoon in June and July. Overall the agro climatic condition of the region is suitable for cultivation of spice crops like pepper, cardamom, tea and coffee.

3.1.3 Cropping pattern

Table 3.2 Share of major crops in the cropping pattern of Idukki district

Sl. No.	Crop	Area (ha)	Percentage share (%)
1	Pepper	42924	16.30
2	Rubber	40395	15.34
3	Cardamom	31810	12.08
4	Fruit crops	31377	11.93
5	Tea	21970	8.34
6	Coffee	16526	6.27
7	Tuber	7934	3.01
8	Vegetables	5535	2.10
9	Others	64700	24.50
10	Total cropped area	263171	100.00

Source: Directorate of Economics and Statistics, Kerala

Plantation crops are having major share in the total cropped area of the district with pepper having the maximum share of more than 16% (Table 3.2). The other important crops of the district are rubber (15.08%) and cardamom (12.08%). Every

farm holding or homestead garden in the district grow pepper as an intercrop and hence it is deeply associated with income and livelihood of majority of farmers. It is mostly grown as intercrop in coffee, tea and cardamom where dadaps (*Erythrina sp*.) and silver oak (*Grevelia sp.*) are used as the most common standards apart from trees like mango, jack fruit tree etc. Quality and productivity of black pepper produced in Idukki is considered superior compared to other districts of Kerala due to the conducive agro-climatic and edaphic factors. It is estimated that pepper contribute about 20% of the agricultural income of the district.

3.2. Selection of sample

Among the 14 districts of Kerala, the highest pepper producing state in India, Idukki district that leads in area and production was purposively selected for the study.

Selection of blocks: Idukki district consists of eight development blocks viz. Thodupuzha, Ilamdesam, Adimaly, Devikulam, Nedumkandam, Kattappana, Idukki and Azhutha. Selection of blocks for the study was made based on the statistics of area under pepper cultivation in these blocks. Out of total cropped area pepper comprises of more than 51 % and 30% in Nedumkandam block and Azhutha block respectively (Table 3.3). These two blocks, Nedumkandam and Azhutha, that had maximum area under pepper were selected as the study area. A map showing the exact location of the study is furnished in Fig. 1.

Figure 1 Map of the study area

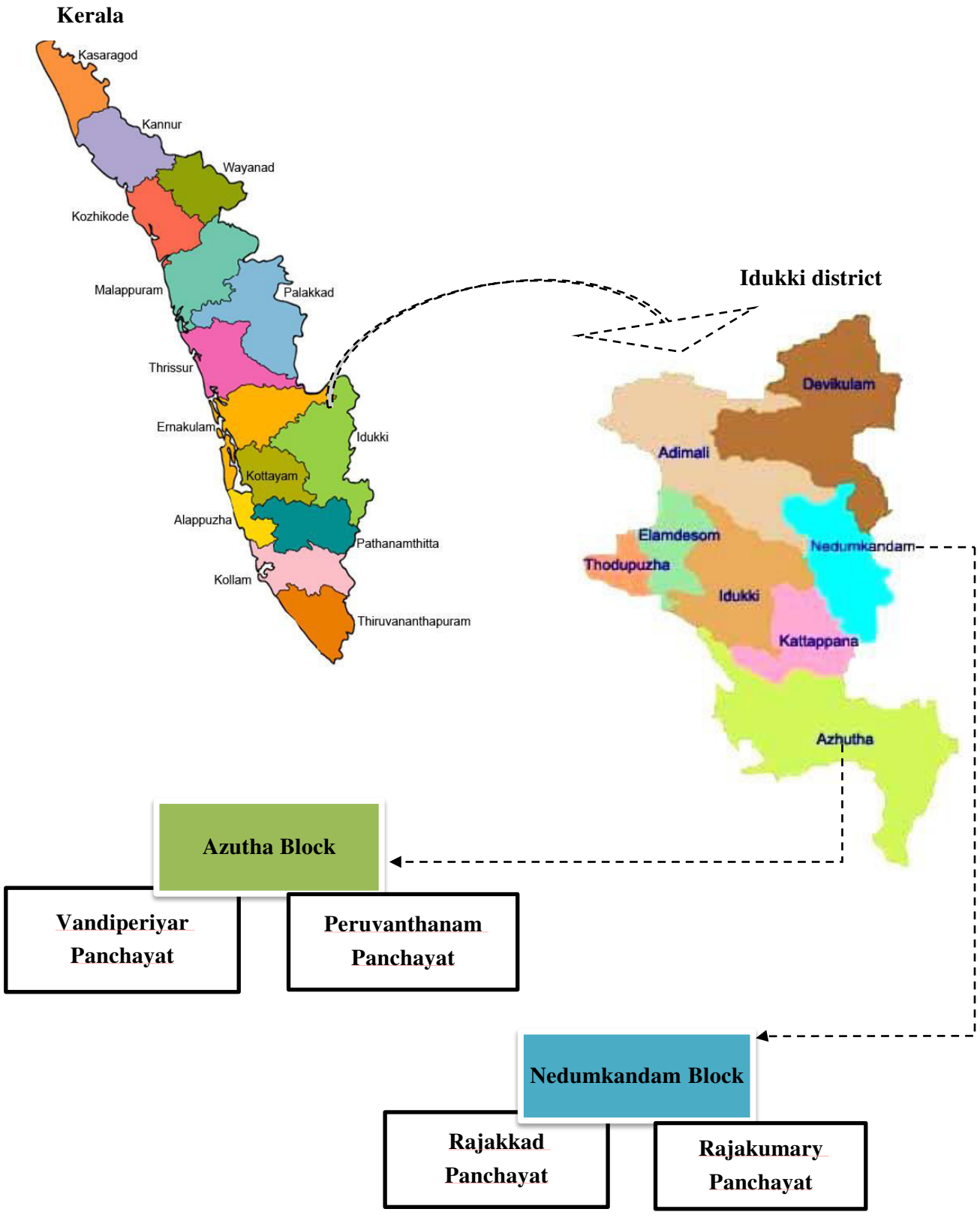


Table 3.3 Area under major crops in the selected blocks of Idukki district

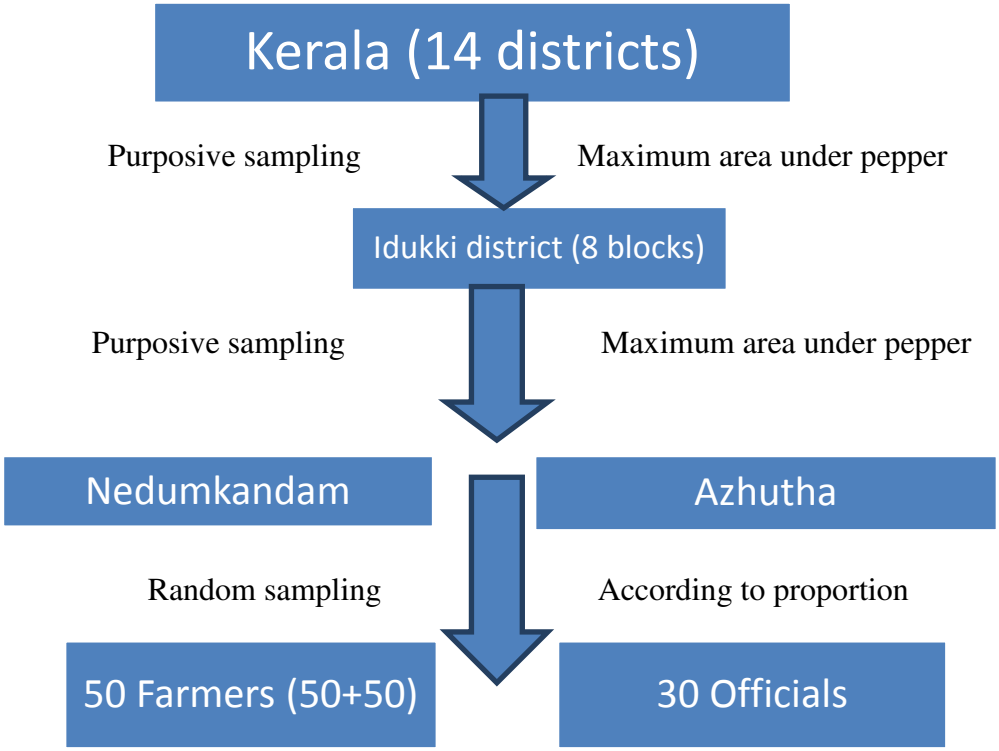
Sl. No	Crop	Area of crops			
		Azhutha block		Nedumkandam block	
		In ha	In per cent	In ha	In Per cent
1	Pepper	7943.29	30.64	11076.69	51.78
2	Jack	4318.31	16.66	3273.97	15.30
3	Coconut	2750.42	10.61	1756.59	8.21
4	Tapioca	1964.72	7.58	511.00	2.39
5	Mango	1981.88	7.64	1163.39	5.44
6	Others	6968.37	26.87	3611.4	16.88
7	Gross cropped area	25926.99	100.00	21392.7	100.00

Directorate of Economics and Statistics, Kerala; 2013-14

`*Selection of farmers*: Random sampling was adopted for the selection of farmers from each selected block. The list of practicing organic farmers in pepper was collected from the office of the Assistant Directors of Agriculture of the two selected blocks, Peermade Development Society (PDS) and Eco Development Society (EDS). Lists were compiled to include all the organic pepper growers of the selected blocks without duplication. The compiled list was used to select randomly 50 organic pepper growers from each of the blocks that made a total sample size of 100 farmers.

Selection of Extension Officers: Agricultural Extension Officers of the State Department of Agriculture (SDA), Field Officers of Spices Board, PDS and EDS were the major extension functionaries of the selected blocks. Proportionate to the number of personnel available in each institution, 18 agricultural extension officers from SDA working in the selected blocks were included in the study. Also an exhaustive sample of 12 field officers, eight from Spices Board and two each from PDS and EDS were selected to make total sample of 30 for the study. The sampling frame used is given as Fig. 2.

Figure 2 Sampling design for the study



3.3. Selection of organic practices in pepper

`A focus group discussion (FGD) was held at the site of a workshop on organic agriculture organized by the Kerala Agricultural University at

Karunapuram panchayath in Nedumkandam Block. Organizing the FGD sessions with the existing organic conference allowed wide publicity enabling participation of all farmers and other stakeholders interested in organic farming in the district. In FGD, detailed examination of the organic production process with respect to pepper cultivation in the district, focusing on producers' agronomic and marketing practices was used in the selection of cultivation practices. It revealed Ad-hoc Organic Package of Practices of Kerala Agricultural University and the organic certification standards popularized by Spices Board, and PDS which followed an ecological approach that integrated cultural, biological and mechanical practices were the organic systems popular among the pepper farmers. The package fostered recycling of resources, building ecological balance, and protection of biodiversity. Accordingly organic pepper growers were assessed on the following criteria in the study

- ecology based practices (biological pest management and composting)

-complete avoidance of synthetic chemicals, antibiotics, and hormones

-maximum reliance on internal inputs and resources

-use of fundamental components and natural processes of ecosystems as farm management tools

1.4. Selection of criteria for the classification of organic pepper growers

Based on the FGD the organic farmers were defined as those who fostered natural processes and principles of agro-ecology in pepper production with maximum reliance on internal resources. The major defining features that distinguished these organic farmers were the certification and how they tried to meet the certification standards of production. Hence organic certification by an accredited agency and the extent of use of external inputs in meeting the

production standards were used as the criteria for the classification of organic pepper growers under the study.

i) ***Organic certification***: Accredited production and processing standards and certification procedures are the most significant factor distinguishing organic farming from other methods of sustainable agriculture. Regional, national and international standards have been developed with respect to the rules and regulations on organic farming and requirements for certification of organic products. Organic labelling by an independent body is used as a trading instrument that creates transparency enabling producers to access markets for organic products and obtains premium prices.Hence organic certification by an accredited agency was used as the criteria for the classification of organic pepper growers under the study. Conversion of an existing plantation to organic cultivation required a minimum conversion period of three years but none of the respondents under the study belonged to this group of Transition organic farmer (TOF) category. Hence based on certification by accredited agency, organic pepper growers in the study were classified into certified organic farmers, and Non-certified organic farmers.

Certified organic farmer(COF): It included the group of organic pepper growers whose production and processing practices were certified by an approved regional, national and international agency for meeting the prescribed standards of organic production.

Non-certified organic farmer (NcOF): The group of organic pepper growers who had no certification of any approved regional, national and international agency but functionally followed the prescribed standards of organic production and were accepted by faith and good will.

ii) ***Percieved External Input Dependency (PEID)***: Based on the dominant type of inputs used in the cultivation practices to meet the organic standards, both the groups of COF and NcOF were again classified as Scientific organic farmers

(SOF) and Natural organic farmers (NOF). Farmer perception on external input use dependency was rated in a continuum of 1-8. Farmers with complete dependency on natural inputs alone were provided one point and those who supplemented all the inputs based on external resources were provided 8 points. Farmers who got above mean score was categorized as scientific organic farmer since they are following more scientific oriented farming practices and farmers below mean score was categorized as natural organic farmer.

Scientific organic farmers (SOF): Scientific organic farmers included both COF and NcOF farmers who mostly depended on external inputs for fostering the natural processes in organic pepper production.

Natural organic farmers (NOF): Natural organic farmers included both COF and NcOF farmers who adopted natural processes and relied mostly on internal resources for meeting the prescribed organic standards.

1.5. Selection and measurement of variables

3.5.1. Variables selected for the study

Based on the specific objectives of the study and review of literature, the following variables were selected. The selected variables were categorized to dependent variables and independent variable.

A. **Dependent variables**

1. Extent of adoption of organic practices in pepper cultivation
2. Relative yield between organic and conventional pepper production
3. Extension support efficiency of institutions involved in organic pepper production

B. **Independent variables**

The independent variables selected for the study were grouped into personal attributes of farmers and farm characteristics of organic pepper. The selected variables included the following

(i) Personal attributes

1 Age

2 Education

3 Experience in organic pepper farming

4. Scientific orientation towards organic farming

5. Credit status

(ii) Farm characteristics

1 Total farm size

2 Total area under organic pepper

3 Annual income

4 Share of organic pepper in total income

5. Status of livestock possession

6. Certification status of farm

7. Type of standard used

8. Organic pepper yield

9. Conventional pepper yield

C. Marketing channels of organic pepper growers

D. Constraints in adopting organic pepper farming

3.5.2. Measurement of variables in the study

The categorized groups were analyzed and measured following the procedure as detailed below:

A. Dependent variable

1. Extent of adoption of organic practices in pepper cultivation

Many standardized methods developed by different researchers to quantify adoption behavior of farmers were available. The method selected in the present study was based on review of following methods:

Wilkening (1953) developed the adoption index as percentage of practices adopted to total number of practices applicable to a farmer.

Marsh and Coleman (1955) used percentage of total practices adopted as the adoption index.

Chattopadhyay (1974) used quotient approach for measuring adoption behavior. He used a ratio scale that measures different dimensions of innovations.

Adoption of a single technology in isolation can be measured as the proportion of the cropped area of its application (Feder *et al.* 1985). However, when there is a blend of many technologies the measurement is complex and development of composite index is required. Organic production of black pepper involved mix of large number of technologies related to the following practices as derived from expert consultation and FGD.

- degree and extent of on-farm fertility management through biofetilizer use, composting and cover cropping
- degree of on-farm biological pest management using microorganisms like bacteria and algae
- avoidance of restricted chemical materials (chemical pesticides or fungicides except Bordeaux mixture)
- employment of innovative weed control practices such as slashed mulching/ leguminous cover cropping
- bio-diversified cropping patterns, including intercropping and integrated livestock

- evidence of intensive management like use of traditional and resistant HYV, prophylactic measures to avoid incidences of diseases and pests
- use of soil and water conservation measures

As Adoption Index (AI) is a combination of different dimensions of agricultural technology, technologies used under each of these practices were grouped into the following dimensions of organic black pepper production.

1. Practices to sustain soil fertility (with additional score for soil conservation measures)
2. Practices related to organic pest management
3. Extent of use of organic inputs
4. Extent of use of innovative weed management(with additional score for water conserving irrigation measures)
5. Extent of farm diversification

Weightage and the scoring of practices under each dimension were decided based on the criteria of agro-ecology as described by Guthman (2000). Respondents were given weight of one point for each dimension sustainably met, except for the first two dimensions, which were given double weight since there is a much wider spectrum in these areas. Usage of in-situ techniques and on farm input management was provided more weightage than relying on external sources in scoring of the practices under each dimension. A black pepper grower who cover crops a portion of the farm every year and purchases compost from a supplier would earn two points. Whereas a farmer who provides the entire farm's fertility needs through on farm recycling and cover cropping will get three points.But a farmer who meets all fertility needs through purchases will get only one point.Additional factors such as attention to water/soil conservation, irrigation, or development of on-farm seed and planting materials were considered in the dimensions of soil fertility management, weed management and crop diversity respectively. The scoring procedure followed has been described in Table 3.4.

Table 3.4 Dimensions and parameters used in scoring of organic practices adopted by Pepper growers

Sl. no.	Dimension of Practice	Parameters of measurement	Practices considered	Scoring adopted	Maximum score	Minimum score
1.	Soil fertility management	1.Intensity of organic manure use	Schedule & type of organic manures/ameliorants used	Regular >2 times =3 Regular 2 times=2 Sporadic use <2 times=1	8*	2
		2.Sourcing of organic manures	Extent of *in situ* production of soil management inputs	Complete *in situ* production=3 Partially outsourced =2 Completely outsourced =1		
2.	Pest management	1.Intensity of pest management	Schedule of pest management	Regular Prophylactic practices =3 Contingent based management =2 Natural management =1	6	2
		2.Sourcing of inputs	Dependency on external inputs in pest management	Complete *in situ* management=3 Partially dependent on external inputs =2 Completely dependent on natural processes =1		
3.	Organic input use	Method of sourcing of bio-inputs	Extent of dependence	Complete internal sourcing of bio-inputs=3 Partial dependence on external bio-input=2 Complete dependence on external inputs=1	3	1
4.	Weed management and recycling	Management strategy	Type of practices followed	Slashing/cover cropping+ mulching=3 Slashing+ Burning=2 No weeding=1	5**	1
5.	Crop diversification	Diversity in variety and farm components	Varieties, crops and livestock components Use of on-farm seed and planting materials	2 or more varieties) + developed on farm (partially/fully)+livestock=3 < 2 varieties/crops with livestock=2 2/< varieties/crops without livestock=1	3	1
				Total score	25	07

*Additional score of 2, 1 and 0 for on farm soil conservation measures practiced, mulching and no conservation respectively

** Additional score of 2, 1 and 0 intensive water conservation measures, moderate water conservation measures and no conservation respectively

In addition to the scoring described in Table 3.4, a rating of zero was assigned to growers if they were in obvious violation of organic codes and practices. Scores of each dimension were added and then calibrated for uniform comparison to an aggregate rating of one to five, one being assigned to growers who took none of these affirmative steps, and five going to those who did all. Thus the total adoption score ranged between 1 and 5 on each dimension and the total score between 5 and 25 which was used in the calculation of Adoption Index (AI).

The dimension wise adoption index aided in the identification of areas that required concentrated interventions and was measured using the adoption scale used by Sriram (1997).

Accordingly adoption index was calculated as:

$$\text{Adoption index} = \frac{\text{Respondent's total score}}{\text{Total possible score}} \times 100$$

Respondents total score = total score obtained by a farmer on a dimension, multiplied by the respective weightage.

Total possible score = total of scores obtained on each dimension multiplied by the respective practice weightage

2. Relative yield between organic and conventional pepper production

Relative yiel**d** was defined as the yield gap that results from the difference in average yield of organic and conventional pepper. Mean relative yield was calculated and compared between highest and lowest values and based on the score the respondents were grouped at 10 percent interval in yield gap. For identifying the relative yield gap for different organic farmer groups, viz., certified and noncertified scientific and natural, relative yield gap of each group is calculated separately and the mean is compared with yield in organic farming as a percentage to conventional farming.

The formula used in the calculation of relative yield is as follows:

$$\text{Relative yield} = \frac{\text{Yield under organic farming}}{\text{Yield under conventional farming}} \times 100$$

3. Extension support efficiency of institutions involved in organic pepper production

Extension support efficiency (ESE) is defined as the extent of support and services provided for the organic pepper growers by different government institutions and NGOs involved in supporting organic black pepper production in the area. The major institutions identified to be included in the study were Peerumede Development Society (PDS), NGO, Krishibhavan (State Department of Agricultural Development and Farmer Welfare), Eco-development society (EDS) of the Department of Forests, Spices Board (Government of India) and Cardamom Research Station, Pampadumpara (KAU).

3.1. Extension support efficiency (ESE)

Extension support efficiency (ESE) of the various selected agencies was measured as the perception of individual respondents to the benefits of services provided by each of the selected institution. The determinants for measuring ESE identified through expert rating were adequacy, accessibility, credibility and timeliness of support and services. Each institution was rated on selected attributes by individual respondents in a five point continuum as given below and the aggregate score was used.

Response	**Score**
Never	1
Seldom	2
Occasionally	3
Frequently	4
Always	5

3.2. Perceived problems in institutional extension support of selected institutions

Problems in institutional extension support of selected institutions were measured in terms of the perception of extension officials about the constraints service delivery by the institutions supporting organic pepper cultivation in the area. Problems included for rating were poor accessibility, inadequacy of training in organic practices, lack of funding for credit support, lack of of availability of quality inputs, inadequate support in certification processes and lack of exclusive markets. These six identified problems based on expert rating were evaluated on a four point continuum as given below.

Response	Score
Not important	1
Slightly important	2
Important	3
Very important	4

B Independent variable

I. Personal attributes

a. Age

It was operationalized as the number of calendar years completed at the time of interview. The respondents were classified into young, middle age and old based on the procedure followed in census report of India (2011) with slight modifications.

b. Education status

It was operationalized as the literacy level acquired by an individual respondent. The respondents were categorized into four groups namely primary

level, high school level, higher secondary level and college level based on the level of education they acquired. Primary school denotes up to 7^{th} standard, high school level indicates up to 10^{th} standard, higher secondary level indicates up to 12^{th} standard and college level indicates possession of degree or diploma.

c. Experience in organic pepper production

It was operationalized as number of years the respondent has been engaged in organic pepper production. The respondents were classified into three groups as less than 10 years, 10 to 30 years and greater than 30 years based on the categorization used by Sabu (2015).

d. Scientific orientation towards organic farming

Science of organic farming is based on principles of inter-dependence, diversity and recycling fostered through biological and ecological processes and production methods (Altieri,1987). Accordingly scientific orientation towards organic farming was operationalized for the study as the degree to which an individual farmer is oriented towards following principles of agro-ecology and laws of natural ecosystems in the design and problem solving of pepper cultivation. It was measured following the scale suggested by Guthman (2000) with slight modifications and was based on the number of organic principles followed by the farmers in organic pepper cultivation as given in Table 3.5. Maximum score possible was eight and minimum was two. The individuals above the mean score were rated as farmers with high scientific orientation in organic farming.

Table 3.5. Factors selected to assess the scientific orientation

Sl. No.	Practice	Score
1	Extent of on farm fertility management	*In situ* organic measures 3, Ex situ organic measures1
2	Extent of on farm pest management	Prophylactic in situ management 2 Contingent external input management 1
3	Weed control measures	Recycling measures 1, Others 0
4	Including livestock component	Presence 1, Absence 0
5	Water and soil conservation measures	Presence 1, Absence 0

e. Credit status

It was operationalized as the total loan amount in rupees an individual respondent had borrowed from different sources such as private, cooperative banks and nationalized banks at the time of survey as credit for organic pepper cultivation.

II. **Farm characteristics**

a. Total farm size

It was defined as the number of hectors of land under farming owned and cultivated by the respondent.

b. Total area under organic pepper

It was defined as the number of hectares of land under organic pepper cultivation owned and cultivated by the respondent.

c. Annual income

It was defined as the total income generated by the respondent in a year by marketing organic pepper.

d. Share of pepper in total income

It was operationalized as the share of income generated from organic pepper marketed to the total income generated by farming and allied activities. It was accessed on the amount in rupees a respondent obtained by marketing pepper to different sources.

e. Status of livestock possession

It was operationalized as the number of livestock owned by an individual respondent at the time of survey.

f. Certification status of farm

It was defined as the possession of a valid certificate issued by an authorized organic certification agency.

g. Type of standards used

It was operationalized as the combination of standards an individual respondent had used to support pepper vines. The combinations identified were erythrina alone, erythrina and trees and trees alone. The combination existed in the farm on the time of investigation was recorded for measurement.

C. Marketing channels of organic pepper growers

It was defined as the channels used by individual respondent for marketing organic pepper. The number of intermediaries involved and their roles in the marketing channel was identified for this purpose. For analyzing the share of farmer in the consumer rupees, cost involved in each operation of marketing like primary processing, secondary processing, grading and transportation was calculated at farmers level and distributors level.

D. Constraints faced by organic pepper growers

It was defined as the constraints perceived by the individual respondents in adopting organic practices in pepper production. Based on the ranking by experts and review of literature 14 constraints were identified for including in the survey schedule. Respondents were asked to rate each constraint in a five point continuum as shown below:

Response	Score
Strongly disagree	1
Disagree	2
Moderately agree	3
Agree	4
Strongly agree	5

3.6. Methods of data collection

The study is based on both primary and secondary data. The details such as production, productivity, price variations, and cost of cultivation are collected from secondary data such as publications from spices board and other on-line sources. Preliminary information was collected in a FGD organized for the purpose in the area. Primary data was collected from farmers by interview method using pre structured interview schedule (Appendix I). Details of organic practices followed, use of organic inputs, soil conservation measures, marketing channels used, institutional support and constraints faced in organic pepper production were collected from farmers. Information on progarmmes for supporting pepper production and constraints in implementing the programmes were collected from official respondents using open ended interview schedule (Appendix II).

3.7. Statistical tools used

The data obtained from respondents are tabulated and analyzed using the following statistical tools. SPSS and Excel software were used to do the analysis.

3.7.1 Descriptive statistics

Percentage analysis, mean and standard deviation were used to compare data wherever necessary.

3.7.2 Kendalls' coefficient of concordance

Kendalls coefficient of concordance was used to evaluate the extension efficiency support of various institutions as perceived by the individual respondents.

3.7.3 Garrett ranking

Garrett ranking technique was used to rank constraints faced by farmers in organic pepper cultivation and to rank major drawbacks of institutions supporting pepper cultivation in the region as perceived by the individual respondent.

3.7.4 Mann whitney U test

The test was used to measure the relationship between adoption behavior of organic pepper farmers.

3.7.5 Binary logistic regression

The test was used to understand the variables which were affecting the scientific orientation of farmers.

Results and discussion

4. Results and Discussion

The results were analyzed within the framework mentioned in the methodology and according to specific objectives of the study. The findings of the study and the discussions about the results obtained are presented in this chapter under the following heads:

4.1. Personal and farm profile of organic pepper farmers

4.2. Classification of organic pepper farmers

4.3. Extent of adoption of organic practices

4.4. Relative yield in organic and conventional pepper production

4.5. Marketing channels used by organic pepper farmers

4.6. Perception of organic farmers on institutional extension support

4.7. Constraints faced by organic pepper farmers

4.1. Personal and farm profile of organic pepper farmers

Understanding the personal and farm characteristics of organic pepper farmers helped in analyzing and interpreting the results accurately. Results of selected variables used to characterize organic pepper farmers on personal attributes and farm characteristics are presented in Table 4.1 and Table 4.2 respectively.

4.1.1. Profile of organic pepper farmers on personal attributes

Results from Table 4.1 indicated that personnel attributes of organic pepper farmers showed maximum variation on age followed by experience in organic pepper and education which displayed high variation in range.

i) Age:

Average age of the farmers was 48 years with 52% above and 48% below the mean score. This along with range (28-63) indicated that organic pepper farmers belonged to young and middle aged categories. The detailed analysis found that 54% of farmers were of the age group of 30-50 years. Farmers belonging to the age group of less than 30 years were only 2 per cent of the total respondents. This clearly showed the reluctance among youth in taking up farming as their occupation. The results obtained are in accordance with the results of Sasidharan (2015).

(ii) Education:

On education the mean score of 2.23 revealed slightly above high school level of education, but 70% of the farmers had education score below the mean value. This is substantiated by the fact that higher secondary (19%) and high school (56%) were the dominant educational categories of the farmer respondents. Primary and collegiate levels covered only 14% and 11% respectively. Range from 1-4 also suggested wide variation among the educational level of the farmers.The results are similar to trends of the education status of Kerala (GOI, 2011).

(iii) Experience in pepper farming:

The distribution of organic pepper farmers based on their total farming experience as presented in Table 4.1 revealed that the organic pepper farmers had an average 25 years of experience in pepper farming. Moreover, the farmers were equally distributed at 50% above and below the mean score. Low value for range also indicated that there was not much variation in the total farming experience in pepper among the farmers. Distribution of farmers on farming experience in pepper showed that 62% were with experience of 10-30 years and 34% had more than 30 years in pepper cultivation. Only four per cent of the farmers reported less than 10 years of experience in pepper. Idukki being a traditional pepper growing tract and all the respondents having agriculture as the primary occupation

could testify the results. The results were in line with Sajitha (2012) who reported an average 35 years of experience in pepper crop for farmers of Idukki district.

(iv) Experience in organic pepper farming:

Organic pepper gained popularity in India towards end of 1990s with official extension services like Spices Board taking up organic projects in the district. Therefore, 2000 was taken as the base year for comparison of experience in organic pepper farming in the study. Results in Table 4.1 revealed that 57 percent of the pepper farmers had experience in organic cultivation of pepper above the mean score of 9.58 years. This indicated organic farming of pepper was accepted by the farmers of the district from its early years. This can be attributed to the fact that conventionally most of the farmers were not following high chemical input use in pepper farming due to favourable climate and soils that ensured good yield. Range indicated the presence of farmers with wide variation in years of organic farming experience that ranged from 3-15 years. This reflected the continuing trend of farmers changing to organic method in the area. Parvathy and Weibel (2015) obtained almost similar results in their study of black pepper.

(v) Credit status:

Important inference from the credit status assessment of organic pepper farmers was that 60 per cent of the farmers did not avail any loan. Mean score of credit amount owed by the organic pepper farmers to the various lending agencies was Rs 0.87 lakhs. Majority of 72 percent of the farmers had credit amount below the mean value that ranged from 0 to 12 which indicated relatively lower variation in the credit status. Also among the various sources of credit nationalized banks and cooperative banks had the maximum share in credit lending with 21 and 19 percent respectively. None of the farmers depended on private money lenders for loans. The results are in accordance with Rana*et al.* (2012).

Table 4.1 Profile of organic pepper farmers on personnel attributes (n=100)

Variables	Category	Frequency	Mean	Range
Age (years)	10-30	2	47.89	28-63
	30-50	52		
	50-80	46		
Education	Primary school	14	2.23	1-4
	High school	56		
	Higher secondary	19		
	College education	11		
Experience in pepper farming (years)	<10	4	25.12	8-40
	10 – 30	62		
	>30	34		
Experience in organic pepper farming*	<10	57	9.58	3-15
	>10	43		
Credit status (lakh Rs)	Availed Loan	40	0.87	0-12
	Not availed loan	60		

*2000 as base year

4.1.2 Profile of organic pepper farmers on farm characteristics

Results from Table 4.2 revealed that farm characteristics of organic pepper farmers showed maximum variation on share of organic pepper in total area, farm diversity status, farm size and annual income with wide range in scores. The detailed results of the selected farm characteristics of organic pepper farmers are presented.

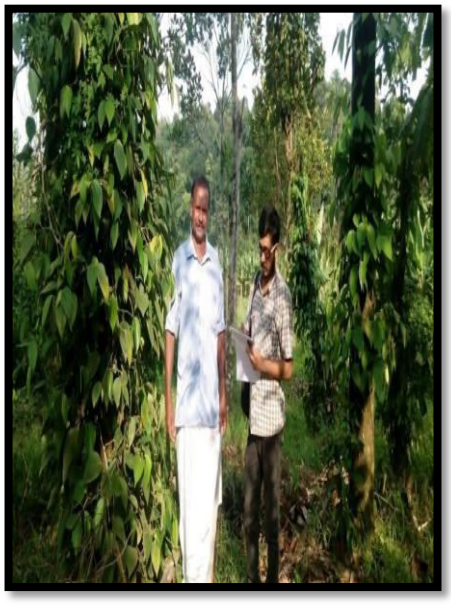


PLATE ONE – SURVEY OF ORGANIC PEPPER FARMERS

Table 4.2 Profile of organic pepper farmers on farm characteristics

Variables	Category	Frequency	Mean score	Range
Farm size (ha)	Small	64	2.49	0.4-15
	Medium	31		
	Large	5		
Area under organic pepper (ha)	Small	85	1.25	0.3-10
	Medium	12		
	Large	3		
Share of organic pepper in total area (%)	Less than 50	56	54.02	14.3-120*
	More than 50	44		
Annual income from organic pepper(Lakh Rs)	<2 lakhs	67	1.02	0.23-17.5
	2-5 lakhs	28		
	>5 lakhs	5		
Farm diversity status	With livestock component	50	3	1-5
	Without livestock component	50		

*Forest land without ownership also included

i) Farm size:

Results in Table 4.2 revealed that majority of the farmers (56%) under organic pepper farming had farm size below 2.49 ha which indicated small holding size. However, 44 per cent of the farmers were having medium sized and large sized holdings with acreage above 2.49 ha. The range was between 0.4 and

15ha that indicated the wide variation that existed in farm size among the farmers. The results are almost similar to the findings of Sabu (2014).

ii)Area under organic pepper:

The results from Table 4.2 showed that majority (66%) had area under organic pepper below the mean value of 1.25 ha. This is also reflected in the range from .3 to 10 ha which indicated high mean variation within the sample.

iii) *Share of organic pepper in total area:*

Results on the share of organic pepper in the total farm area revealed that 48 per cent of the respondent farmers had above 54.02 % of their total farm area under organic pepper. However, there was large variation in the share of organic pepper area among the farmers as suggested by the range. But it could be concluded that organic pepper was an important crop for majority of farmers in the area.

iv) Annual income from organic pepper:

The average annual income from organic pepper from the results was Rs.1.94 lakh. The annual organic pepper income that ranged between 0.23-17.5 lakhs was the result of wide variation in area rather than income as the income per ha had only small variations. The high returns also validated the high share of area under organic pepper. The results are similar to those obtained by Varghese (2012).

V) Farm diversity status:

Mean score of 3.0 on farm diversity status with 66 percent of organic pepper farmers above the mean score (Table 4.2) suggested the high importance given to livestock components and farm biodiversity in organic farming by the farmers. The results were in conformity with the findings of Parvathy and Weibel (2015).

Evaluation of the profile characteristics of organic pepper farmers in Idukki district helped in understanding the current scenario of organic pepper in the region. This enabled to probe into the agencies which are supporting organic pepper cultivation and the extent of support provided by each of the institutions. It also helped to identify the exact reasons of the constraints faced by organic pepper farmers together with other variables like adoption of organic practices. Here it is attempted to review the organic pepper production in detail and also to provide new dimensions to organic pepper cultivation. For achieving this objective adoption indices are calculated wherever it was necessary. The farmers were divided into certified organic farmers and Non-certified organic farmers in a clearly defined manner. Finally the results are summarized in different angles in a consolidated manner so that the performance evaluation of organic pepper in Idukki district is presented in a comprehensive manner.

4.2. Classification of organic pepper farmers

Certification of pepper production by accredited agency and the perception of farmers regarding their extent of dependence on external inputs for maintaining organic principles of farm management were used in the classification of organic pepper farmers. The results on different categories of organic pepper farmers are presented under the following sub-heads.

4.2.1 Classification of organic pepper farmers based on certification

Organic certification provided the public assurance that the products were grown and handled according to strict procedures and standards that prevent the use of any chemical that harmed health of men or nature (Coleman, 1999). Therefore, certification of organic standards followed in pepper production by an accredited agency was used in the study as an authentic criteria to classify organic pepper farmers into certified organic farmers (COF) and non-certified organic farmers (NcOF). The results of classification based on certification status of farms given in Table 4.3 indicated that 45 per cent of farmers had certification from accredited agencies whereas 55 per cent were functional organic farmers

who relied on trust and goodwill. It was revealed that all of the COF were facilitated for the certification process by the two major extension agencies that promoted organic pepper cultivation in the area viz. Peremedu Development society (PDS) and Eco-development Society (EDS).

Table 4.3. Distribution of organic pepper farmers on certification status of farm

Major facilitating agency	Category of organic farmer			
	Certified Organic Farmer (COF)		Non-certified Organic Farmer (NcOF)	
	Frequency	Percentage	Frequency	Percentage
Peermedu Development society (PDS)	30	66.66	55	100
Eco-development Society (EDS).	15	33.33		
Total	45	100	55	100

The results from the Table 4.3 indicated that around 67 per cent of certified farmers were facilitated by the extension services and support of PDS and 33 percent were under the patronage of EDS. It was significant to observe that none of the public sector extension agencies in the area like Krishibhavan under the State Department of Agriculture or Spices Board had supported certification process. The major organic certifying agencies that have agreement with the NGOs for undertaking organic certification of pepper in the area are listed in Table 4.4. Most commonly used agency by farmers is NPOP which is used by more than 60 per cent of the organic farmers. PDS have linkage with other international agencies like USDA, European Union and Japanese Agricultural Standards (JAS).

Table 4.4.Major certifying agencies for organic certification of pepper

Sl.no.	Name of certifying agency	Apex organization
1.	National Programme for Organic Production (NPOP)	APDEA-Ministry of Commerce and Industry, Government of India
2.	USDA label	United States Department of Agriculture, Agricultural Marketing Service
3.	European Union	Agriculture and Rural Development Department of the European Commission
4.	Japanese Agricultural Standards	Ecocert
5.	BUD label	Biosuisse, Switzerland
6.	Demeter, biodynamic	Demeter,USA

4.2.1.1. Profile characteristics of certified and Non-certified pepper farmers

An attempt was made to compare COF and NcOF on the selected profile characteristics and the results are presented as Table 4.5.The results show that certified farmers are younger than the Non-certified organic farmers and had more experience in organic pepper cultivation. Non-certified farmers had more farm area than certified farmers but area under pepper is more for certified farmers. Irrigation status suggests that Non-certified farmers are having more area under irrigation. Farmers however are not very keen in irrigating pepper and the crop is irrigated only on critical conditions of wilt. It is reflected in the low productivity of the crop in Kerala. The results also shows income from organic pepper is more for certified farmers and also the share of pepper on total income is also considerably high. The main reason for that is certified farmers are getting a steady and premium price for their produce. It is clear that if more farmers are brought under certification through effective govt. intervention then the income level of farmers can be increased substantially.

Table 4.5 Comparison of COF an NcOF on selected profile characteristics

Sl. No.	Variables	Certified organic farmer (COF)		Non-certified organic farmer (NcOF)	
		Mean	SD	Mean	SD
1	Age	47.42	7.32	59.0	8.27
2	Education	2.02	0.78	2.47	0.84
3	Experience in farming	25.36	7.76	24.93	8.85
4	Experience in organic pepper farming	10.49	2.45	8.84	3.33
5	Farm area (ha)	2.25	1.86	2.67	2.27
6	Area under organic pepper (ha)	1.27	1.10	1.24	1.40
7	Share of organic pepper in total area (%)	61.28	18.5	48.08	16.99
8	Irrigation status (Area under irrigation)	1.05	0.54	1.42	0.94
9	Credit status	0.28	0.68	1.35	2.60
10	Annual organic pepper income (lakh Rs)	2.12	1.65	1.79	2.46
11	Share of organic pepper in total income (%)	60.11	25.63	43.20	32.65
12	Farm diversity status	3.02	1.01	3.03	1.35

4.2.2 Classification of organic pepper farmers based on perceived external input dependency

It was observed that there existed wide variation in the cultivation practices followed by both COF an NcOF. This variation resulted from the rich forest soils and favorable climate in the area that conventionally supported pepper production with minimum use of external inputs. There were farmers who cultivated on forest land with zero input use and were mostly facilitated by EDS. However, majority of other extension agencies in the area like PDS, State Department of Agriculture and Spices Board promoted use of bio-inputs in organic farming. In order to accommodate these wide variations in input use dependence the organic farmers were categorized based on their perceived

dependence on external inputs for maintaining organic principles in farm management into scientific organic farmers (SOF) and natural organic farmers (NOF). The results from Table 4.5 indicated mean score on perceived external input dependency (PEID) calculated at 3.49. Organic pepper farmers who secured score above the mean are classified as scientific organic farmers and below the mean score were classified as natural organic farmers. It is observed from the table that NOF were the majority consisting of 58 per cent whereas the SOF constituted only 42 percent of organic pepper farmers. This can be attribute to the fact that EDS, a major extension agency working in organic pepper, promoted natural organic farming with minimum input use as indicated by all the 15 farmers under it had PEID score below mean value of 3.49. However, majority of PDS certified farmers (17%) belonged to SOF category.

Table 4.6. Distribution of organic pepper farmers on perceived external input dependency(N=100)

Category of Organic farmer	Mean PEID score	Frequency of COF		Total COF	Frequency of NcOF	Total (%)
		PDS	EDS			
Scientific organic farmer (SOF)	>3.49	17	NIL	17	25	42
Natural organic farmer (NOF)	<3.49	13	15	28	30	58
Mean= 3.49, S D =1.6						

4.2.4 Factors affecting adoption of scientific organic practices

External input dependency was taken as the dependent variable with value of one for the values above mean and zero for below mean. According to the binary

logistic regression analysis, it was found that the major factors affecting the scientific orientation of farmers are age, total area and income. These are the major factors that influence the external input dependency rank from low to high. Out of this income is the variable which can be modified through external interference. If proper market and additional income can be assured then there is a greater chance that more organic pepper farmers will adopt scientific management practices. Also bringing more young farmers into the sector also improves the scientific management of organic pepper.

Table 4.7 Factors affecting scientific orientation of organic pepper farmers

Variable	Odds ratio	Probability (Per cent)
Age	1.10	52.38%
Experience	.88	47.03%
Total area	1.38	57.98%
Area under pepper	.648	39.32%
Income	1.0	50%

4.3. Extent of adoption of organic practices in pepper

Extent of adoption of organic practices by pepper farmers were quantified in terms of the following five major dimensions of organic pepper cultivation.

1 Practices to sustain soil fertility (with additional score for soil conservation measures)
2 Practices related to organic pest management
3 Extent of use of organic inputs
4 Extent of use of innovative weed management(with additional score for irrigation water conserving measures)
5 Extent of farm diversification

Aggregate adoption index (AI) was also worked out for organic pepper farmers and independently for COF and NcOF. The results of extent of adoption of organic practices are presented under the following heads.

4.3.1. Extent of adoption of soil fertility management practices in organic pepper

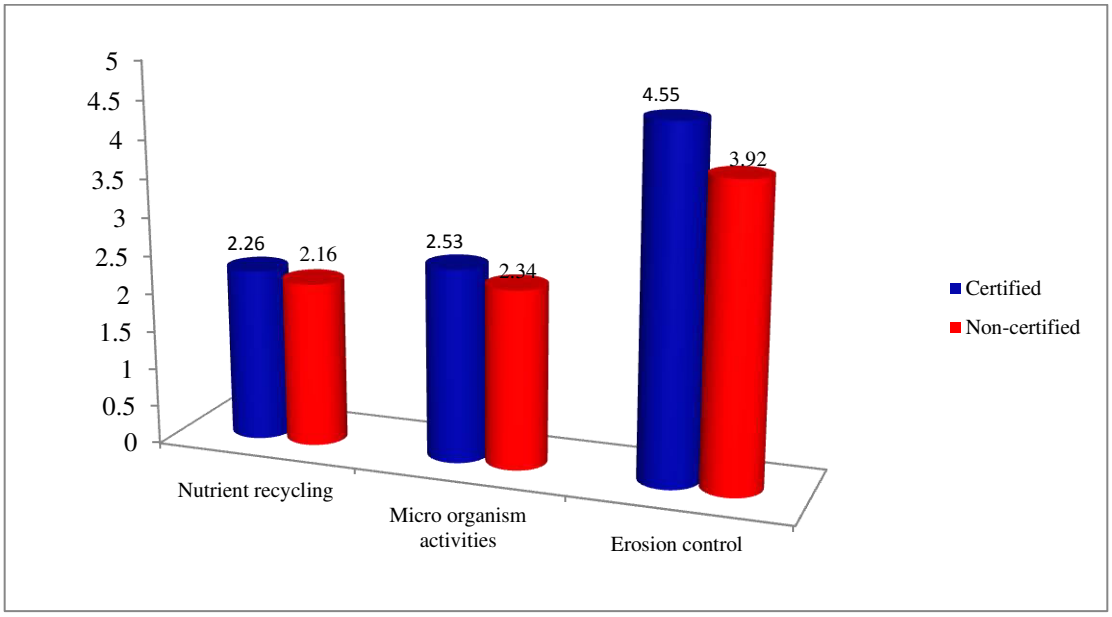
Organic farming promoted soil management using natural inputs, which did not cause any harm to the humans or to the environment (FAO, 2005; Chandrashekar, 2010). Therefore, an assessment of the extent to which the organic pepper farmers adopted these practices in soil management is imperative. Organic nutrient management and recycling, practices relate to improving micro-organisms in soil an soil conservation measures were the components on which organic soil management was assessed and the results are given in Table 4.8.

Table 4.8Adoption of soil management practices by organic pepper farmers

Components of soil fertility management	Adoption score	
	Certified organic farmer	Non-certified organic farmer
Organic nutrient management and recycling	2.26	2.16
Enhancing soil micro-organism activities	2.53	2.34
Soil erosion control measures	4.55	3.92
Average total score	**3.11**	**2.81**
Adoption index	**62.34**	**52.36**
Total adoption index of organic pepper farmers (AI)	**56.85**	

The results from Table 4.8 showed that certified farmers had high adoption score for soil fertility management practices. Soil erosion control measure had the maximum score for both the certified and non-certified groups of farmers. The advantage of higher ratio of scientific farmers in certified group was reflected in

Figure 3 Adoption score of organic farmers on soil fertility management practices



the adoption score. Nutrient recycling and enhancing soil organism activities were adopted more by certified farmer.

4.3.2. Extent of adoption of practices related to organic pest management in pepper

Adoption scores of organic control of pest population is presented in Table 4.9 The adoption index for both certified and non-certified farmers were high though certified farmers had better scores. Avoidance of chemicals is practiced by most of the farmers but some reported the use of chemicals on phytophthora rot incidence.. Prophylactic measures were adopted more by Non-certified farmers due to the belief of some of the certified farmers that Bordeaux mixture is not permitted in organic farming.

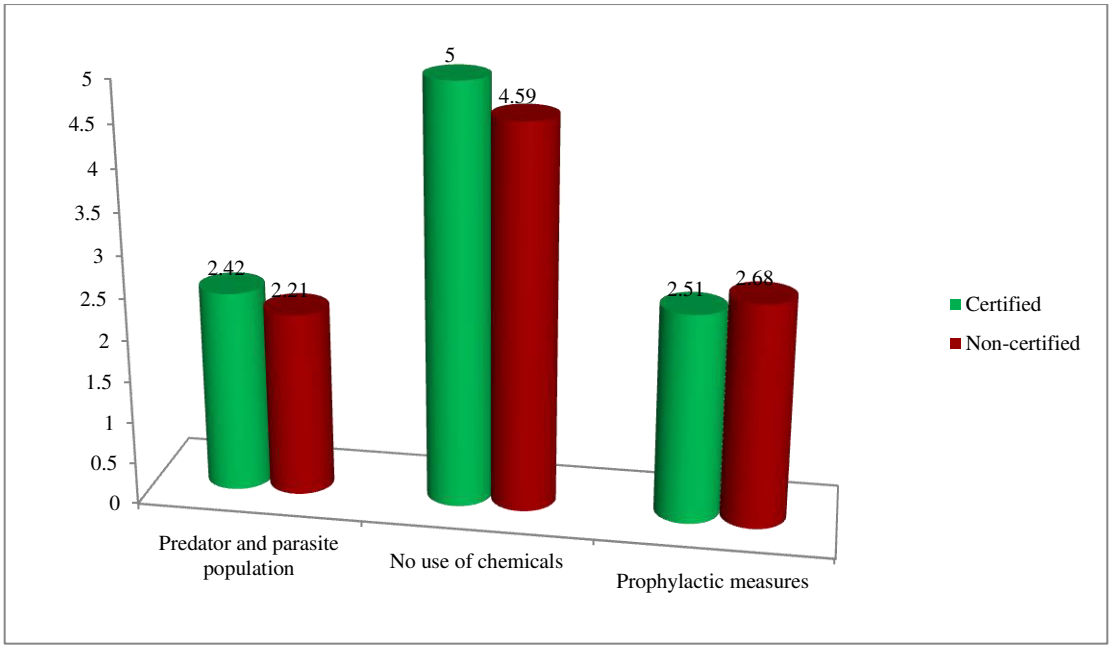
Table 4.9 Adoption scores of organic pepper farmers in pest management

Organic pest management Practices	**Adoption score**	
	Certified organic farmer	**Non-certified organic farmer**
Build up predator and parasite population	2.42	2.21
No use of chemical pesticides or fungicides except Bordeaux mixture	4.59	5
Prophylactic measures to avoid incidence of disease and pest	2.51	2.68
Average total score	**3.31**	**3.16**
Adoption index	**66.29**	**63.23**
Total adoption index(AI)	**64.60**	

4.3.3. Extent of adoption of organic inputs in pepper.

The results on the extent of adoption of organic inputs by the two major groups of organic pepper farmers are presented in Table 4.10. Except for the use of Bordeaux mixture, certified farmers had adopted more organic input usage than

Figure 4 Adoption score of organic farmers on organic pest management practices



noncertified farmers. The main reason for this is the support provided by the PDS and EDS to the organic farmers by providing quality organic inputs free of cost. Composting was the practice adopted maximum by certified farmers while use of Bordeaux mixture was the practice adopted maximum by Non-certified farmers. It also reflected that Non-certified farmers are not as inclined to depend on adopting organic practices.

Table 4.10 Adoption scores of organic pepper farmers on extent of use of organic manures

Use of organic inputs	Adoption score	
	Certified organic farmer	**Non-certified organic farmer**
Composting	2.48	2.18
Use of bio pesticides	2.40	2.15
Use of bio fertilizers	2.18	2.12
Use of Bordeaux mixture	2.07	2.45
Average total score	**2.22**	**2.28**
Adoption index	**45.74**	**44.54**
Total adoption index(AI)	**45.08**	

4.3.3. Extent of use of innovative weed an water management practices

It can be observed from the results of Table 4.11 that certified farmers concentrated more on slashing for weed management in organic pepper cultivation. The share of other crops in the total area was very low for certified farmers compared to noncertified farmers. This also reflected the help provided by the respective NGOs in educating the farmers in organic certification procedures. While most of the farmers did not resort to burning of the weeds some farmers who adopted zero external input use strategy used burning of the weed plants in the field.

Figure 5 Adoption score of organic farmers on use of organic inputs

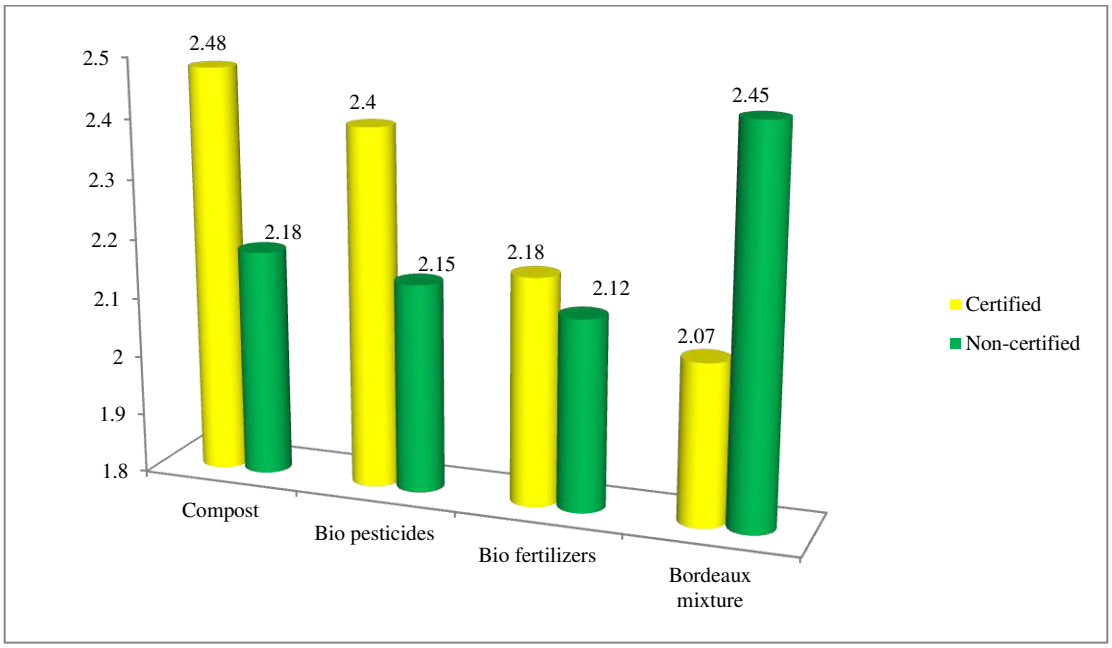


Table 4.11 Adoption scores of organic pepper farmers on organic weed management

Organic weed management Practices	Adoption score	
	Certified organic farmer	**Non-certified organic farmer**
Use of slashed material as such	3.66	3.12
Weeding limited to slashing as far as possible and burning used as the last resort	4.81	4.87
Intensive cropping	1.81	3.87
Average total score	3.43	3.73
Adoption Index	68.64	74.74
Total adoption index (AI)	**71.99**	

4.3.3. Extent of adoption of farm diversification practices

It can be inferred from the results in Table 4.12 that certified farmers were more interested in pepper and not very keen on diversifying the farm. Certified farmers mostly used proven disease resistant local varieties than HYV. Adoption rate of integrated farming was more among the Non-certified farmers. But it can be attributed to the reason that EDS farmers used forest land in farming and as such could not undertake livestock farming. The adoption rate of local varieties was high for both certified and Non-certified farmers indicating that the farmers are more interested in growing varieties that are existing in the area earlier and has shown greater adaptability. The higher adoption rate of NcOF clearly shows that they were more interested in the proven adapted local varieties rather than high yielding varieties.

Figure 6 Adoption score of organic farmers on organic weed management practices

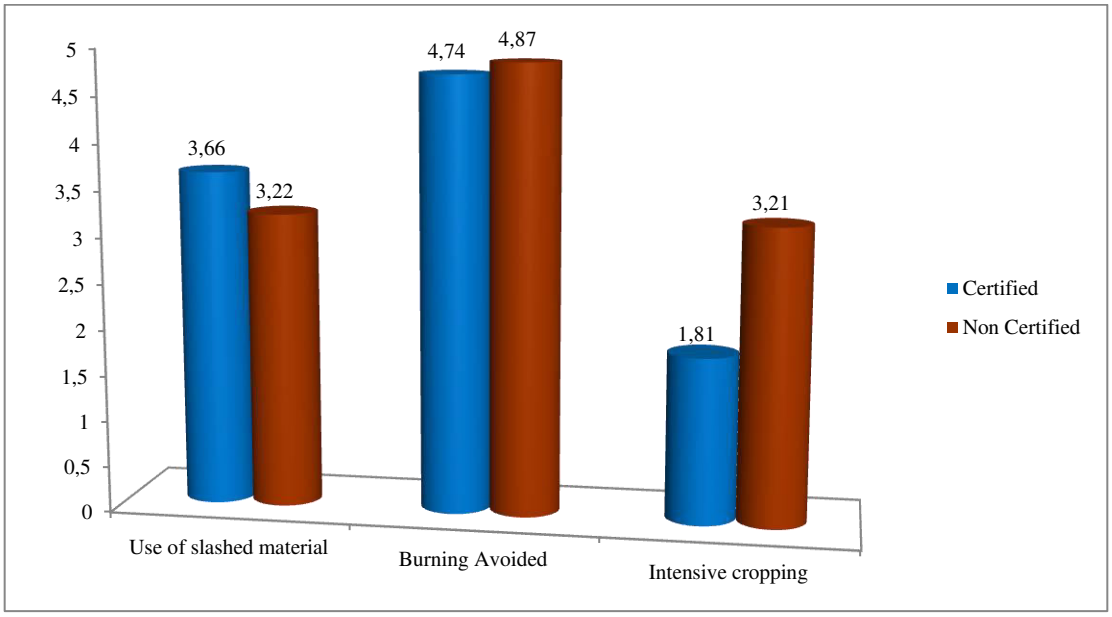


Table 4.12Adoption scores of organic pepper farmers on farm diversification

Farm diversification components	Adoption score	
	Certified farmer	Non-certified farmer
Planting high yielding varieties	1.70	1.87
Integrated farming	3.37	3.54
Use of traditional disease and pest resistant varieties	3.48	3.33
Average total score	**2.85**	**2.91**
Adoption index	**57.37**	**58.38**
Total adoption index of organic pepper farmers (AI)	**57.92**	

4.3.6 Distribution of organic pepper farmers based on adoption index (AI)

The table 4.13 shows that except for organic input usage for all other practices the highest proportion of farmers fall under medium level of adoption. For input usage most of the farmers were having low adoption index with 63 percent of farmers. Percentage of farmers with high adoption index was only less than 20 per cent for all the practices that was studied. It clearly shows that the organic farmers are not adopting the practices to the potential. Lack of proper training and unawareness about proper organic practices were the most important factors that hinder the adoption behavior of farmers. It clearly underlines the importance of having an institution with mandate of pepper research to be established in the area so that they can come up with new varieties and also effectively carryout extension work by training and empowering the farmers.

Figure7 Adoption score of organic farmers on farm diversification

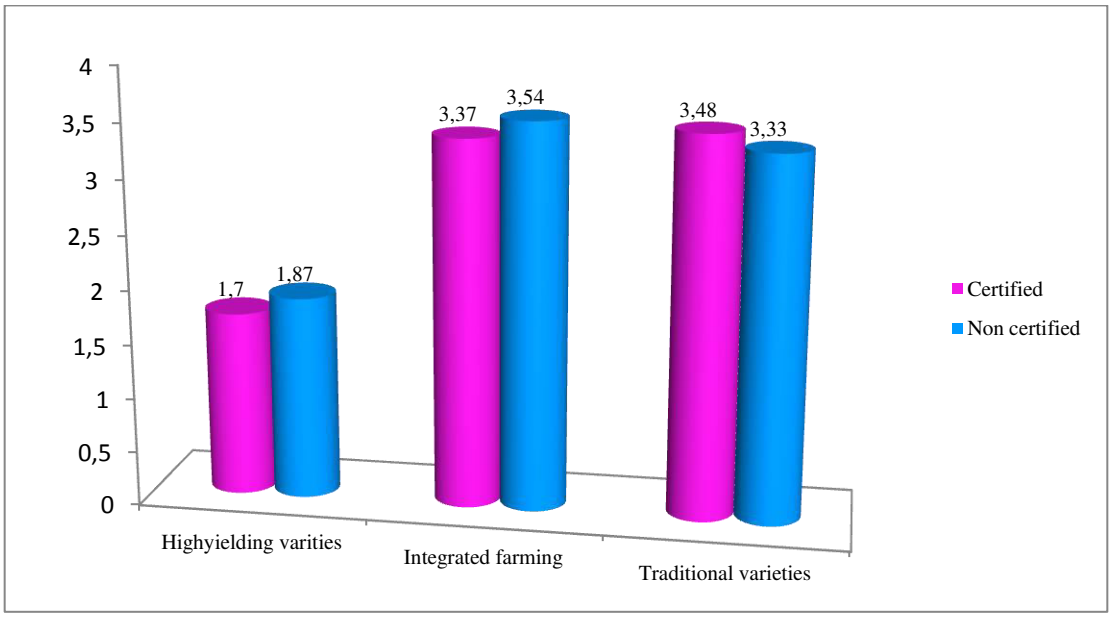


Table 4.13Distribution of organic pepper farmers based on adoption index

Practice	Low	Medium	High
Soil fertility management	18	66	16
Organic pest management	7	81	12
Organic input use	63	23	14
Weed management	28	60	12
Crop diversification	17	65	18

Table 4.14 Comparison of certified and Non-certified organic pepper farmers on adoption Index

Mean rank		Mann-whitney	Z value	Sig.(2 tailed)
Certified	**Non-certified**			
51.81	49.43	1178.500	-0.409	0.683

The table 4.14 showed the results of Mann-Whitney U test and it indicated that there was no significant difference in total adoption of organic practices among the two groups. However higher rank for certified farmers indicated that the adoption behavior was higher in the certified group.

4.3. Relative yield in organic and conventional pepper production

A major critique against organic agriculture has been the lower yields which warranted the need for more land to produce the same amount of produce as from conventional farms. This has high significance in the inherently fragile ecological zones of the study area as it can lead to more widespread deforestation and biodiversity loss. Therefore, an attempt was made to compare the organic and conventional yields of pepper recorded in the study. The analysis of data showed that the average organic-to-conventional yield ratio in pepper was 0.83. This indicated that overall the organic pepper yields were 17 per cent lower than conventional.

Table 4.15 Relative yield of organic and conventional pepper

Yield parameters	Organic (kg/ha)	COF	NcOF	Conventional (kg/ha)
Average yield (kg/ha)	632.88	686.00	588.00	760.00*
Organic-to-conventional yield ratio	0.82	0.90	0.73	-
Relative organic yield gap (%)	16.73	7.90	22.50	-

*Taken from the study of Varghese (2012) in the same area

The results were in conformity with the findings of Seufert *et al.* (2012) and Ponti *et al.* (2012) which reported lower comparative organic yields with respect to conventional agricultural yields. Although there was no significant difference in the adoption of organic practices, certified farmers were adopting more organic practices than non-certified farmers. The farmers under PDS were not adopting any type of input usage but were farming in forest land with high fertility. These factors contributed to an advantage of about 100 kg in yield for certified organic farmers. This stressed the need for niche pricing and developing exclusive markets for organic produce so that the loss can be compensated.

Table-4.16 Comparison of different categories of organic pepper farmers on relative organic yield gap

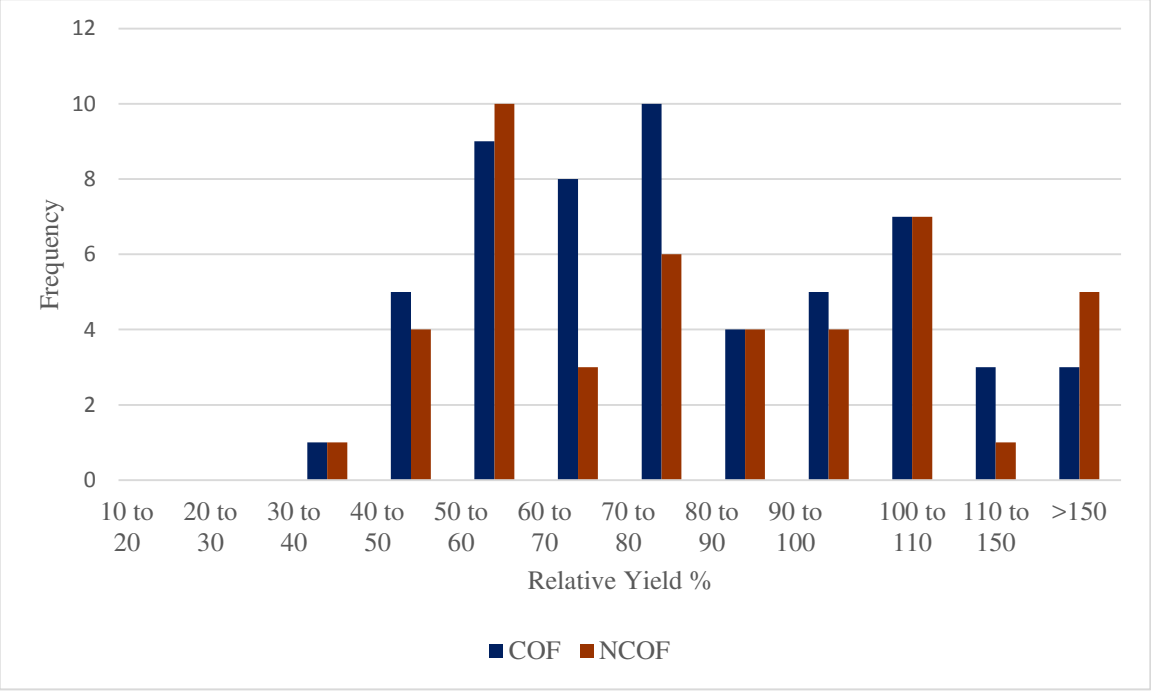
Yield parameter	Certified organic farmers		Non-certified organic farmers	
	Scientific	Natural	Scientific	Natural
Relative organic yield gap (%)	-23.67	29.91	17.89	26.34
Total	7.90		22.50	

The table shows that scientific farmers had lower yield gap than that of natural farmers. Certified scientific farmers had the lowest value of -23.67 while certified natural farmers had highest value of 29.91. While examining the relative organic yield of certified and noncertified farmers we can see that certified farmers has got substantially lower index than that of Non-certified farmers. The lesser yield gap of scientific farmers can be attributed to greater adoption of organic practices by scientific farmers. The analysis also indicates that certified farmers are following more scientific method of organic farming. The distribution of farmers based on relative organic yield is depicted in Fig. 8.

4.4. Marketing channels used by organic pepper farmers

The marketing of organic pepper was analyzed to understand about the marketing channels used by organic pepper farmers and to analyze the price spread of organic pepper in different channels. The results revealed the presence of separate market channels for COF andNcOF in the stuy area. Direct markets were facilitated by NGOs involved in certification of organic pepper farmers where as NcOF had to depend on open markets and few health resorts to sell their produce. The results of organic pepper marketing are summarized as follows:

Figure 8 Distribution of organic farmers based on relative yield



4.5.1. Marketing channels of certified organic pepper farmers

The marketing of organic pepper by COF depended on the facilitating extension agency involved in promoting organic farming. Distinct market channels identified for COF promoted by EDS and PDS in the area are described.

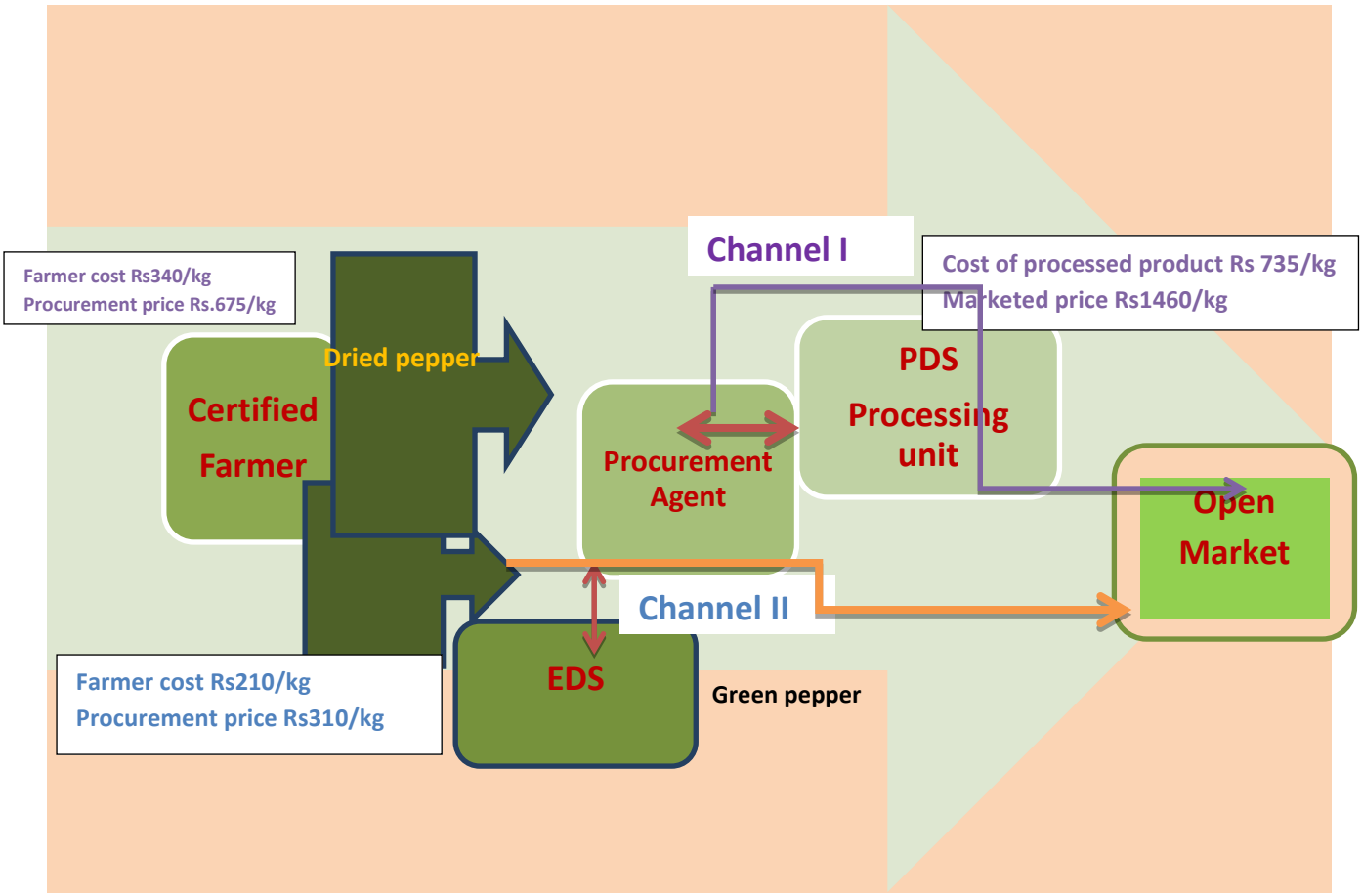
4.5.1.1.Marketing channels of EDS farmers:

COF of EDS followed a three step channel that consisted of direct field procurement of green pepper. Procurement was done by a trading agency selected each year based on competitive bidding by the EDS. The selected agency procured green pepper directly from the farmers' field at prices accepted in the tender. This ensured better prices for the farmers as they did not have to spend on processing or transportation of the produce. The average procurement price received by the farmers under this system for 2014-15 was Rs. 300 and the steps are depicted in Fig 9.

4.5.1.2.Marketing channels of PDS farmers:

The produce of COF under PDS was procured directly from the field by the procurement agents employed by the NGO. They procured all the produce to be marketed free of cost. The agent was also involved in the supply of inputs required for farming and monitored the verification procedures for the regular renewal of organic certification. The procured pepper was processed at the processing unit into 10 different organic pepper products by strictly adhering to the export product standards. The organic pepper products were three grades of whole black pepper, dehydrated green pepper, butcher cut black pepper, white and black pepper crushed, white whole pepper, black pepper ground and green pepper in brine. After processing the product is exported and hence the marketing channels beyond processing could not be identified. An illustration of the stages in marketing and price spread is presented in Fig. 9.

Figure 9 Marketing channel for Cerified farmers



The results on marketing channel of COF showed minimum intermediaries and as such ensured maximum benefit to the farmers. It was significant to note that none of the certified farmers traded directly in the market. All of them depended on the respective facilitating extension agency for marketing and as such indicative of market-led extension strategies for popularizing organic farming in general and organic pepper specifically. Moreover, the procurement facilitators also ensured certification of the production processes.

4.5.2. Marketing channels of non-certified organic pepper farmers

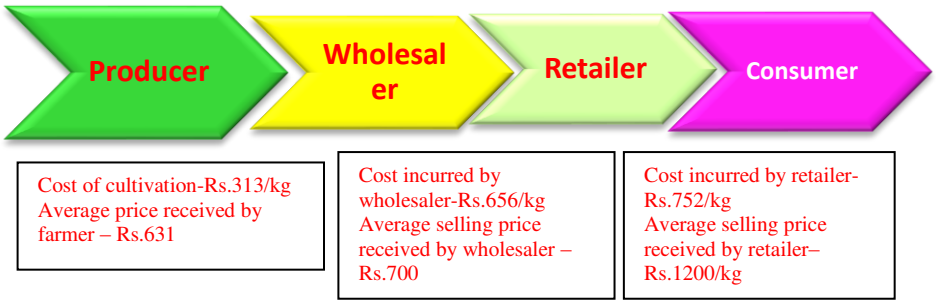
Marketing of black pepper either as raw produce or after processing was prevalent among the NcOF. Two major types of marketing channels were identified among NcOF. The most popular market channel used by 68 per cent of NcOF involved four major actors including the farmer as shown in Fig 10. The flow of produce from producer to consumer in the channel had two intermediaries in the form of wholesaler and retailer. Another less practiced market channel involved a five step flow that included a commission agent and domestic exporter between the producer and consumer as depicted in Fig. 10. In this the commission agents collected the produce from all the wholesalers in the area and assembled it for domestic export.

For Non-certified farmers two types of marketing chain occurs. Farmers either market the produce as raw or after processing. The main difference in market chain between certified and Non-certified farmers is that for Non-certified farmers have to bear all the expense for marketing themselves. Commission agents collects the produce from all the wholesalers in the area and assemble it for domestic export.

4.3.3. Comparison of marketing channels of COF andNcOF in pepper

The main difference in market chain between certified and non-certified farmers was that there was no extension support in meeting the market related expenses for NcOF and they had to meet it themselves. This affected their net returns as is evident in the price spread analysis summarized in Table 4.17. Price

Figure 10 Marketing channel of Non-certified Organic Farming



parameters described in the table illustrated that the profit of certified farmers was more compared to non-certified farmers in terms of their income from organic pepper. The advantage for COF was that they did not incur any transportation cost and had the benefit of assured market for their produce. As the certification cost is met by the facilitating agencies involved i.e., PDS and EDS, the cost of certification was not included.

Table 4.17 Comparison of price received for organic pepper by COF and NcOF

Cost parameters (Average per kg)	**Certified farmer (Rs)**		**Non-certified farmer (Rs)**	
	Green pepper	Dry pepper	Green pepper	Dry pepper
Cost of cultivation	210	315	250	288
Cost incurred for transportation	0	0	25	25
Cost incurred for drying	0	25	0	25
Cost incurred by producer	210	340	275	338
Price received by producer	310	675	300	631
Net profit (%)	**100 (47.61%)**	**335 (98.52%)**	**25 (9.09%)**	**293 (86.68%)**

The price spread of whole dry organic pepper in the two popular marketing channels of COF an NcOF are described in Table4.18. Results indicated change of around 116.29 per cent increase from farmer to consumer for certified organic pepper. Even the market channel of non-certified organic pepper that involved wholesalers and retailers in between consumer and producer recorded an increase of 10.93 per cent. The results were indicative of value creation due to certification and processing in realizing the full potential of price advantage of organic products. This can be utilized fully to the advantage of farmer only by creating unique market space for organic produce and by empowering farmers to enter export market directly by meeting the required fair trade standards of organic production.

Table 4.18 Comparison of net profit share in major marketing channels of whole dry organic pepper

Cost parameters (Average per kg)	Certified organic pepper (NGO)(Rs/kg)	Non-certified organic pepper (Wholesaler) (Rs/kg)
Cost incurred by the producer	340.00	313.00
Price received by the producer	675.00	631.00
Processing cost	60.00	25.00
Price paid by the consumer	1460.00	700.00
Percentage change in price received by the producer and price paid by the consumer	116.29%	10.93%

4.3. Perceived institutional extension support efficiency to organic pepper

Kendalls coefficient of concordance was used to analyze the perception of organic pepper farmers on extension support efficiency. The statistic W is used to identify significantly associated institutions in organic pepper. The results obtained were summarized based on perception of certified and non-certified organic pepper farmers.

4.6.1. **Perception of extension support efficiency of organic pepper farmers**

Perception of organic farmers on extension support was analyzed to evaluate the performance of various institutions supporting organic pepper cultivation. Kendalls Coefficient of Concordance was used to identify the unanimity of responses by the individual farmers.

Table 4.19 Perception of organic farmers on extension support efficiency to organic pepper (n=85)*

Institution	Accessibility	Extent of support	Adequacy of support	Credibility	Timelines
Krishibhavan	2.73	2.92	2.85	2.72	2.85
Indian Cardamom Research Institute	2.23	2.13	2.33	2.03	2.35
Peermade development society	3.50	3.47	3.38	3.53	3.55
Cardamom Research Station	1.53	1.48	1.43	1.72	1.25
Kendalls W	0.454*	0.527*	0.465*	0.434*	0.602*

(*EDS was excluded since the sample size was very low and farmers other than those cultivate pepper in forest land had no association with the institution).

The table 4.19 suggests that the support by institutions on organic pepper production is not adequate. The main drawback is lack of an institution which has research on pepper as its main mandate. The mean rank is more for Peermade Development Society for most of the category which is a reflection that it is the institution which has gained more popularity among pepper farmers. Peermade Developmant Society is supporting the farmers for acquiring organic certification and also provides complete market support..Krishibhavan is providing planting materials but the quality of the same is not ensured which resulted in losses to some of the farmers. They are also providing bio fertilizers but the quantity is not sufficient to cover even one fourth of the total area owned by farmers. Cardamom research station is providing bio fertilizers but the cost is not affordable to small farmers. Their main objective is research in cardamom and therefore no much effort is taken to undertake pepper development projects. ICRI under Spices Board provides organic inputs and polythene sheet for drying pepper. There also the main mandate is cardamom development.

4.7. Constraints in organic pepper production

4.7.1 Constraints in extension support services to organic pepper production as perceived by extension officials

This was recorded as the major draw backs perceived by the extension officials regarding institutional support to organic farming. Garrett ranking was used to identify the major constraints faced by extension officials. Table 4.20 reveals that extension officers have perceived lack of availability of quality inputs and lack of proper training regarding organic practices as the major constraint. Lack of accessibility was also identified as a constraint due to overload of office works resulting in lesser time to concentrate on extension activities. Some of the farm areas are located in very remote area and there was no sufficient transportationfacility for the extension officers to reach those areas.Not having facilities to initiate organic certification was not considered as a higher concern by extension officials.

Table 4.20 Major constraints faced by extension officials

Sl. No.	Constraints	Garrett score	Rank
1	Inaccessible terrain	1677	4
2	Proper training regarding organic practices are not provided	1708	2
3	Lack of proper funding for credit support	1667	5
4	Lack of availability of quality inputs	1758	1
5	Inadequate facilities to provide support for certification	1623	6
6	Lack of priority for developing exclusive market for organic pepper	1686	3

4.7.2 Constraints in organic pepper production by farmers

It was defined as the major constraints faced by organic pepper farmers in adopting organic pepper cultivation. The constraints were ranked using Garrett ranking and the following results were obtained.The table 4.21 based on Garrett score reveals that lack of exclusive markets and low productivity are the major constraints faced both by certified and non-certified organic farmers. Lack of exclusive credit agencies was perceived as an important constraint by farmers certified under EDS since they do not possess owned land. Another important constraint identified was unawareness on export standards which stress the importance of training so that the advantage of certification can be utilized to maximum. Finding alternatives to pesticides was perceived as a medium level constraint by both the groups and unavailability of organic inputs was not perceived as an important problem.

Table 4.21 Constraints faced by farmers in organic pepper production

Sl. No.	Constraints	Certified Farmer (Garrett score)		Non-certified farmer (Garrett score)
		PDS	EDS	
1	Low productivity	2167 (II)	1003 (VI)	3937 (II)
2	Lack of exclusive markets	2098 (III)	1051 (I)	3956 (I)
3	Unawareness of specified standards	2069 (V)	1013 (V)	3927 (III)
4	Lack of quality planting materials	2168 (I)	975 (X)	3846 (V)
5	Lack of opportunity for niche pricing	2067 (VII)	1050 (II)	3832 (VI)
6	Labour shortage	2000 (XI)	985 (VII)	3867 (IV)
7	Complicated extensive certification procedures	2068 (VI)	1035 (IV)	3745 (IX)
8	High production cost	2074 (IV)	960 (XII)	3800 (VIII)
9	Poor quality of availability inputs	2029 (X)	971 (XI)	3828 (VII)
10	Unavailability of exclusive credit agencies	1987 (XIII)	1039 (III)	3736 (X)
11	Finding alternative to chemical pest control measures is difficult	2034 (IX)	981 (VIII)	3727 (XI)
12	Lack of knowledge about best organic practices	2035 (VIII)	980 (IX)	3680 (XII)
13	Lack of authorized proof to prove authenticity	1960 (XIV)	955 (XIII)	3664 (XIII)
14	Non availability of organic manure	1995 (XII)	935 (XIV)	3591 (XIV)

(Value in parenthesis indicate respective rank)

Summary

5. Summary

5.1 Organic pepper scenario in Idukki district

The scenario of organic pepper in Idukki district can be analyzed in three different stages. The first stage is the era prior to 1980s. The main characteristics of the period were low input use i.e. growing the crop with minimum management practices. But during the period the yield was very high and pest and disease incidence was very low. Marketing channel followed at that time included intermediaries who collect pepper from farmers and take a portion of the profit. Farmers however received reasonable price during the period.

The next stage from 1980 to 2000 witnessed changes that turned the scenario of pepper production in the region completely. Farmers started to use more inputs and started to commercialize the pepper production. Quick wilt became a major problem and use of chemicals like phytolan increased. The price of pepper became highly volatile and some farmers faced losses. During the same period World Trade Organization formulated strict rules for export of agricultural produces. This resulted in returning of the consignments of exported pepper due to high quantity of pesticide residue. New agencies were formed for uplifting the pepper farmers in the area and the most important of them was Peermade Development Society.

In the next stage i.e. post 2000 the NGOs like Peermade development Society and Eco Development Society began to provide support to organic certification to help the farmers to avoid market risk. PDS was more entrusted on scientific management of pepper while EDS was more concerned about ecological safety. They provided complete support for certification and marketing. But still the frequency of farmers who are coming forward to certification is less and a majority of the farmers are still cultivating pepper as organic by default.

It is in this context the results were analyzed and tried to enunciate the reasons that restricts farmers from adopting scientific management practices. The summary of the important results obtained from the study are provided below.

5.2 Salient findings of the study

The study entitled "Performance Analysis of Organic Pepper Cultivation in Idukki District" was framed with the following objectives:

1. To document organic practices adopted by farmers in pepper cultivation
2. To make a comparative analysis of role of different institutions in supporting organic pepper cultivation
3. To analyze the marketing channels of organic pepper used by farmers
4. To record constraints experienced by organic pepper farmers

The salient findings of the study are:

Profile Characteristics

1. Majority (52%) of the organic pepper farmers were in the age group of 30-50 years with 56 per cent of the farmers having educational qualification up to high school level.
2. More than 60 per cent of the farmers were having 10-30 years of experience in organic farming but 57 per cent had less than 10 years of experience in organic pepper farming.
3. More than 64 per cent of the organic pepper farmers were having small land holdings and average area under organic pepper was 1.25 ha.
4. Annual income of more than 65 percent organic pepper farmers were under two lakh rupees.

5. Farmers who had acquired certification were 45 per cent and out of that 66 percent were under Peermade Development Society and rest under Eco Development Society.

Adoption of scientific organic practices

6. Organic pepper farmers who were having high scientific orientationwas 42 percent.
7. Adoption index for soil management practices was 62 for certified farmers and 52 for Non-certified farmers.
8. Adoption index for pest management practices was 66 for COF and 63 for NcOF.
9. Adoption index for extent of organic input use was 46 for COF and 45 for NcOF.
10. Organic pepper farmers with high level of adoption for weed management practices were more than 60 per cent.
11. Organic pepper farmers with high level of adoption for farm diversification were 54 percent.

Conventional to organic yield

12. The average organic to conventional relative yield ratio was 0.82
13. For COF the yield ratio was 0.90 and for NcOF the yield ratio was 0.73.
14. Majority of the COF were having yield ratio at 70 to 80 per cent while majority of the NcOF were having yield ratio at 50 to 60 per cent.

Analysis of marketing channel

15. Certified farmers who sold dried pepper secured a profit of Rs.335 per kg. while for Non-Certified farmers the profit was Rs.293 per kg.
16. Average profit for certified farmers who marketed green pepper was Rs.100 per kg.
17. It was found that processing the product increased the profit by more than 110 percent.

Institutional support to organic pepper cultivation

18. PDS is the institution which was identified as the most important institution in supporting organic pepper production.
19. Constraints due to lack of an institute with research in pepper as the primary mandate was evident throughout the survey.
20. No other institution except PDS had given priority for certification of organic pepper.
21. Marketing interventions by institutions was minimal and the organic produce was not able to secure potential price.

Constraints experienced by extension officers and organic pepper farmers

22. Extension officers had perceived lack of availability of quality inputs and lack of proper training regarding organic practices as the major constraint.
23. Lack of exclusive markets, low productivity and unawareness about organic standards were the major constraints faced both by certified and non-certified organic farmers.

1.3 Policy recommendations

1. Starting Farmer Producing Organizations so that the farmers can pool their product and apply processing function before marketing which will ensure higher price.
2. Through efficient training and support the farmers can be motivated about advantages of following scientific management practices and thus the productivity of organic pepper can be increased.
3. The profit share received by the farmers can be increased if they are properly supported by government to acquire organic certification.
4. Exclusive markets for organic pepper should be opened where an assured price is guaranteed.
5. Need for on-farm research to diagnose the yield gap between COF and NcOF.

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Appendices

Appendix 1

Questionnaire For Performance Analysis of Organic Pepper cultivation in Idukki District

1. Name :
2. Address :
3. Panchayath :
4. Block :
5. District :
6. Phone Number :
7. Age :
8. Experience in farming (No. of years) : a) Conventional b) Organic
9. Method Of Organic Farming : a) Palekar Method b) Conventional

1. Family and Farm Details

No. Family Members :

Category :

Male	Female	Children

Educational Qualification :

Total Area Owned (ha) :

Total Area Leased (ha) :

Area under pepper (ha) : Organic ☐ Conventional ☐ Total ☐

Type of cropping : Single ☐ Multiple ☐

Standard used :

Area under Irrigation :

Source of irrigation :

Pond ☐ Well ☐ Stream ☐ Canal ☐ Others ☐ Give Details :

Any loan for organic Pepper cultivation : Yes ☐ No ☐

If Yes, From Which Source : Co-Operative Bank ☐ Nationalized Bank ☐

Private Source ☐

Loan amount (Rs.) :

Repayment status : Completed repayment ☐
Underepayment ☐ Default ☐

Farm diversification status

Components :	Share	Year of adoption

Practicing animal husbandry : yes ☐ no ☐

If yes, which all animals : Cow ☐ Goat ☐ Buffalo ☐ Hen ☐
Others (specify)

Practicing apiculture : yes ☐ no ☐

Soil conservation measures : yes ☐ no ☐

Have you done soil testing : yes ☐ no ☐

Have you practiced liming : yes ☐ no ☐

If yes, at what dose :

Any other soil amendments used : Quantity ☐ Interval ☐ Dose ☐

Water conservation measures :

Other organic practices (specify) : Mulching ☐ Trap cropping ☐ Any other

2. Crop Details

Sl. No.	Variety Cultivated	Area	Source of planting material	Cost of planting material	Reason for selection
1					
2					

3					
4					
5					

3. Inter cultivation practices :

Sl. No.	Practice	No. times per year	Labour requirement	Cost
1	Earthing up			
2	Mulching			
3	Green leaf manures			
4	Weeding			
5	Pruning			
6	Bunding			

4. **Use of Organic Fertilizers :**

Sl. No.	Organic Fertilizer	Source	Dosage	Cost	Labour cost
1	Cowdung				
2	Bio-Gas Slurry				
3	Vermi Compost				
4	Coirpith Compost				
5	Green Leaf Manures				
6	Bone Meal				

7	Chicken Manure				
8	Goat Manure				
9	Ash				
10	Others(Specify)				

5. Use of Organics in plant protection

Sl. No.	Organics used	Source	Dosage	Purpose of use	Cost	Type of use	Labour cost
1	Bordeaux Mixture						
2	Neem Oil- Garlic Emulsion						
3	Neem Seed Extract						
4	Neem Cake						
5	Trichoderma						
6	Pseudomonas						
7	Any Traps						
8	Others (Specify)						

6. Major agencies supporting organic pepper cultivation

Sl. No.	Institution	Area of support	Services provided	Extent of support **(Always-5, Frequently-4, Occasionally-3, Seldom-2, Never-1)**
1				
2				
3				
4				
5				
6				
7				

7. Efficiency of agencies supporting organic pepper cultivation (Rating from 1 to 5) Always-5, Frequently-4, Occasionally-3, Seldom-2, Never-1

Sl. No.	Institution (5,4,3,2,1)	Adequacy of support (5,4,3,2,1)	Accessibility (5,4,3,2,1)	Timeliness of support (5,4,3,2,1)	Credibility of service (5,4,3,2,1)
1					
2					
3					
4					
5					
6					
7					

8. Marketing Channels:

Quantity of pepper marketed annually :

Price received (Per Kg) : Organic ☐ Conventional ☐

Type of marketing : Direct ☐ Through Co-Operatives ☐ Middleman ☐

Distance from the market :

Mode of transport :

Constraints (If any) :

9. Details of harvesting and value addition

Forms in which pepper is marketed :

Value addition strategies adopted : Unprocessed ☐ Primary ☐ Secondary ☐

How it is done and advantages **:**

10. Major constraints faced in organic pepper cultivation

Sl No.	Constraints faced	Strongly agree	Agree	Moderately agree	Disagree	Strongly disagree
1	Low productivity					
2	Non availability of organic manures					
3	Finding alternative to chemical pest control measures is difficult					
4	Lack of exclusive markets					
5	Lack of opportunity for niche pricing					
6	Lack of knowledge about best organic					

	practices					
7	**High production cost**					
8	**Lack of authorized proof to prove authenticity of the product**					
9	**Poor quality of available inputs**					
10	**Unavailability of exclusive credit agencies**					
11	**Complicated extensive certification procedures**					
12	**Unawareness of specified standards of organic produce for export markets**					
13	**Lack of quality planting materials**					
14	**Labour Shortage**					

Appendix 2

Questionnaire for collecting information from extension officials

1. **What are the major programmes related with organic pepper cultivation that is being undertaken by this institution.**

2. **What are the initiatives taken by the institution for supporting organic pepper farmers.**

3. **What are the projects started earlier related to organic pepper. Are the projects still running, if not what was the reason for stopping the project?**

4. **What are the major constraints faced in delivering extension service related to organic pepper cultivation.**

5. **What are your suggestions to improve the scenario of organic pepper cultivation in the district.**

6. **Please add any other relevant information that you want to convey.**

PERFORMANCE ANALYSIS OF ORGANIC PEPPER CULTIVATION IN IDUKKI DISTRICT

By

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ABSTRACT OF THE THESIS

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Abstract

Black pepper is the most important spice crop of India with geo-political significance. In export trade also organic pepper has high significance especially to complete with leading global pepper producers with high productivity. Idukki district in Kerala is a traditional pepper tract where a large portion of the farmers followed organic cultivation by default. It was in this backdrop and also with the gaining prominence of organic policy in the state Idukki district was purposively selected for the study to evaluate the different parameters of organic pepper cultivation. The study was conducted in Nedumkandam and Azhutha blocks where maximum area under organic pepper was reported and also had the presence of prominent extension agencies in organic farming. The total sample size was 130 consisting of 100 randomly selected organic peppers from these blocks and 30 extension officials selected from the various extension agencies proportionate to the number of field staff.

Based on the criteria of certification organic pepper farmers were classified into two groups viz. Certified Organic Farmer (COF) and Non-certified Organic Farmer (NcOF). It was found that 45 per cent of the farmers had valid organic certification from an accredited agency and 55 per cent were NcOF who followed good will of peer certification. Peermade Development Society (PDS) and Eco-Development Society (EDS) were the two NGOs that supported organic certification process of the farmers. The comparison of COF and NcOF on profile characteristics showed that COF were younger with a mean of 47 years while NcOF had average age of 59 years. Share of pepper on total income was 60 per cent for COF while it was 43 per cent for NcOF.

Adoption Index (AI) measured on five selected dimensions of organic pepper cultivation (Guthman, 2000) showed organic weed management as the most adopted practice with AI values 68 per cent for COF and 74 per cent for NcOF followed by organic pest management with AI at 66.29 and 63.23 respectively. However the extent of adoption of total organic inputs recorded the least AI

values for COF (45.74) and NcOF (44.54). This is attributed to the large number of natural organic farmers who followed zero to minimum input use. Regression analysis showed that age, education and certification status were the significant factors influencing adoption.

Relative yield ratio between organic and conventional pepper farmers revealed that organic yield was 82 per cent of the conventional yield and COF had a higher yield ratio of .90 compared to .73 of NcOF.

Two types of marketing channels each were delineated for COF and NcOF. Produce of COFs were collected directly from the field by procurement agents posted by PDS and EDS. In channel I of PDS, dry pepper collected from COF was supplied to the processing unit of PDS and marketed by them. In channel II procurement agent was posted through open tenders by EDS. They procured green pepper directly and traded in International markets. The profit percentage of dry pepper was found to be 109 per cent for COF while it was 92 per cent for NcOF. Comparison of value addition in the certified organic pepper channel showed 116 per cent increase while in non-certified organic pepper channel the increase was only 10.93 per cent.

Analysis of institutional support to organic pepper cultivation revealed that PDS as the most important institution supporting organic pepper production. Krishibvan and Indian Cardamom Research Institute received moderate ranks but they were not considered as providing adequate support to organic pepper production. Constraints experienced by both farmers and extension officers were studied and it was found out that extension officers considered that inadequate supply of quality inputs as the most important constraint. Most of the farmers reported unavailability of exclusive market for organic produce as the most important constraint. Low productivity and unawareness of organic standards was also considered as important constraints. Thus certification and assured market were inferred as the critical factors of organic pepper cultivation in the district.