ECONOMIC IMPACT OF ORGANIC FARMING IN KERALA: A MICRO LEVEL ANALYSIS

Thesis submitted to the University of Calicut

in partial fulfillment for the requirements

of the award of the degree of

Doctor of Philosophy in Economics

Under the Faculty of Humanities

By

SAJEESH P V

Under the Guidance of

Dr. SABU P. J

Research and Post Graduate Department of Economics
St. Thomas College (Autonomous),
Thrissur, Kerala, 680001
December, 2021

CERTIFICATE

I hereby certify that this is the revised version of the thesis entitled **"ECONOMIC IMPACT OF ORGANIC FARMING IN KERALA: A MICRO LEVEL ANALYSIS"** submitted by Shri. SAJEESH P V under my guidance after incorporating the necessary corrections/ suggestions made by the adjudicators.

Dr Sabu P J

Research Guide

Assistant Professor

Research and PG Department of Economics

St.Thomas' College(Autonomous)

Thrissur

Dr. Sabu P. J., M.A, PhD
Assistant Professor & Research Guide
Research & P.G. Department of Economics
St.Thomas' College *(Autonomous)*
Thrissur - 680001, Kerala

Place: Thrissur

Date: 24 March 2022

Dr. Sabu P.J, M.A, Ph.D
Assistant Professor & Head
Department of Economics
St. Thomas College (Autonomous)
Thrissur, Kerala, India
E mail: sabustc9@gmail.com

CERTIFICATE

This is to certify that the thesis entitled **"ECONOMIC IMPACT OF ORGANIC FARMING IN KERALA: A MICRO LEVEL ANALYSIS"** being submitted by SAJEESH P.V for the award of the degree of Doctor of Philosophy in Economics, to the University of Calicut is a record of bonafide research work carried out by him under my guidance and supervision at the Research and Post graduate Department of Economics, St. Thomas's College (Autonomous) Thrissur. The contents of this thesis, in full or in part, have not been submitted and will not be submitted to any other institute or University for the award of any degree or diploma. Plagiarism is checked and found within the permitted limits.

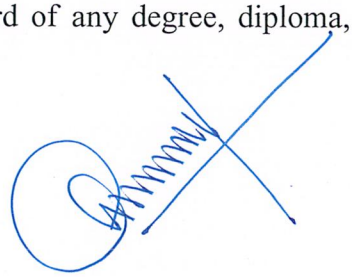
Dr. Sabu P.J
Research Guide
Assistant Professor & Head
Research and Post-Graduate Department of Economics
St.Thomas College (Autonomous), Thrissur

Place: Thrissur
Date:29-12-2021

Dr. Sabu P. J., M.A, PhD
Assistant Professor & Research Guide
Research & P.G. Department of Economics
St.Thomas' College *(Autonomous)*
Thrissur - 680001, Kerala

DECLARATION

I, **SAJEESH. P.V**, do hereby affirm that this written account entitled **"ECONOMIC IMPACT OF ORGANIC FARMING IN KERALA: A MICRO LEVEL ANALYSIS"** is a bonafide record of research done by me under the guidance of **Dr. SABU.P.J**, Assistant Professor & Head, Research and Post Graduate Department of Economics, St Thomas' College (Autonomous), Thrissur. I also declare that this thesis has not been submitted by me earlier for the award of any degree, diploma, fellowship or any other similar title.



Place: Thrissur SAJEESH P. V.

Date:29-12-2021

ACKNOWLEDGEMENT

In the name of Almighty GOD, I express my immense pleasure and privilege to present my thesis before the academic community. Many things and many people came to my mind while writing this thesis. Throughout my work I have received a great deal of support and assistance from the people in and around me and without them this work may not happen. First and foremost, I would like to thank my esteemed supervising guide, Dr.Sabu P.J, Assistant Professor and Head of the Department of Economics, St. Thomas College, Thrissur for his valuable guidance, constant encouragement and timely support to pursue my research in this emerging area. His insightful feedback, immense knowledge in the field of research and invaluable advice pushed me to sharpen my thinking and brought my work to a higher level .I express my gratitude to Dr C. D. Johny. Associate professor (Retd.), Department of Economics, St. Thomas College, Thrissur for his valuable guidance, constant encouragement and timely support to pursue my research in this emerging area. I would like to acknowledge Respected Principal. Thomas College, Dr. Martin K.A. for his support and co-operation throughout the work. I express my heartfelt gratitude to librarian and staff of CHMK library of University of Calicut for their constant support and encouragement.

I would like to thank all the office staff and Librarian of St. Thomas College for their cooperation to carry out my work. I am deeply indebted to all the research scholars of the department of Economics, Dr. Dhanya Sankar, Dr.Dhanya John, Dr.Anila, Dr.Shijitha, Dr.Sasi, Liji, Mary Francis and Jeena P.M of St.Thomas College for their care, motivation, support and assistance throughout my work. I would also like to express my gratitude to Dr.Nisha T.A in supporting and assisting me. I would like to thank Dr. Chacko V.M, Associate Professor and Head & Research coordinator for his valuable advice and support.

I express my gratitude to Dr. Prasad A K, Associate professor, department of economics, University of Kerala Kariavattom for his support and motivation to complete my research work. There are so many people directly and indirectly contributed to my research work. I would like to thank Dr K.P. Mani, Dr Manju S Nair, Dr Chacko Jose P, Prof. Sajad Ibrahim, Dr Abhaham Thachil and Dr K. M. Francis who all motivated me at different stages of my work.

I would also like to thank all my colleagues in the Office of the principal Accountant General (Audit-I& II) Kerala branch Thrissur, I would like to thank all my dear friends, relatives and most importantly, all the teachers of the department of Economics ,St Thomas college Thrissur for their help, motivation and encouragement to complete my research work. I would also like to thank to the library staffs of the St Thomas College Thrissur, John Mathai study Centre Aranattukara, Thrissur, Kerala Institute of local Administration. Calicut university library, university library palayam Thiruvananthapuram.I would like to thank all the sample farmers to their promising support to render the valuable information to conduct the research smoothly ,I express my gratitude to all the agriculture officers to their support to identifying the framers in their locality and their valuable helps to complete my research work. I would also like to thank my beloved mother Vishalam and my wife Arya Narayanan for their support and encouragement.

There are no words to express my deepest gratitude to my brother Akhil, who stood for me at each stage of my work by his constant support, I like to thank my two lovely kids who adjusted a lot more than what I expected helped me to complete my work. Above all I thank God, the almighty who led me with his power and invisible hand that made me to complete my research work. Once again thank you to one and all that directly and indirectly helped me in my endeavor. Thank you all.

SAJEESH P. V

Abstract

The sustainability of farmer's agriculture and economic condition has been worsening over the last few decades in Kerala. After the green revolution a dramatic changes in the agricultural sector. Over consumption of pesticides and fertilizers have increased the input cost of the farm production and deteriorated soil health. The input cost used in agricultural production seems crucial for small and marginal farmers. This dragged them into poverty trap and food security problems among the farmers in Kerala. Conversion of Kerala rural agriculture into sustainable agriculture, organic farming might panacea that can create a sustainable agriculture and reimburse the production and sustainability of soil. Most ofthe studies in this area rarely addressed the economic impact of organic farming in Kerala. In this context, the present study is a micro level study aimed with assessing the economic impact of organic farming in Kerala. The study conducted in the four districts such asThriruvanthapuram, Thrissur, Alapuzha and Wayanad.The study used both quantitative and qualitative approaches for the collection and analysis of data. The study found that the foremost was the conviction of the farmers for conserving the agro-ecosystem and its sustainability and the capability of organic farming to reduce environment pollution and ill effects of pesticides and produce chemical free safe food. Crop diversity was very high in farms and homesteads.Four case studies revealed that the farmers groups helped in organizing the organic farmers groups and providing land holdings support in production, grading, marketing through organic bazaar, eco-shops. Kudumbashree units and self helps groups' plays crucial role in promoting organic farming in Kerala. The productivity and profitability of Kerala organic farms are normal profits. The conversion period output was too low. The study revealed that organic farming is profitable in long run. The study found that there are various types of constraints faced by the organic farmers in Kerala. They are: (1) social constraints; (2) personal constraints; (3) ecological constraints; (4) technological constraints; (5) economic constraints; (6) certification constraints and (7) marketing constraints. The constraints faced by the organic farmers are lack of reliable package of practices of organic farming, Non-availability of organic farming input, lack of awareness of grading and food quality standards. The advocacy strategies suggested for implementing the organic farming in Kerala is through minimum common programmes guaranteed by the government. Organic farming is a best alternative measure to promote safe food to health and to conserve the nature. Based on these findings, the study argues that organic farmers should introduce innovative methods to survive and surmount in sustainable agriculture. Along with that government should initiate geographic and farmer specific policies to accelerate the growth of organic farming in Kerala.

Key Words: Organic Farming, Constraints, Productivity, Kerala, Impact, Constraints

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF CHARTS

ABBREVIATIONS

APOF	Association for Promoting of Organic Farming
DAC	Department of Agriculture and Co-Operation
FAO	Food and Agriculture Organization
FYM	Farm Yard Manure
GAP	Good Agricultural Practices
GMO	Genetically Modified Organism
ICCOA	International Competence Center for Organic Agriculture
ICS	Internal Control System
IFOAM	International Federation of Organic Agricultural Movements
IFOF	International Federation of Organic Farming
ITC	International Trade Centre.
KAU	Kerala Agricultural University
NAP	National Accreditation Policy
NAPP	National Accreditation Policy and Programme
NGO	Non-Government Organization
NOCA	National Organic Certification Association
NPOP	National Programme for Organic production
OFAK	Organic farming Authority of Kerala
UPASI	United Planters association of South Asia
WTO	World Trade Organization
FOM	Farmers open Markets
PEC	Product Exchange Centre
KADS	Kerala Agriculture Development Society
NPOF	National Project on Organic Farming
PKVY	Parampragat Krishi Vikas Yojana
PGS	Public Guarantee System
FCO	Fertilizer Control Order
NSOP	National Standard for Organic Production
RKY	Swasarya Karshaka Samithi
PTD	Participatory Karshaka Samithi
SFAC	Small Farmers Agribusiness Consortium

Chapter 1

Design of the Study

1.1. Introduction

Agriculture sector performs the vital function of supplying food stuff to the people in India. More than 60% of her population depends on agriculture for their livelihood. Global awareness on health and environment issues is spreading fast in the recent years. Sustainability in production has become the prime concern in agriculture development organic method of farming is the best option to ensure food air, water and soil around us unpolluted leaving the environment safe for the present and future generation. The agricultural model promoted during the green revolution period was based on the use of high yielding varieties and high close of chemical fertilizers and pesticides. Long term field experiments have made clear the negative impact of continuous use of chemical fertilizers on soil health (Yadav, 2003).

The occurrence of multi-nutrient deficiencies and overall decline in the productivity of soil under intensive fertilizer use has widely reported. Recognizing soil as a dynamic living entity which promotes beneficial biological activities in soil and root zone of plant is central to the organic agriculture. Meeting the domestic food requirement has been the fore most social priority before India since independence, vegetables play a vital role in health and nutrition of people organic farming is today's answer not only for higher and sustained productivity but also for safe nutritious food and it is increasingly demanded by enlighted consumers around the world organically grown agricultural produces fetch a premium in market.

Organic farming is today's answer not only for higher and sustained productivity but also for safe nutritious food and it is increasingly demanded by enlightened consumers around the world organically grown agricultural produces fetch a premium in market. India has a vast potential of manorial resources. Farm yard manure and poultry manure are the most commonly used organic manures by the farmers of Kerala. Poultry manure is a rich source of nutrients especially for vegetable production. Vermi-compost which is produced by chemical dis-interaction of organic matter by earth warm contain higher amount of nutrients hormones and enzymes and has stimulatory effect on plant growth.

Nutrient management in a crop production assumes paramount importance in sustainable agriculture with the advent of green revolution our farming community

with the (advent of green revolution our farming community Repeat) sole aim of maximizing production and profit had been moving away from integrated nutrient management towards in organic fertilizer management. Stagnant crop yields inspite of high yielding varieties and advanced plant protection measures had made a farming community. The policy makers convinced of the importance of organic manures in sustaining soil productivity and quality of agricultural produces. Organic farming is now being advocated globally as a panacea for all the present day problems in the agricultural front.

The paradigm shift towards organic farming is due to many reasons like concern for human health and environment, decreasing productivity of modern farms increasing pests and diseases etc. The prime cost for all these is being attributed to repeated use of chemical fertilizers without the accompaniment of organic manures. This has become more serious income of crops that do not return back organic residues in substantial quantities or in farming practices where all the residues are removed over dependence on chemical fertilizers due to unavailability of organic manures has slowly but definitely resulted in the decline of soil organic matter nutrient imbalance and consequent deterioration of physical chemical and biological functioning of soils in many intensively cropped areas, but sole independence on organic sources to satisfy the full nutrient requirement of a crop warrant enormous quantity of organic manures. The viable alternatives, this is a strategic shift from the present day of chemical based soil fertility management to organic-based integrated nutrient management.

Organic manures contain high percentage of carbon and relatively small percentage of plant nutrients. They have a multi furious role in improving and maintaining soil productivity organic manure serve as a source of nutrients for the plant and a source of either directly through their action as butlery diluents in compacted soils and indirectly when the waste products of animals and micro organisms thriving on organic matter act as cements to bind soil particles together.

The best known organic manure and the one commonly used by farmers in the waste from mixed arable and livestock forming called farm yard manure (FYM) which contains drug, urine and partially rotted straw. Traditionally agricultural practices which are based in year of experience and careful observation have

motivated Kerala farmers in using several products in crop production. Use of panchagavym in crop production is one among traditional practices which has been gaining popularity in recent times. Organic farming can be defined as an approach to agriculture where the aim is to be created integrated, humane environmentally and economically sustainable agriculture production system. Reliance on external inputs such as chemical or organic is reduced as far as possible in organic agriculture in India. The term organic is the best thought of referring to the concept of the farm as 'organisms'.

The role of organic agriculture, whether in farming, processing, distribution or consumption is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human being [international federation of organic farming]. The concept of organic farming is not clear to many concerns. Many people think that traditional agriculture, sustainable agriculture and Jaivakrishiaree organic farming.The organic farming in real sense envisages a comprehensive management approach to improve the health of underlying productivity of soil. The term 'organic' is best thought of as referring not to type of inputs used, but to the concept of farm as an organism. In which, all the components of soil minerals, organic matter, microorganisms, in which all the components of soil minerals, organic matter, microorganisms, insects, plants, animals, and humans, interact to create coherent self-regulating and stable whole.

Benefits of Organic Farming

Food safety

Soil conservation and maintenance of soil fertility

Less pollution of water

Protection of wild life

Increased bio-diversity

Better utilization of animals

Less utilization of external inputs

Pesticide free food

No hormones and antibiotics in animal products

Better product quality

Four Pillars of Organic Farming

1. Organic standards
2. certification
3. Technology packages
4. Market net work

Organic Standards and Certification

The most important aspect in modern era of organic farming is certification programmes which consists of standards (rule) inspection (checking whether rules are implemented) and certification (judgment) only by this certification programme organic farming can be distinguished from other methods of sustainable agriculture. In fact certification in organic agriculture generally refers to independent third party certification. Third party implies it is not only done by either the producer or the buyer. The system includes farming inspector and audit trails. Certificate is valid only if it is done by accredited certifying agency, certification programme vary among countries or regions because of differences in environment, climate and soil and cultural factors. Globally there are more than 60 standards which include if OAM standards CODEX Alimentation commission guidelines.

Technology packages

Conventional practices cannot be followed for growing crops organically. It includes selection of variety, organic, fertilization, biological control of pest diseases and storage etc. some countries have developed package of practice for some selected crops but there is ample scope to feline this package with scientific method and practices.

Market Network

Organic farming has a place where there is a market to accept the product at a higher price. The growing interest in organic farming practice is due to an expectation of higher premium for organically produced goods.

Basic Steps to Organic Farming

1. Conversion of land from conventional management to organic management.

2. Management of the entire surrounding system to ensure biodiversity and sustainability of the eco system.

3. Crop production with the use of alternatives sources of nutrients such as crop rotation, residue management, organic manures and biological inputs.

4. Management of weeds and pests by better management practices, physical and cultural means and by control system.

5. Maintenance of livestock with organic concept and make them an integral part of the entire system.

Organic farming is the process of producing food naturally. This method avoids the use of synthetic chemical fertilizers and genetically modified organisms to influence the growth of crops. The main idea behind organic farming is 'zero impact' on the environment. The motto of the organic farmer is to protect the earth's resources and produce safe, healthy food.

Organic farmers and gardeners grow their crops without the aid of artificial fertilizers and harmful chemical pesticides. Organic ranchers and dairymen raise their livestock free of drugs and animal hormones. Supporters of the organic lifestyle believe that food produced in this manner is of higher quality, tastes better, and possesses higher nutritional value in comparison to food produced by conventional, chemical-based methods. Many developed countries, including the United States and those in Europe, have certification programs to restrict the liberal use of the term "Organic". This has benefited the consumer by ensuring that quality assurance standards have been met and that the source is reliable. The definition of organic varies from place to place but may include things such as a minimum time period that a field is free of chemical use before being used for organic farming.

Organic farming has re-emerged as the outcome of consumer reaction against harmful toxins and the desire for more health and environmental safeguards. This method is a re-implementation of a primitive process followed by our ancestors before

they discovered chemicals that could save time and improve crop quality, but had the unfortunate side effect of ruining our air, water, and soil.

In the USA, the National Organic Program (NOP) provides the most commonly used definitions of organic farming. That said, USDA organic farming standards don't truly cover the maximum in sustainable farming practices.. Some feel that organic farming methods should include sustainable practices, while some argue that sustainability is not a necessary component of organic farming, thus the non-universal acceptance of a clear organic farming definition. Numerous U.S. states, regions and local farmers have additional organic farming standards in place that exceed basic NOP standards. Additionally, other countries have their own established organic farming standards that differ from USA standards

Organic agriculture is a cultivation technique that relies on natural ingredients without the use of synthetic chemicals. Organic farming is the agricultural production systems that avoid or severely limit the use of chemical fertilizer (plant), pesticides, herbicides, plant growth regulators Environmentally sound cultivation is an agricultural cultivation are planned and implemented with due regard to the properties, conditions and environmental sustainability, thus natural resources in the environment can be utilized as possible so that the damage and environmental deterioration can be avoided and resources in order to preserve natural resources and the environment.

The main purpose of organic agriculture is to provide agricultural products, especially food which is safe for the health of producers and consumers and does not damage the environment. Thus a healthy lifestyle has been institutionalized internationally, which requires the assurance that agricultural products should be safe to eat beratribut (food safety attributes), high nutrient content (nutritional attributes) and environmentally friendly (eco-labeling attributes). Consumer preferences such as these cause the world demand for organic agricultural products increased rapidly.

The definition of organic agriculture differs depending on where you sit in the world. The Food and Agriculture Organization of the United Nations offers a distilled explanation that organic agriculture is "a system that relies on ecosystem management rather than external agricultural inputs." The more detailed explanation is that nations,

regions within nations, and private certification bodies set their own definitions with guidance from two global organizations the FAO/WHO Codex Alimentarius Commission and the International Federation of Organic Agriculture Movements (IFOAM).

However, IOFPCL has still not been able to develop and put in place a structured and efficient logistic network of minimum transaction cost. The company has adopted a procedure of making immediate payment in case of small farmers at the time of collection and partial payment as per previously agreed terms to large farmers. This was corroborated by the primary producers during interaction with them.

KADS is a voluntary organization of farmers registered in 2001 under the Charitable Society Act, 1955 of Kerala. The mission of KADS is securing fair price to farm produces by avoiding middlemen, promotion of quality organic produce production, and assistance in sustainable management of natural resources through awareness campaign, promotion and practicing of eco-friendly agriculture.

KADS facilitates marketing through 'farmer's open market' and organic agriculture through assisting in organic certification in collaboration with INDOCERT, which is a certification agency. About 1000 farmers formed into 54 groups are: in C1, C2 and C3 stages of organic certification in about 1800 ha. KADS has currently 1242 member ships.

Production and marketing are promoted on spices like nutmeg, cardamom, pepper, cloves, vanilla, 144 ginger, other spices and condiments, and other crops like cocoa, vegetables, tapioca and other tubers, coconut, areca nut, banana, rubber, coffee ornamental and medicinal plants, planting materials, seeds and seedlings, and dairy products, meat of goat rabbit and poultry, eggs, etc. and inputs like vermin compost, bio-pesticides and value added products. KADS with farmers' participation also facilitates collection, transporting and storage of various produces. It also encourages women's participation in kitchen garden and marketing traditional dishes and popularizing cooking methods through 'Grameena Bhakshanashala' (village food stall).

'Farmers' Open Market' (FOM) sells farm produces directly to the customers realizing fair price to farmers. The FOM is essentially open only to those who are

registered farmers. KADS officials claim that FOM facilitates to realize at least 15-20% higher price than the selling price in alternate market. In addition, KAOS offers 30% extra price on 'organic' produce, the market for which is increasing. In 2008 KAOS is planning to introduce its own logo and label for the organic produces. The organic produces includes Nendran banana, different varieties of plantain, vegetables, paddy, milled rice, cocoa, coconut, and tender coconut.

The quality of natural resources should be maintained and the vitality of the entire agro ecosystem- humans, animals and crops to microorganisms- should be enhanced in a sustainable agricultural system. The emphasis is on the use of renewable resources where there is minimal loss of nutrients, biomass and energy. Waste is nil or minimal (Reijntjes et al, 1992).

The environmental qualities of organic farming methods have been proven extensively and beyond any doubt. Long-term studies in the US and many other countries have shown that even a reversion to organic farming after years of modern high-input chemical farming has shown the resilience of nature to come back to a healthy state. Scores of researches have shown the higher quality of the soil and other natural resources and the low negative impact organic farming has on the environment. Not only has the natural resource base benefited but also the quality of the produce improved. Consumer expectations have been met as regards the standards of nutritive and health values. The ennobling, virtuous way of life that agriculture was once considered to be has been swept away in the global cultural changes that have taken place since the Industrial revolution. Agriculture, once a mode of life, has become a mode of production (Krimsky & Wrubel, 1996).

The industrialization of farming has rendered the traditional values of life redundant. The ownership of land, the freedom to nurture and evolve it to one’s own liking; the intimate, instinctive love, labour and the tremendous satisfaction as the farmer looks at his creation-to the traditional farmer, it meant everything. Income generation was only a fringe benefit. Socially, too, the farmer was among the most respected in a community.

Land ownership and the control of food production put him at the apex of the social pyramid. However, when the objective of human way of life changed its course

from that of subsistence and sustenance to leisure and luxury, agriculture too, changed its colours. Changes in the mode of agricultural production reflect concurrent changes in other aspects of social and cultural life. Thus it becomes imperative to highlight the economic viability of any mode of interaction. As everything has to be assigned a market value, such is the case with organic farming besides an invitation to change to that mode of agricultural production. This is very much so in the case of farmers who are reluctant to step away from the established pattern of sustenance. As the lure of less labour, more production and huge profits veered away almost entire nations from their time tested and enduring way of life, a similar promise has to be kept for winning them over to organic farming.

To be economically viable, farmers should be able to produce enough for self-sufficiency and income and ensure sufficient returns to meet the costs. The yield as well as resource conservation and minimal risks should the measure of the sustainable farm. Organic agriculture is more or less traditional agriculture; at least it is so to India which has a past and where traditions still survive, and to similar other countries. However, a change to organic farming cannot mean a return to the traditional way of life. A few non-conforming individuals may opt for it, but not the majority who want to improve their living standards.

One of the main arguments against organic farming is that it would not meet the food requirements of an ever-increasing population. But a brief look at the era of modern agriculture would show that, in spite of the booming agricultural production, more people die of starvation and malnutrition than before. Inequitable distribution of food rather than insufficient production is the root of the problem. Studies on ecological farming in South India show that ecological farms produce similar levels of output as that of conventional farms (Vander, 1992).Thus ecological agriculture does not put food security at risk in the short term. As ecological farming practices slow soil erosion and the depletion of soil fertility, it safeguards the future food security of the nation. The low dependence on external inputs is likely to reduce the drain on foreign exchange reserves.

1.2. Research Gap and Research Problem

Having understood the goals of organic farming in achieving the twin objectives of growth and sustainability, the next question is regarding feasibility of organic farming in India. Besides the lack of knowledge regarding the ecological significance, advantages offered and more importantly the techniques of organic farming, is there any economic reason behind lukewarm response to organic farming? Expectation of profit may one reason. An entrepreneur will produce only if total revenue is greater than the total cost. The same logic can be applied to organic farming as well. That is, a farmer will adopt organic farming only if total revenue obtained by selling his product is greater than costs of cultivation. To determine clearly the preference of organic farming compared to conventional farming a comparison between total revenue and total cost of the both modes may be necessitated. Result originating from total revenue-total cost analysis may helpful to understand the unfavorable elements in cost structure of organic farming. This understanding may lead to greater popularity of organic farming.

The empirical literature shows that the comparative performance of organic and non-organic practices is inconclusive across regions. The farm-level studies and regional studies in India do not provide lucid information that; which region or state has better potential for organic and non-organic practice and how does performance differs across a To make a conclusive statement for a country as a whole, there is a need to cover maximum regions or states performing both farming practices. The farm-level studies do not provide any macroeconomic variables that affect the organic and nonorganic. Organic farming practices, as anew agricultural strategy the organic farmers faces many problems regarding the conversion of farmland conventional to organic. The Government may take many measures to regulate and promote organic farmers in Kerala for promoting sustainable in Kerala and uplifting of organic farming in Kerala. The present study is an evaluation of the economic impact of organic farming in Kerala through analyzing the productivity and profitability of organic products in Kerala.

1.3. Objectives of the Study

1. To examine trend and pattern of organic farming in Kerala.
2. To analyze the Government initiatives to organic farming in Kerala
3. To evaluate the socio-economic status of the organic farmers in selected districts in Kerala.
4. To analyze the productivity and profitability of organic farms in Kerala
5. To analyze the constraints faced by the organic farmers in selected districts in Kerala.

1.4. Methodology of the Study

As the objective of the study is to understand the economic impact of organic farming in Kerala is through measuring efficiency and functioning of the selected Organic farming units in selected districts in Kerala. Primary and secondary data are used for the study. Primary date collected from the organic farmers in the sample districts in Kerala. Out of 14 districts in Kerala seven districts are rationalized. Those district which are actively involved in the in the promotion of organic farming. As suggested by agronomist of Kerala Agricultural University Thrissur and various NGOs are associated with organic farming in Kerala. Four districts are selected Thiruvananthapuram, Alappuzha, Thrissur, and Wayand fifty organic farmers are selected from each district. The total sample size is Two hundred and Well-structured interview schedule is used to collects information from the farmers. The study has three main components

i) The survey of selected organic farmers in sample district
ii) Discussion with organizers of the organic farming units in Kerala by using well-structured interview schedule.
iii) Locate speech case studies of farming units in the sample area. A structured questionnaire is used to collect the information from the organizers of the farming units to gather the information related to the demand and market behaviour of the organic products.

Questionnaire survey was followed by visit to selected farmers from the organic units. Periodical visit were made to the farm covering on season of agricultural activities in the farming units. The qualitative date collected through direct observation and verification of farm records in available

i) to record the problems faced by organic farmers and the recommendations by them
ii) Assess the profitability productivity and viability of the organic farming units,

The secondary data collected from the books and journals, internets, and other published sources. Along with simple statistical and mathematical tools Time-series analysis and multivariable linear regression model also will be used to analyze collected data. The performance of organic farming is measured through the measuring technical efficiency in production. In addition to this Kruskal-Wallis (K W test), a non-parametric alternative to one way ANOVA was also used to analyse the variables in ordinal level.

1.5. Significance of the Study

The failure of new agricultural strategy in enhancing agricultural production has led to the popularization of sustainable agriculture which is an application of the concept of sustainable development. Enhancing agricultural productivity together with maintenance and improvement of environment and living condition is the main feature of sustainable agriculture policy measures for sustainable agriculture policy measures for sustainable agriculture are dry land farming, rain fed agriculture, rain water harvesting, better crop rotation techniques, conservation agriculture and balanced use of fertilizers and organic forming.

It may be note that all the aforesaid, except organic farming are there in the agricultural front of Kerala. There are many things in common for new agricultural strategy and sustainable agriculture. High degree of pesticides consumption in the agricultural lands of Kerala causes to the harmful effects of environment. These harmful effects of conventional farming leads to negative impact on the human life in the present and future-generations as well. As a protection, the conventional farming method of Kerala disappeared and it gives more attention to the non-conventional

farming method especially like organic farming. In this present study has growing much more importance the present study entitled as "Economic impact of organic farming in Kerala: A Micro level Analysis"

1.6. Definition of Key Concepts

Organic Farmer: A farmer may be defined as 'Organic Farmer' provided he/she adheres to and practices the following three essentialities of organic farming, a farmer who practices mixed farming including food crops, a farmer who ensures the conservation of soil and water and a farmer who conserves the biodiversity of the farmland.

Mulching: Mulching is the process of covering the topsoil with plant material such as leaves, grass, twigs, crop residues, straw etc

Green Manuring: The practice of growing a leguminous plant species for biomass production and incorporation into the soil may be new to most farmers. Nevertheless, this practice can greatly contribute to improvement of soil fertility.

Organic Pest Management: It is a Careful associations and management of plants and animals in order to prevent pest and disease outbreaks.

Intercropping: Growing two annual crops together

Degraded Land: Land may be degraded due to shifting cultivation, overgrazing, over-cultivation or deforestation, salinity after years of intensive irrigation with ground water, or water logging and flooding

1.7. Limitations of the Study

The present study has number of limitations. The unavailability of accurate date and correction information are the serious limitation of the study. And another important limitation is that organic farmers providing in the sample are having incomplete awareness of organic farming methods and techniques. As the study area is limited to four districts of Kerala state, generalization of the findings to the whole country will be a difficult task. This study is based on primary data collected from a small sample of farmers practicing organic farming in different agro-climatic zones of

Kerala state. As most of the information they have given is from their own experience during the various stages of their farming life there may be chances of human bias. Even if the data was cross checked to minimize the error, it is a fact that the results of the study may be apt only for the area where the study had been conducted and this should be considered while generalizing the result in a larger area.

1.8. Scheme of the Study

The first chapter is the introductory chapter. It deals the background of the study; it is a brief overview of organic farming, statement of problem, need and importance of the study, research gap, objectives and definition of key concepts, location of the study, structure of the study and finally limitation of the study. Chapter two deals with review of theoretical and empirical literature survey chapter brings an overview of various studies related to the study area, and the literature relating to the development concepts, theories and models of various organic farming practices, in this chapter also include the various Governmental reviews related to the various agricultural practices in the world and India.

The third chapter deals with data and methodology adopted in the present study This chapter discusses about the sampling frame work and analytical frame work And important key variables used in the study, and how these variables are expected to be related for each other and the conceptual model explains the methodology adopted in the present study. It includes research approaches, research design, formulation of sampling-instruments, data collection and analysis techniques adopted are discussed in this chapter. Fourth chapter discuss the present position of organic farming in India and Kerala chapter deals with an analytical description of origin and scope of organic farming in India and Kerala. Anda comparison of organic and conventional farming, the first objective of the study is to examine the origin and historical aspect of the organic farming in India. Fifth chapter brings an overview of government initiatives on organic farming in Kerala and major constraints faced by the organic farmers Government strategies for promoting organic farming in Kerala is also included in this chapter.

Sixth chapter deals with the analysis of primary data collected from the sample respondents among the various districts of Kerala. This chapter tries to analyze the

third and fourth objectives of the study, this chapter is divided into three parts, first part is dealing with the Socio- Economic status of the organic farmers in Kerala and the part two of this chapter is an examination of performance of the organic farming units in the sample districts. Performance of organic farming is assessed through the measuring the annual farm productivity and technical efficiency of the farming units. And third part deals with the productivity and profitability of selected organic farming units and finally this chapter ends with concluding remarks.

Chapter Seven is an examination of identifying the various problems faced by the organic farmers in Kerala. This chapter includes four case studies of selected organic farms in sample districts. It brings a clear idea about major problems and constraints faced by the organic farmers. This chapter also discusses the various constraints faced by the farmers and these measured through statistical tools.

Final chapter listing out the major findings and enumerate conclusion and useful information's emerging from the research analysis. The recommendations for future research are also included in this chapter.

Chapter 2

Review of Theoretical and Empirical Literature

2.1. Introduction

Theories and models of agricultural development a base upon which the particular study can proceed and gives an idea about the thoughts of traditional and modern economist. These agricultural theories provide valid information about the past as well as present circumstances upon which the theory is built. These Theories can make a strong foundation to the present study.

Agriculture plays a key role in food security and economic development .The most of the population in rural and urban areas depends directly or indirectly on agriculture for their daily needs .There is a positive relation between migration and population, yet as the world's population increases and migration to towns and cities intensifies, so the proportion of people not producing the food will grow. According to Nwachukwu, agricultural development is a multi-sectional activity that support and promote positive change in the rural and urban areas. However, the main objectives of the agricultural development are the improvement of material and social welfare of the people. So the agricultural development is seen as synonymous with rural development (Yadav, 2006).

Agricultural development can also address gender disparities In Sub-Saharan Africa and South Asia, women are vital contributors to farm work, but they have less access to improved seeds, better techniques and technologies, and markets, yields on their plots are typically 20 to 40 percentage lower than on plots farmed by man. Addressing this gap can helps households become more productive and reduce malnutrition with in poor families .Economic growth is seen as a long term rises in the capacity to supply increasingly diverse economic goods to its population. Therefore the role of agriculture in transforming both the social economic framework of an economy cannot be over-emphasized. It has been the source of gainful employment from which the nation can feed its teaming populations, providing the nation's industries with local raw materials and as a reliable source of government revenue.

2.2. Theoretical Literature

Creating a sustainable agricultural development path means improving the quality of life in rural areas ensuring enough food for present and future generations

and generating sufficient income for farmers.Supporting sustainable agricultural development also involves ensuring and maintaining productive capacity for the future and increasing productivity without damaging the environment or natural resources. In addition, it requires respect for and recognition of local knowledge and local management of natural resources, and effort to promote the capabilities of current generations without compromising the prospects of future ones. Consequently, economic and environmental sustainability adequate farmer's income, productive capacity for future, improved food security and social sustainability are important element for developing countries' agricultural development.

The main aim of agricultural development is the improvement of material and social welfare of the people; therefore, it is often seen as integrated approach to improving the environment and wellbeing of the people of the country. The first step in the process of agricultural development is abandoning the view of agriculture in pre-modern or traditional societies as essential static. The problem of agricultural development is not that of transforming a static agricultural sector, but of accelerating the rate of growth of agricultural output and productivity consistent with the growth of the other sectors of a modernizing economy. A theory of agricultural development should provide insights into dynamics of agricultural growth, either into the changing source of growth.In view of the context of organic farming, there are about seven agriculture general models in the literature on agricultural development.

1. The high-pay of input model
2. The urban-industrial impact model
3. The conservation model
4. The Frontier model

5 The diffusion Model

6. Theories related to land Use Pattern
7. Schultz theory of Traditional Agriculture
8. Organic Farming and Poor but Efficient Hypothesis
9. Cob-web Theorem and Organic Farming

2.2.1. The High Payoff Input Model

The inadequacy of policies based on the conservation, urban-industrial impact and diffusion model led to a new perspective in the 1960s. The key to transforming traditional agricultural sector into productive source of economic growth is an investment designed to make modern, high pay off inputs available to farmers in poor countries. Peasants, in traditional agricultural systems were viewed as rational, efficient resource allocators. They remained poor because in most poor countries there were only limited technical and economic opportunities to which they could respond.

According to Ruttan, the new high payoff- off inputs were classified into three categories

a) The capacity of public and private sector research institutions to produce new technical knowledge
b) The capacity of the industrial sector to develop, produce and market new technical inputs.
c) The capacity of farmers to acquire new knowledge and use of new inputs effectives.

The enthusiasm with which the high pay off input model has been accepted and translated into economic doctrine has been due in part to the proliferation of studies reporting high rates of returns to public investments in agricultural research. The high return associated with the adoption of new varieties and the associated technical inputs and management practices have led to rapid diffusion of the new varieties among the farmers in several countries. The model remains incomplete as a theory of agricultural development. However the education and research are public goods not traded through the market place. The mechanism by which the resource is allocated among education, research and alternative public and private sector economic activities are not fully incorporated into the model (Schults, 1964).

2.2.2. The Urban-Industrial Impact Model

In the conversion model, location variations in agricultural development were related primarily to differences in environment factors. It stands in sharp contrasts to models which interpret geographical differences in the level and the rate of economic

development primarily in terms of the level and the rate of economic development. Initially, the urban industrial impact model was formulated to explain geographical variations in the intensity of farming system and productivity of labour in an agricultural society. Later this model was expanded to explain the more effective performance of the factor and products markets linking the agricultural and non-agricultural sectors in regions characterized by urban industrial development .The model has been tested extensively in the limited states but has received only limited attention in the less developed world (Club at Rome, 1972).

2.2.3. The Conservation Model

The conservation model of agricultural development evolved from the advances in crop and livestock in crop and livestock husbandry associated with the English agricultural revolution and the concepts of soil exhaustion suggested by the early German chemists and soil scientists. The conversion model emphasized the evolution of a sequence of increasing complex and labour intensive cropping system, the production and use of organic manures and labour intensive capital formation in the form of physical facilities to more effectively use land and water resources. This model was the only approaches to intensification of agricultural development that was available to most of the world's farmers. The agricultural development within the ambit of the conservation model clearly was capable in many areas of the world of sustaining rate of growth in agricultural production around1.0% year over relatively long periods of time .This rate is not compatible with modern rates of growth in the demand for agricultural output which typically fall between 3-5% in the developing countries (Von Thunen, 1826).

2.2.4. The Frontier Model

The history expansions of area cultivated or grazed in the western countries has represented the main way of increasing agricultural production. However, the most dramatic example in western history was the opening up or creation of the new continents – North and South America and Australia to European settlement during the 18^{th} and 19^{th} centuries. In earlier times, similar processes had proceeded, through at a less dramatic pace, in the peasant and village economies of Europe, Asia and Africa. Intensification of land use in existing villages was followed by pioneer

settlement the establishment of new villages and the opening up of forest or jungle were a serious of successive change from Neolithic forest fallow to systems and in recent years b annual cropping. When the soil condition was favourable as in the great river basins and plains new villages are gradually intensified their system of cultivation. While where soil where poor ,as in many of the hill and upland areas, new areas were opened up to shifting cultivation to nomadic grazing (Perkins, 1829).

As a result of population growth, the model did not last the main limitation of the Frontier models were quickly reached. Crop yields were typically low measured in terms of output per unit of seeds rather than per unit's crop area. Output per hectare and per man tended to decline expect in the Delta areas such as in Egypt and South Asia and wet rice area of the East Asia.

2.2.5. Diffusion Model

The diffusion approach to agricultural development rests on the empirical observation to sustainable differences in land and labour productivity among farmers and regions the route to agricultural development in this view is through is through more effective dissemination to technical knowledge and narrowing of the productivity differences among the farmers and regions The diffusion of better husbandry practices was a major source of productivity growth even in the pre modern societies. The development of modern agricultural research systems substantial effort was devoted to crop exploration and introduction. Even in nations with well-developed agricultural research systems a significant effort is still devoted to the testing and adaption of exotic crop varieties and animal species. The model was developed emphasizing the relationship between diffusion rates and personality, characteristics and educational accomplishments o farm operators' Diffusion model provides the major intellectual foundation of much of the research and extension effort in farm management and production economics sine the emergence in the later of the 19th century of agricultural economics as a separate sub discipline linking the agricultural science and economics The development that led to the establishment of active programs of farm management research and extension occurred at a time when experiment station research was making only a modest contribution to agricultural productivity growth (Cardo, 2017).

2.2.6. Land Use Pattern and Agricultural Production

The organization of farms varies because of differences in physical, economic and cultural factors though they have something in common as well (Mellor, 1966). The two prominent factor inputs for agricultural production are land and labour and the farmers have an inclination to increase the size of their farm because they can add to their income more than what they will get by applying more labour to the existing farm and the productivity of labour increases. Rent not only varies with its fertility, whatever its produce, but with its situation, whatever be its fertility and it is a residually determined distributive share in terms of most common agricultural produce of the country and levels of rent vary with intensities of Land Use and that both rent and land use varied with distance (Smith,1776).Rent is that portion of the produce of the earth which is paid to the Landlord for the use of the original or indestructible powers of the soil‖. The definition clarifies that land possesses original permanent powers which are related to the natural ecosystem with a protection of environment. Rent arises from the extensive, intensive cultivation as well as the regionalisation of the existing land. Each increase in population results in increasing demand for land and necessitates cultivation of progressively inferior quality lands (Ricardo, 1817).

2.2.7. Nature of Agriculture and Production

Traditional agriculture occurs if and only if, the state of art of cultivation remains constant and where the farmers use the same factors of production and same procedure of production that their forefathers were doing. Considering the new factors as well as extended factors as constant or given, the farmers, by their experience, can expect an unchanging pattern of net returns which will encourage production and can attain equilibrium where cost of each factor is equal to marginal returns from each factor. If the art of cultivation and motives and preferences to hold the productive assets remain static, then the disequilibrium, if occurred is only temporary. Any permanent deviation towards disequilibrium cannot make agriculture traditional. If equilibrium is disturbed due to price changes, cost reductions, making changes in the costs or the marginal returns, the particular temporary disequilibrium can be restored after sometime at some other level. With the static art of agriculture, there exists neither misallocation of resources nor the existence of unused resources, especially in

agriculture. Since they are utilizing the resources in the proper manner without any misallocation, the farmers can earn their maximum income, but may be a lower or equivalent income when compared with other agriculture progressing countries. The particular concept is called as Efficient but Poor Schultz (Schultz, 1964).

2.2.8. Organic Farming and Poor but Efficient Hypothesis

According to Shultz traditional agriculture is all economic concepts. It implies short run equilibrium when agriculture of a country reaches such equilibrium, it will become an traditional agriculture. The equilibrium can be reached irrespective of the cultural attributes of the society and its institutional arrangement or technical efficiency of its factors. As deduced from the definition of traditional agriculture. Schulz moves on to the description of another hypothesis based upon the perfect allocation of resources which, by now has become quite well known. (Maumdar,1990) The poor but efficient hypothesis implies that people in a traditional agriculture are no doubt efficient so far as the allocation of resources is concerned but still they are poor. According to him optimum allocation of resources fails to ensure a high level income for the farmers. This is because the returns from the resources themselves are quite low or cost of income stream is rather high. Schultz suggests that changes in the nature of from the above implication about the perfect allocation of resources. Schultz suggests changes in the nature of factors of production in order to transform traditional agriculture (Desai and Meller, 1999).

2.2.9. Cob-web Theorem and Organic Farming

The agricultural commodity under consideration is harvest annually, and consumed during two seasons. The production decision is made by the representative farmers/producers in season. The storage decision is made by a representative marketer during both seasons. The quantity planted by the farmer in autumn is available for sale to the marketer. The market is segmented into a local market sells the commodity to the marketer and a central market where the marketer sells the commodity to consumers. This scenario is especially relevant for developing economies. Where production and consumption are geographically dispersed and where transport infrastructure limited. It is also plausible for some regions of developed countries (Bobenenrieth and Wright,2006). In addition, the effects of

storage on price variation are mixed. In the presence of inter annual storage, chaotic price series show less variation compared to a situation without inter annual storage. Storage contributes to the endogenous volatility of prices by making chaotic dynamics more likely.Cobweb theory is the idea that price can lead to changes in supply which causes a cycle of running and falling price in agricultural market where supply can vary due to variable factors(Empler,1990)

2.3. Empirical Literature

There has been a splurge in organic farming literature in last decade. The literature can be broadly classified as (i) Those dealing with the problems of modern agriculture and suggesting alternative systems such as organic farming (ii) Those expounding the principles and practices of organic farming (iii) Those which study the different elements such as effect of bio-inputs studied on comparative yields. The reconciliatory to me can be understood in the emergence of new terminology and practices like sustainable agriculture.

Organic farming is a gaining momentum due to increasing concerns of global food crisis, global warming and health concerns from Genetically Modified Organisms (GMO). The World Market for organic food has been shown consistent straits for over 15 years.

The article “Two concept of sustainability evolution of organic farming” 2002 by Ki-Huengkim discusses how to evaluate organic farming via two concepts of sustainability namely capability sustainability (which includes environmental, social and human aspects) and economic sustainability by highlighting the experiences of organic farming in Japan, Korea and Thailand. The article also discusses two types of organic farming- large scale and profit or landed and small scale and environmentally aware.

Albert Howard’s An Agricultural Testament, first published in 1940, could be said to have marked the origin of modern organic farming in the west. It championed a type of agriculture, which emphasized feeding the soil through compost, the approach is holistic, rather than analytic lands, farmer, food and consumer compose a whole system. It is based on Howard’s experiments while in India 1990’s when he

developed the composting techniques described there in. It is possible that the borrowed the idea from Indian farmers.

Masa noba Fukoka (1985) is the work "One Straw Revolution" indicates four basic principles of natural farming. They are (1) No plunghing, (2) No chemical fertilizers, (3) No weeding,(4) plant protection. In addition, 2000 United Nations Report commonly referred to as the World Agricultural Report, concluded that the world must move away from chemical dependent, industrial agriculture towards sustainable farming.

The curtain raised article "Overview of organic agriculture (2006) by Paul Krishansen Arcan Tari and John Reganold provides a culture of the history and development of the organic movement from its roots in the early 1900s to its current position is global agriculture. The article answers questions related to sustainability and productivity of organic agriculture and whether organic agriculture can feed the world.

Bill Mollison's An Introduction to permaculture (1991) and permaculture – A Designer's Manual 1990 detail the permaculture way of system that ecologically sound and economically viable. A location specific system permaculture is based on a philosophy of working with nature and not against it. The most widely quoted book on sustainable agriculture is Miguel. A Altieri's Agriecology : The Science of sustainable agriculture (1987) The classic work emphasizes the importance of agro ecology as the discipline that provides the basic ecological principles of house to study design and manage eco-systems that are both productive and natural source conserving and are also culturally sensitive.

Martha Kiley-Warthington's Eco-Agriculture food first faming (1993) is another of the no-nonsense, down to earth books which gives a pragmatic view of eco-friendly agriculture, The brilliant exposition of the pit falls of modern agriculture, description of alternatives and finally evolving a set of principles of eco-friendly agriculture based on her own experience gives the reader clarify of whole philosophy of Judious exploitation of natural resources.

Jules N. Pretty's regenerating agriculture and policies and practices for sustainability and self-reliance (1995). It looks at the scale of challenges facing

agriculture today and details the concept and characteristics of alternatives, sustainable agriculture practices. Return to the Good Earth. 'Damaging effects of modern agriculture and the case of for ecological farming (1993) is a collection of articles and excerpts from many sources published by the Third world network. The dangers of pesticide over use, the green revolution and its disastrous effects in the third world', the bio-technology threat, indifferences and natural farming methods that are productive and ecologically sound etc are some aspects covered in these dossier.

Robert C. Oelhalf's organic agriculture (1978) is a watershed in the history of organic farming because it is one of the earliest works that has analyzed organic farming using the conventional scientific methodology.

Francis Blake's organic farming and growing (1987) is a comprehensive hand book on organic husbandry outlying principles of organic agriculture, giving advice to those considering going organic and step by step guide to conversion.

The last two decades of 20th century witnessed an over whelming popularity and scientific acceptance of organic farming in the western world. especially USA, Germany and the Scandinavian countries. In depth research has gone into different aspects, stages and shades of organic agriculture.

There is no doubt that organic forming has been established in the west. Natural fallout is the interest shown by MNCs who sent a huge killing in a new area. The prime motive organ becomes generation of easy money and opening at new markets. Organically grown food produce is already being exported in the West from Latin America and Asia under the supervision and certification of inspectors from the West. The whole idea of food export from Kerala is cashew nut and seafood.

Organic agriculture is new practiced in almost all countries of the world and it is the share of agriculture land and forms is growing the total organically managed area is more than 22 million hectares worldwide. The market of organic products is growing not only in Europe and North America but also in many other countries including many developing countries official interest in organic agriculture is emerging in many countries (Yusseli and Mitscke, 2003).

2.3.1. Sustainability and Organic Farming

India produces primary organic products; processed foods are limited organic products grow in various agro-climatic zones are coffee, tea, spices, fruits vegetables and cereals as well as honey and cotton. Organic animal husbandry, poultry and fisheries do not exist. Domestic organic market and consumer awareness are under developed in India but interest is usually sold directly by the farmers or through specialized shops and restaurants.

External certification bodies introduced inspection and certification programmes in 1987 in June 2001. The government of India announced the national programmes for organic production (NPOP), which aims to promote.

Organic farming is mainly for export markets, has made significant progress in many part of India, However, this ecological form of agriculture face, several obstacles. Institutional support by the government can help overcome the hurdles and promote faster growth of this sector. Organic agriculture is penetrating the farm lands of India slowly but surely. It is in deeded remarkable that the organic model in its modern form (Le central organic") has found acceptance among the divers categories of agriculturists operating in different parts of India under varied agro ecological and financial condition and often with divine objects

In India organic food is usually sold directly by the farmers or through specialized shops and restaurants. At present, a price premium of about 20-30% over conventional; products can be received (FAO, 2002). India is an exporting country and does not import any organic products. However in recent times a number of studies on related aspects of organic farming have been fourth coming line the effect of organic and inorganic manures, chemical and bio pesticides comparative yield studies on integrated pest nutrient management.

"Tending the Earth" Traditional, sustainable agriculture in India, summarizes a wealth of information and ideas from a voluminous documentation collected over more than 21 years. It dents how the traditional agricultural system in India was so developed in terms of productivity, self-reliance, diversity and sustainability (Winin Pereria, 2003).

The organic farming source Book is the first document of the organic farming scene in India. It also contains brief but very interactive reviews on the publications on organic farming in India. If gives an ample information about various eco-friendly farming practices prevalent in the world (Claude Alvarez, 1996).

The organic farming reader includes different sections such as the "philosophy and ethics of organic farming; soil fertility management and land generation', "seeds-Genetic sources and food security" problems in plant-animal relationships and "Economic and special aspects of organic farming' cover almost the entire spectrum of organic farming" (Alvarez, 1999).

"Agrarian Crisis", Analysing the failures and strategies for sustainable Development emphasizes the adverse impacts of green revolution. The country is passing through the agrarian unrest. Food production has shrunken over the last decade. According to the author population is increasing by 2% every year and projected to reach 130 crore by 2010 and may require 300 million tones of food grains to feed the population (Agarwal, 2003).

Institutionalized sustainable agriculture in India towards as a response to climate change" is a study published in 2009This study examined the nature of threats faced by the Indian agriculture sector from the impeding change in agriculture and climate. The study also emphasizes the importance of organic farming in improving crops and animal productivity under low-external inputs and selecting varieties and breed that are lit under local conditions in the spirit of organic farming (Milindo, 2009).

The national seminar on National Farming (1992) in Rajasthan brought the first comprehensive collection of papers on organic farming in India. The National symposium on organic farming (1996) held in Chennai, congress on traditional sciences and technologies of India (1993, 1995,and 1997) held at Mumbai, Chennai and Varanasi, respectively. The workshop on tropical organic farming (1995) and seminar on sustainable farming and the environment (1993) held at Kottayam and Kochi respectively are some of the major events in the course of development of organic farming in the country. It is also discusses major issues and suggests remedial measures needed for the popularizing of organic agriculture (Jhnadhan, 2009).

Air quest for green revolution and food security, we have completely ignored soil. As organic farming is the need of the time the research work has been projected to explore the possibilities and feasibility of organic matter, recycling and enrichment of using cheap non- traditional organic waste available.

Another important article on organic farming is "study of Awareness and adoption of organic farming among the cultivators in Maharashtra" say that the concept of organic farming is not well popularized in addition; certification procedure is also very complicated. The study is based on the primary data collected from 306 organic farmers from the selected counties. The study suggest that the government should take steps to minimize the constraints in adoption of organic farming add to popularize organic farming (Kasar, 2004).

The article "organic farming solution to starvation" authorized by C.S. Murthy (2009) explains the bio-technology that has the potential to increase agricultural productivity through intensification rather than exploitation of additional resources.

An important article "organic farming" authorized empowering farmers by Rao (2009) high light that organic farming has the potential to create job opportunities for rural people and sybolises a novel opportunity for small farmers who lack the resources (Fertilizers and pesticides) to do conventional farming India has a tremendous potential to flow crops organically and emerge as a chief of organic products in international market.

One of the most significant studies that have a strong relevance is the one on the "organic farming in Pudukkotai, Tamil Nadu". The study on the cost-benefit analysis, impact of organic farming an yield, soil, income and expenditure Ecology, debt, health etc, of the 300 organic farmers of Pudukkotai district. Tamil Nadu reveals despite the infancy stage of organic farming, the results are very encouraging. The cost benefits ratio of some crops is already higher for organic farming (Norman, 1997). The growth of organic farming mainly for export markets, which makes a significant progress in many parts of India. It also discusses the convention period from conventional farming into organic which may turn cut to be a difficult phase for farmers owing to direct and indirect costs involved in the process (Kasturidas,2009).

Another article titled “Issues and Challenges in Financing organic agriculture” emphasizes that banks need to prepare for the emerging business opportunities and funding of large amount for commodities it also discusses that organic agriculture is going to benefit the farmers by security him a surplus and this, in turn would help de-risk the agricultural portfolio of the bank (Murray,2009).

Another important study is “Ecological Agriculture in South India” describes two research programmes carried out on ecological agriculture. The duration of the transition period is directly related to previous farming systems. An average transition taxes 3 to 5 years, consisting of one ecological and one conventional relevance farm is analysed in relation agro-economic and economic performance. Ecological farms achieve similar economic performance. Ecological farms (Evender Werf, 1992).

The two works that appeared recent times are organic farming for sustainable agriculture (Dharma, 1999) in a bleak scenario where there are hardly any books on the Indian context of organic farming. The four important factors of sustainable agriculture are balanced fertilization integrated plant nutrient system (Prasad, 1996).

The quality of the crops produced by a mixture of organic matter and phosphate is better than the produced in control soil or that fertilized by the application of inorganic fertilizers. The protein vitamins and minerals are appreciably greater in the organically produced crops (Srivasthava et al., 1982).

To sum up the greatest challenge for the coming decades lie in the fact that the production environments are unstable and degrading and the balance between intensive and extensive agriculture is precious. Experience over the past 20 years has shown that mismatch between crop production methods and resources characteristics has led to a decline in soil Fertility increased soil losses disturbed hydrological balance and a buildup of pests and diseases (Ahrol, 1994).

2.3.2 Environmental Impact of Organic Farming

Agriculture in Kerala is at the cross roads. Hundreds of farmers who had learnt the bitter lessons of chemical farming and mono cropping practiced hitherto in the name of ‘scientific agriculture’ are making come back to organic multiple crop learning more importantly from the farmers initiative the state department of

agriculture has made a significant turnaround to promote the production and marketing of organic food by launching a programme and policy for "organic sustainability of Kerala" named Jaiva Keralam.

The most revealing statement on the agricultural situation in Kerala in recent times is in the Kerala State Resource based Perspective Plan 2020 AD Giving a bird's eye-view of agriculture in Kerala, it strongly recommends the adoption of sustainable agricultural practices at the earliest. It is one of the most precise indictments on the state's sorry state of agricultural affairs. Detailed data on Kerala's agriculture, on the basis of agro-climatic zones are given in the book.

First major coverage on organic farming by a popular periodical was in "Karshakashree. The article by Mini George contained the principles of organic farming, sustainable farming and examples of organic farmers in the state. The periodical "Jaiva Karshaka Prakritti" published by the Jaiva Karshaka Samiti (Kerala Association of organic farmers) carries articles on organic farming and environment conservation. Two books named "Oorvathayude Sangeetham" by Dayal and Krishi Malayalam by Sujith Sankar (1996), while the former services as excellent introduction to organic farming, the latter deals with the history and culture of agriculture in Kerala.

Another significant study from the 1980s is the Report of the One-Man Commission on the problems of Paddy cultivators in Kerala (1981). Though restricted to the problems of paddy cultivation, the recommendations of the study are valid for the entire agriculture sector. Noteworthy among the observations are those on decreasing use of organic manures in the fields and the negative impacts of chemical pesticides. The Report recommends popularisation of bio-fertilisers and green manures; to initiate a 'Green manure perennial planting Programme mechanical plants for manufacture of compost in Corporations and Municipalities, minimization of use of insecticides; and to take up biological and mechanical control of rodents. Enquiry into the available literature on organic farming in Kerala revealed a void. Here again, there are quite a number of studies on organic manures, natural pesticides, integrated pest and nutrient management but organic farming as a system seems to have been left out. This gap is filled to a certain extent by the few studies on homestead gardens and farms of Kerala.

"Organic farming the cluster-Approach" talks about the need for organic farming policy which advocates for a cluster approach for organic farming. According to him organic farming can be introduced in art of the selected villages and sale of pesticides and their use would be banned in such villages. According to the author, much of crop loss and farmers suicide happen only in the areas where the mono cropping and excess chemical fertilizer usage. The recent realization of the ill effects of chemical fertilizers and pesticides that personal the environment and food crops has forced the rethinking on going back to the organic farming which is eco-friendly and free from health hazards (Baby, 2010).

Sreekumar Chatopadhay, Richard W Frantise (2006) in their book striving, for sustainability environmental stress and Democratic initiatives in Kerala" take stocks of Kerala's environmental decline as well as the people's response towards possible alternatives that meet the basic criteria for sustainability. In this book the author discusses the changes in agriculture inorganic fertilizers have been substituted for livestock manure, compost and nitrogen fixing crops. Machines have replaced labour and fossils fuels have been substituted for local energy suppliers. External inputs as the means to increase food production have made the whole agricultural system more vulnerable to sudden failures.

The proceedings of the two major seminars and workshop held at Kochi and Kottayam organized by the united planters association of South India brought out a number of works of farm-level experiences of organic farmers. Cultivation practices of various field crops as well as plantation crops. Enquiry into the available literature on organic farming in Kerala revealed a void. Here again, there are quite number of studies on organic manures, natural pesticides. Integrated pest and nutrient management but organic farming a system seems to have been left out. This gap is held to a certain extent by few studies on homestead gardens and farms of Kerala are by, Thampan of Kochi, in this book (organic agriculture) 1995 he has compiled articles on organic agriculture. Verms culture, traditional Indian agriculture, some case studies of organic farmers from the different parts of India. It provides data on yield returns techniques used for maintaining soil fertility etc.

Diverse agricultural systems had evolved in Kerala, as diverse as its landscapes. But in the last few decades, traditional agriculture was rejected in favour

of the modern, intensive kind. This had a negative impact not only on agriculture but also on the economy, environment, culture and social life of the people. The transformation of 'agriculture' toagri-business' is most evident in Kerala. Oilseeds, rubber, tea, coffee, cashew, spices, sugarcane, horticulture, and floriculture have relegated food crops to the background (Madhusudanan, 1995).

Decreasing share of agriculture in the total domestic production and individual earnings from agriculture, diminishing importance of agriculture as a source of livelihood, shift from short term annual crops to long term cash crops and tree crops which have a lesser potential for employment, decrease in the area under paddy cultivation mainly due to conversion of paddy lands to coconut plantations, brick kilns and construction of residential houses, acute shortage of farm workers, fragmentation of land, pollution due to chemical pesticides and fertilizers, are some of the major problems faced by agriculture in Kerala (Varghese, 1995).

"The current farming systems lay emphasis on high yields which are achieved by intensive use of fertilizers, pesticides and other off-farm inputs. Alternate farming systems range from systems which follow only slightly reduced use of these inputs through the better use of soil tests, cultivation of crops only on soils best suited to them and integrated use of pest management. to those that seek to minimize their use through appropriate crop rotations, integration of livestock with crop husbandry, mechanical or biological control of weeds and less costly buildings and equipment. So for agriculture to be sustainable, it should include a spectrum of farming systems ranging from organic systems that greatly reduce or eliminate use of chemical inputs to those involving the prudent use of antibiotics to control specific pests and diseases' (Kerala Land Use Board, 1997)

In Kerala, organic agriculture has been showing a rising trend. So the conventional farming will directly or indirectly effects the environment as well as the human beings also here we produce organic products many for exports: domestic consumption of the organic products in Kerala is very low. Organic agriculture is a way of forming that avoids the use of synthetic chemicals and genetically modified organisms and usually subscribes to the principles of sustainable agriculture. Its theoretical basic puts an emphasis on soil health. It proponents believe that healthy soil maintained without the use of man-made fertilizers and pesticides and live stocks

raised without drugs and yields higher quality food than conventional based agriculture.

The term 'organic' was first used in relation to farming in the book "Look to the land" the farmer itself must have a biological completeness. It must be a living entity; it must be a unit which has within itself a balanced organic life (Boune, 1940).

The origin of modern organic agriculture is intertwined with the birth of today's "industrially based organic agriculture" Before the introduction of chemical fertilizers, eco-friendly agriculture was the only optics for farmers. But those days production yield was very low. This led to the invention of chemically synthesized fertilizers and pesticides. Like a can has two sides, one side it leads to enormous increase in production on the other side, it becomes a threat to our health, climate etc. The negative effects of industrially based agriculture force the farmers to rethink and how they are moving back to eco-friendly and poison free agriculture i.e. organic agriculture.

Rice ecosystem in the sandy soils of Onattukara as influenced by organic manures and in organic fertilizers Symposium "Rice in Wetland Ecosystem" December 1990, Kottayam. Results of the Permanent Manurial trials at the KAU Rice Research Station at Kayamkulam show that organic manure is essential for rice production in Onattukara tract. Cattle manure acts as a buffer and helps to maintain soil PH. The water holding capacity, percentage pore space and absolute specific gravity are increased by cattle manure (Abraham Varghese, 1990).

Farmers' character and preference among rice cultivars- a group participatory analysis. Proc. IX Kerala Science Congress, January 1997, Thiruvananthapuram. Itshows the preferences of attributes of rice seeds of the rice farmers of the small production system. Stability of yield, grain quality, good taste, high protein content, quick cooking quality, low input and cultivation cost, adaptability to less intensive management, adaptability to inferior fertile soil, etc., were the higher ranked preferences of the farmers. Interestingly, these qualities are inherent in the indigenous varieties rather than the HYVs (Ramesan, 1997).

The study shows that recommending chemical Weedicides for controlling weeds based on their weed killing property is not scientific and correct as it has got

specific effect on plant. Judicious experimentation of these chemicals is essential before recommending them in order to ensure that they do not have a toxic effect (Neelakantan, 1991).

Trends in the use of ecologically hazardous inputs for rice in wetland ecosystem: a 10 year case study. The data on usage of chemical fertilizers and pesticides among the farmers of two villages in Kuttanad show a high percentage of overdoses. Nitrogen, phosphorus and potassium were being applied at levels 50-60% higher than the recommended levels. Fungicides were used in overdoses. The gravity of this problem is enhanced by the fact that 95 % of the farmers used lower than recommended volume of spray fluid. The paper states: "Now that we realize that chemical pesticides are not essential for crop production and that they may be dangerous both to health and the environment, we have the responsibility to determine better way to use these materials. Research ought to be intensified to develop bio-pesticides as substitutes for chemicals" (Krishanakumari, 1990).

A conceptual overview of resource use systems with special reference to the agricultural production system of Kerala. Given the complexity of our eco system any attempt to manipulate natural resources must take into account the entire systems or run the risk of breakdown in the not-so-long-run (Shanmugaratnam, 1993).

"Alternative fertilizer use behaviour of rice farmers in Thrissur district." The study was conducted to identify the alternatives to chemical fertilizers by the rice farmers to overcome the recent price hike of chemical fertilizers and also to compare the constraints in the use of fertilizers before and after the price hike. The choices were: apply more organic manures and reduce the quantity of chemical fertilizers (97.5%) grow green manure crops during the third crop season (49.58%) skip application of fertilizers (30.42%) ranked high among them. Majority of the farmers had adapted themselves to the situation by increasing the use of organic manures and reducing the quantity of chemical fertilizers to the extent possible. This projects the need for self-reliance on the part of farmers as in the past, when they were utilizing cattle manure, green leaf manure, FYM, ash, etc. from their homestead as the nutrients for their crops without wasting them (Geethakutty,1994).

"Cost-benefits analysis of rice cultivation in Kerala". Proc, III "Kerala Science Congress .Kozhikode." Cost and returns and factors affecting yield of rice crop were analysed. Cost of cultivation of local varieties was found to be less than that of HYVs. Due to the higher yield, the HYVs were found to be profitable. The benefit: cost ratio for local varieties and HYVs were found to be 1.28 and 1.31 for the Virippu season and 1.31 and 1.42 for the Mundakan respectively. The method of cultivation, details on the application of fertilisers and chemicals etc., forlocal varieties and HYVs in comparison are not available in the paper (Prakash, 1991).

The comparative yields of vegetable in different organic plots with that of conventional plots were studied. The results showed that, even though the yield in the first season was only 1/7th of that of conventional plot, in the subsequent years the yield increased and it is expected that yield equalization can be achieved within5-6 years (Gopimony, 1996).

The split between organic agriculture and industrial agriculture dates back to the start of the 19th century when it was discovered that it was the mineral salt of the 19th century contained in human and manure that plants absorbed and not organic matter. Sir Humphery Davy and Justus Von Liebig were the key founders of this theory and published their ideas in elements of agriculture chemistry and organic chemistry and organic chemistry in its application to Agriculture and physiology. Their argument was that inorganic mineral fertilizers could replace manures and bring agriculture into scientific fold with resulting increase in the production and efficiency (Davy, 1813).

The first organic certification and labeling system "Demetes" was created in 1924. During this time Robert Mccarison a distinguished scientist, was researching the vitality of the fighting men of India and why lacked diseases common in the west. Mccarison followed up his observations with dietary experiments on rats, feeding one group the diet of the Indian and other of the British poor. The rats on Indian diet flourished while the others suffered a range of diseases and negative sociological effects. This led Maccarison to expand the importance of wholesome diet grown on soil fertilized with manures and other organic matter (Rundgren, 2002).

The formation of a thermal global network is one of the land marks for the organic movements this was the founding of international federation of organic agriculture movement (IFOAM) in 1972, which to this day remains the only global organic non-governmental association.

UDOAN's mission is leading, uniting and assisting the organic movement in it's fully diversity (Woodword and Voytman 2004). The main aims of the organization are:

1. Providing authoritative information about organic agriculture

2. Promoting world wide application.

3. Marking the agreed international guarantee of organic quality.

4. Building a common agenda for all the stake holders in the organic sector.

Explosive growth in organic agriculture occurred in the 1980's beyond the industrialized countries of the Western Europe and Northern America a large growth in organic agriculture occurred in the 1980's in part of Oceania, central and South America has three million hectares of land under organic production (Yusseli, 2004)

Cuba developed several programmes to promote organic agriculture including biological control agents, restricting state farms and developing training and certified frame works. During the latter Vedic period of India, a system of eco-friendly agriculture practices prevailed in India. This indigenous knowledge still applied today in many parts of India acts as an aid for farmers converting to organic agriculture organic agriculture has been adopted in a few countries like Kenya. Australia has largest (10 million hectares) and Argentina the second largest (3 million hectare) are of the world (Yusseli, 2004).

Trends that began in the 1970's and accelerated through the 1980s continued to flourish during the 1990s and into the new millennium. Demand and production of organic products continued to grow exponentially around the world often at 20 to 30% per year organic agriculture is now widely recognized by the public and governments as a valid alternative to conventional agriculture and is a source of ideas

and approaches that conventional agriculture can adopt to make more it more sustainable.

2.3.3. Organic Farming Practices and Fertility of Soil

Since soil is known as the soul of infinite life, continued maintenance of good soil health is vital to agricultural production and nation economy. Amongst the various attributes, organic matters content is the most important determinant of soil quality including its fertility and productivity. Since it serves as a primary sources and temporary sink for plant nutrients, influence water air regime, minimizes degradation process and aids in sustaining soil health Bagwu (1989) reported that application of organic wastes like poultry manure, compost, sawdust, rice shavings and cashew leaves improved the soil structure, water retention property, total porosity, macro porosity and saturated hydraulic conductivity, but in decreased the bulk density of tropical ullisol. A decrease in bulk density by the addition of organic matter residues over long time was observed by Rasmussen and Collins (1991) in temperate and semi-and regions.

Organic matter is an important determinant of available water content and it increased the available water content in sandy texture soils only. As the organic matter increased the volume of ware held at field capacity increased at a greater rate than held at permanent Wilting point. Organic matter addition increased the ability of soils to hold moisture, expanded the available water capacity and decreased the modulus of rupture of compacted soils (Nidal, 2003).

The study conducted on topic soil showed that macro pots were more and continuous to a greater depth (75 cm layer) in the plots receiving liquid diary sludge than in the fertilized plots due to the presence of earthworms. In another experiment to study the water retention characteristics under soybean – wheat cropping sequence, it was observed that in farm yard manure treated, plots, soil water retention was significantly higher in all the depths compared with fertilized plots. This is because water retention at lower tension depends primarily upon the pore size distribution (Mayunkui, 1994).

According to Senthilkumar (2002), vermin compost influenced the physical, chemical and biological properties of the soil. They also opined that it improved the water holding capacity of soil and acted as a mine for various plant essential nutrients.

Lee (1985 observed that the applications of vermin compost rained the pH of the soil. Worm casts have a pit near to neutral change than the surrounding soil and the possible factors that act on soil pH may be excretions of $NH4^{+}$ from Calci Ferass glands of the earth worms.

Agriculture based economic development ideas and the trend of new technology implementation received tremendous attention in developing countries. However, the growth in agriculture, which ultimately drives economic development, is governed by technology and optimal resource utilization. This optimal resource utilization is called efficiency, which has a functional relationship with the resource and the performing units of production. The optimization of resources has a significant role in agricultural sustainability (Johnston and Mellor, 1961; Singer, 1971; Kawagoe et al., 1985).

The growth of agricultural productivity is the key concern of many developing counties, but also it should have the power to maintain sustainability. Agricultural sustainability needs to adopt such a technique that would trade-off crop yields and maintain soil health for future viewpoints Today agriculture productivity is under the pressure of sustainable agro activity development. In the Indian context, the agriculture sector plays a significant role in fostering economic development and providing livelihood to a large population. The per capital food grain consumption has been declined while the total food grain production increased with the population growth. The food grains are the primary source of diet for India's population share, which is also essential for food security (Reddy, 2010).

Traditionally, economic development has widely affected the agriculture sector, especially after India's independence. Still, in India, agriculture and allied activity provide livelihood but have a stagnant growth rate over the past few decades. The major reason behind the slow pace of agricultural growth in developing countries is related to agricultural transformation. The Indian agricultural system is the provider of allied activities, which must be transformed with time (Mellor, 2017).

Agriculture was considered the main source of national income for independent India (Tripathi and Prasad, 2009). The immediate productivity booster by Green Revolution in the early 1960s had prolonged India's institutional strategy and supported the livelihood. In the late twentieth century, the Green Revolution movement enforced many developing countries towards 'productivism', including India (Bowler, 2002).

The intensification of agricultural inputs has benefited a minimal extent of small and marginal farmers. They did not have the necessary capital to acquire this new intensification-based technology on marginal lands. As a result, Indian smallholding farmers are still in poor conditions and away from product market gains. Intensification of fertilizers for enhancing crop production would not solve future food demands in India, and it continuously degraded the crop yield level (Smith et al., 2020).

The main aim of the Green Revolution was to make agriculture self-sufficient and resolve the food security issue. Using high yield variety seeds and chemical fertilizers, some states like Punjab, Uttar Pradesh made a drastic change in food grain production but with a high environmental cost. Today, India is placed at second position after China in most land degraded areas, and these rapid changes would have a severe effect in the long run. The green revolution movement in India was quite successful in northern states. However, the large agricultural holding got shrieked with time, and also the heavy fertilizers and pesticides worsen the soil health. Another challenge is decreasing water levels in arid and semi-arid regions of India, where 70% of arable land is primarily rain fed (Harish, 2020).

Sustainable production with a near stagnant area of cultivation becomes a vital debate by economists and policy makers. The demand for agriculture shifted from high production yield to sustainable production, fulfilling the current production demands without harming future demands. Ainsworth writes, "What is sustainable agriculture after all? The only sustainable agriculture is profitable agriculture. Short and sweet" The policymakers realized that input intensification in agriculture is a widening issue for soil yield sustainability, and we need an alternative method to resolve it. To resolve crop yield and upcoming food demand, organic farming can become an alternative method that has been growing faster in India.

2.3.4. Organic Farming Practices

The concept of organic farming in India is not new. Traditionally, Indian farmers used to do organic farming (e.g., formally a practice without chemical uses). The practice has the inherent trait and natural for Indian farmers and has a potential agro-climatic feature for organic production (Amarnath, 2012). The roots of organic inputs used in India are briefly visible in literature like Ramayana, Mahabharata, Rig Veda and Kautilya's Arthashashtra (Behera et al., 2012).

The modernization and surge for high agricultural yield somehow change the practice, and today this conventional method of farming is rare in practice. So we can say, the conventional farming technique in India was pure organic. Therefore this study writes non-organic practice instead of writing conventional farming and tries to avoid vagueness to readers, especially from India. The idea and fundamental characteristics of organic farming are not clear to many people. Sometimes people believe that traditional agriculture means organic agriculture (Bhattacharyya, 2005).

It should be clear that organic farming is not the traditional farming that we have commonly known. Instead, it is a modern agro-based technique based on traditional farming. Organic farming is a method of farming that does not use any chemical fertilizer and pesticides. Organic farming is a method of farming in which the use of chemical fertilizers, pesticides is avoided, and beneficial microbes like bio fertilizers, manure, and compost are used in agricultural production. This method is based on intimate natural role in farming that produces crops to keep the soil alive (Yadava, 2017).

It uses beneficial microbes, organic wastage, and biological materialism farming practice. In other words, the organic farming method avoids the use of the genetically modified entity, synthetic fertilizers, and chemical during production and makes it more viable for the environment.

International Federation of Organic Agriculture Movements (IFOAM) defines "Organic Agriculture is a production system that sustains the health of soils, eco systems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic

agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."

The modern organic agriculture practice had initiated by two scientists Sir Albert Howards and Rudolf Steiner, in their speech in 1924. In 1972, the organic movement got boost-up by establishing IFOAM. Germany was the first country who adopted organic agriculture more scientifically. Later, many other counties participated in this movement (Nielsen, 2018).

There are many scientific terminologies available in organic farming, and without going into detail about all of them, we only focus on those terms which are essential for this study. As mentioned above, the organic farming practice involves bio-fertilizers and bio-pesticides in the production process. The land which is non-organic need to be transformed to grow organic production but this transformation takes some time, two to three year. This period is called the transformation period, and the products grown during this period are partially organic, or we can say production during the transformation period.

After the transformation period, the pure organic products need to be tagged that excludes them from the non-organic products in the market. Any private or government institution commonly does this tagging or labeling. By labeling the products, a producer gets a higher price for her products, called premium price for the product. The labeling of organic products is a major challenge in developing countries like India. In 2001, the Ministry of Commerce and Industries launched the National Program for Organic Production (NPOP) in India. Organic Farming Policy was introduced in India. The NPOP program is responsible for organic certification, product promotion, standard monitoring, and marketing of organic products. The certified organic products by NPOP have also been renowned by the United States Department of Agriculture (USDA) and European Commission. This international recognition makes Indian organic products exportable in the international markets.

The certification of NPOP based third parties are monitored and regulated by the Agricultural and Processed Food Products Export Development Authority (APEDA). Currently, India has 2.78 million hectares of organic land, which is almost

2% of the total irrigated land size, and out of this, 1.94 million hectares are under the NPOP scheme. Despite the area under NPOP, 0.59 million hectares area is under Parampragat Krishi Vikas Yojana (PKVY) scheme, 0.07 million hectares are under Mission Organic Value Chain Development North Eastern Region (MOVCDNER) scheme and 0.17million hectares belongs to non-schemes. The PKVY and MOVCDNER schemes were launched in 2015 by Government of India (GoI).

Another major and institution-based certification in India has been provided under Public Guarantee System (PGS) India scheme. The PGS India is a participatory approach-based initiative that substantiates the goals of the National Project on Organic Farming (NPOF). The PGS system is a pooled group system of organic farming and covers PKVY and MOVCDNER schemes. In the PGS system, farmers collaborate and monitor farming activities of each other. These farmers or groups of farmers get the organic certificate with direct institutional support from the Ministry of Agriculture and Farmers Welfare, Government of India (GoI). Whether in the PGS India scheme, the institutions are directly involved in certification, while in the NPOP scheme, a third party, mainly private institutions, is involved in the certification process.

India has the largest number of organic producers (approx. 1.4 million organic producers) and at sixth place in organic land. In the past few years, organic farming has emerged as an alternative and sustainable farming method which ultimately enhances the soil yield in the long run and reduces the cost of production in India. The practice has been adopted by many counties worldwide. The growth of organic land share with overall irrigated land size worldwide. A significant organic land size increment has been recorded in the Oceania region, followed by Europe, Asia, North America, and Africa.

2.3.5. Non-organic Farming Practices and Sustainability

The non-organic or the agriculture practice, which is in common practice, is the main livelihood source in India. The study defines the non-organic farming practice, which uses synthetic or chemical fertilizers, pesticides, and any synthetic inputs in farming. The non-organic practice may use bio-fertilizers, manure, and other organic material with chemical fertilizers and pesticides.

It is expected that the global food demand in 2050 will touch 9.1 billion, which is double comparatively the current production level of food grains. However, global agricultural production only increased by 28% from 1985 to 2005 (Ray et al., 2012). By the century, to maintain this required demand, it is necessary to focus upon agricultural productivity with sustainability. India has tremendous agro-climatic advantages to produce different crops across different regions. The agriculture sector in India is important for resolving food security issues and gives lively hood to a significant part of the population. These features make agriculture the primary source of employment in India. The growth rate of Indian agriculture was about1% per annum before the independence and improved to 2.6% per annum after the independence.

This agricultural growth had resulted from increasing agricultural land size in the fifties and sixties. This growth rate was almost stagnant for a long time. Based on institutional policy options adopted from the independence, we can divide the growth of Indian agriculture into four phases. The first phase started in 1947 and ended in the mid-sixties. This phase is known for institutional land reforms, removal of intermediaries, agricultural credit reforms, etc. The second phase started in the mid-sixties when a new agricultural policy was adopted. This period is known for adopting a new strategy for high yield growth in the Indian agricultural system. This was the golden time for Indians because India stood on its bare feet and become self-sufficient for food security. The main strategy was to build a long-term policy for agricultural performance.

The third phase originated in the early 1980s which recorded a drastic change in non-food grain items. The institutional subsidy played a massive role in record growth in fisheries, milk production, and poultry. The fourth phase begins with the new economic policy of 1992. The growth of Indian agriculture mainly declined in this post liberalization period. Despite no policy changes for agriculture in 1991, changes in other sectors indirectly affected agriculture growth. After 1991, the growth rate of crops declined to 1.57 from 2.93. Even for some specific crops, the growth turned negative (e.g., the growth rate of pulses became negative). The policymakers argued that the failure was related to improper or incompetent agricultural policy. The continuous decline of agriculture raised concern for policymakers, and in the

year2000, the new agriculture policy was adopted with the aim of annual growth of 4% per annum. However, the target of the new agriculture policy seems complicated to obtain specifically without any significant technological change in the Indian agriculture system. In the year 2004, the National Commission on Farmers was set up to provide a comprehensive study of the food situation in India. The committee's concern was primarily related to production and productivity in the agricultural system. The committee placed several recommendations to reform agriculture, and those were mainly related to land reforms, public investment in agricultural infrastructure, and enhancement in productivity.

The sectoral growth rates of different sectors in India. The growth rates of this table are average growth rates over different periods or long-term growth. The growth of the agriculture sector has recorded 3.4% annually during 2004-05 to 2016-17, which was better than the previous decade rate of 2.3% annual (during the year 1995-96 to 2004-2005). However, this growth rate is still below the target of the new agriculture policy. During this period, the growth rate of livestock and sub-sectors was remarkable. The livestock sub-sectors have not recorded negative growth in the last 34 years, and it can minimize risk in farming and mitigate the farmers' loss.

Appendx1 shows that the growth of agriculture and agriculture allied activities is comparatively lower than to industry and services in India. The gap between agricultural growth and the overall economy has constantly been widening. Even with the five-year plans, the performance of Indian agriculture gives a mixed phenomenon over time. One major reason behind this slow pace and continuous agricultural growth decline is the decline in productivity time due to intensified agricultural practice. The past thirty years have seen the contribution of agricultural land to the growth has declined, and agricultural productivity concerns have become the new driver for agricultural growth in India.

The food grain production in India accounts for nearly 90% to 95% of total agricultural production, and total food grain production recorded 130 million tons in 1980-81. India has currently recorded 296.65 million tons of food grain production in 2019-20 (Economic Survey, 2019). Also, the agriculture and allied sector contributed 17.2% in Gross Value Added (GVA) at the current price into the national income of India in the year 2019-20. A snapshot of major food grain production in India from

2012-13 to 2017-18 is presented in figure 1.3.In total food grain production; an exciting increase appeared in the case of coarse cereals. The coarse cereals production was 30 million tons in the mid-1990s, increasing to 44 million tons in 2016-17. Oilseeds also recorded a surge in production. During this period, the production of pulses remained stagnant and created demand for imports. A drastic change has been recorded in recent years in food grain production but with prolonged growth rates.

The food grain production in India has been recorded a plodding pace of growth or stagnant growth in the past year. A detailed crop-wise production, yield, and growth of major food grain production working group report by NITI Aayog show how agricultural performance in the last 35 years. It documents that growth in agriculture production in the 1980s was mainly improved by increasing areas that became negative in the 1990s and the negligible amount recorded in the 2000s. The production growth trends of major cereals, especially rice, have declined over the past three decades. These trends are stagnant for wheat and even negative for some Kharif crops.

In recent years, researchers and policymakers have shown an increased curiosity in sustainable agricultural practice. This is the only solution to boost productivity levels in the long run. Issue of low yield and future demands are in policy debates. Kesavan and Swaminathan, (2008) argued that without care of the soil and long-run effects of intensified agricultural practice induced into traditional practice will ultimately drive into agricultural disaster. Also, the yield gap through imbalance agricultural practice in major crops is the critical issue of debate for doubling the farmers' income in India. There is an urgent need to adopt an alternative farming practice that would be more viable for current agriculture conditions in India.

Organic agriculture is an integrated production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of natural inputs (i.e. mineral and products derived from plants) and the renunciation of synthetic fertilizers and pesticides. Organic agriculture follows the principles and logic of a living organism, in which all elements (soil, plant, farm animals, insects, the farmer and local conditions) are closely linked to each other. Organic agriculture shares many techniques used by other sustainable agricultural approaches (e.g. intercropping, crop

rotation, mulching, integration of crops and livestock). However, the use of natural inputs (non-synthetic), the improvement of soil structure and fertility and the use of a crop rotation plan represent the basic rules that make organic agriculture a unique agricultural management system (WHO, 2007).

According with the Guidelines of Organically Food Produce of the Codex Alimentarius (2007), an organic production system is designed to: Enhance biological diversity within the whole system Increase soil biological activity, Maintain long-term soil fertility; Recycle wastes of plant and animal origin in order to return nutrients to the soil, thus minimizing the use of non-renewable resources; Rely on renewable resources in locally organized agricultural systems, Promote the healthy use of soil, water and air as well as minimize all forms of pollution that may result from agricultural practices; Promote the careful processing methods agricultural products in order to maintain the organic integrity and vital qualities of the product at all stages; Become established on any existing farm through a period of conversion, the appropriate length of which is determined by site-specific factors such as the history of the land, and type of crops and livestock to be produced

Chapter 3

Data and Methodology of the Study

3.1. Introduction

The methods of performance evaluations have based on productivity and efficiency comparison of agricultural practices. First, agricultural productivity and efficiency have been considered the main argument of debate in the farming sector's policy agenda. The agricultural productivity measurement is not a new concept and has origins in microeconomic theory (Solow, 1957; Ball et al., 1997). The public and managerial interests in productivity stem that productivity changes social welfare. In general, productivity is the volume produced (output) per resources utilized (input). The measuring of economic impact is quantitative and qualitative phenomenon.

The productivity measurement can be for a single farm or group of farms at any regional or geographical setup. The comparison of productivity levels in the farms or groups of farms at micro and macro levels needs to measure suitable entities involved in production. The present study considers micro-entities for productivity measures at farm levels, and for national-level policy evaluations, The present study need macro-level entities. Agricultural productivity depicts the production process's efficiency based on assumptions that producers or decision-makers are technically efficient. The decision-makers are often interested in efficiency assessment because they consider it *an ex-post* measure that shows how well the production process optimizes the resources. The notions of agricultural productivity and Technical Efficiency (TE) depend on the input type, quality, and how well these inputs have utilized in the production process (Cruz, 1991).

The TE is the ratio of actual output and maximum potential output from the production process. The utilization of inputs to get maximum potential output depicts the production frontier of the production process available technology. The distance between frontier and output level depicts the inefficiency in the production process. The TE justifies different productivity targets of decision-makers. TE is a more suitable indicator for farming comparison over productivity because it provides a relative measure considering both input base and resource and frontier distance from best practice. Hence, considering these advantages of TE over productivity index, this study compares the farming practice based on their TE score. The following sections describe the basics of performance measurement techniques for agricultural sectors,

followed by separate sections of parametric, non-parametric, and semi-parametric agricultural performance measurement techniques (Sekaran, 2005).

3.2. Research Questions

The study developed and intending a test is a conceptual frame work and the important factors that contribute the agricultural development of the Kerala, and how the organic farming will affect the economy in the field of production, saving and investment etc. Ensuring the environmental sustainability and providing organic – healthy products to the society for reducing the health hazards of the organic consumers in the society. The relationship constructed among the different variables leads to arrive the research questions of the study. The three main research questions are arrived that is

1. What is the trend and pattern of organic farming in Kerala?
2. What are the government schemes and programmes on organic farming in India?
3. What are the Socio-economic conditions of the organic farmers in Kerala?
4. What is the productivity and profitability trend of organic farming in Kerala?
5. What are the major constraints faced by the organic farmers in Kerala?

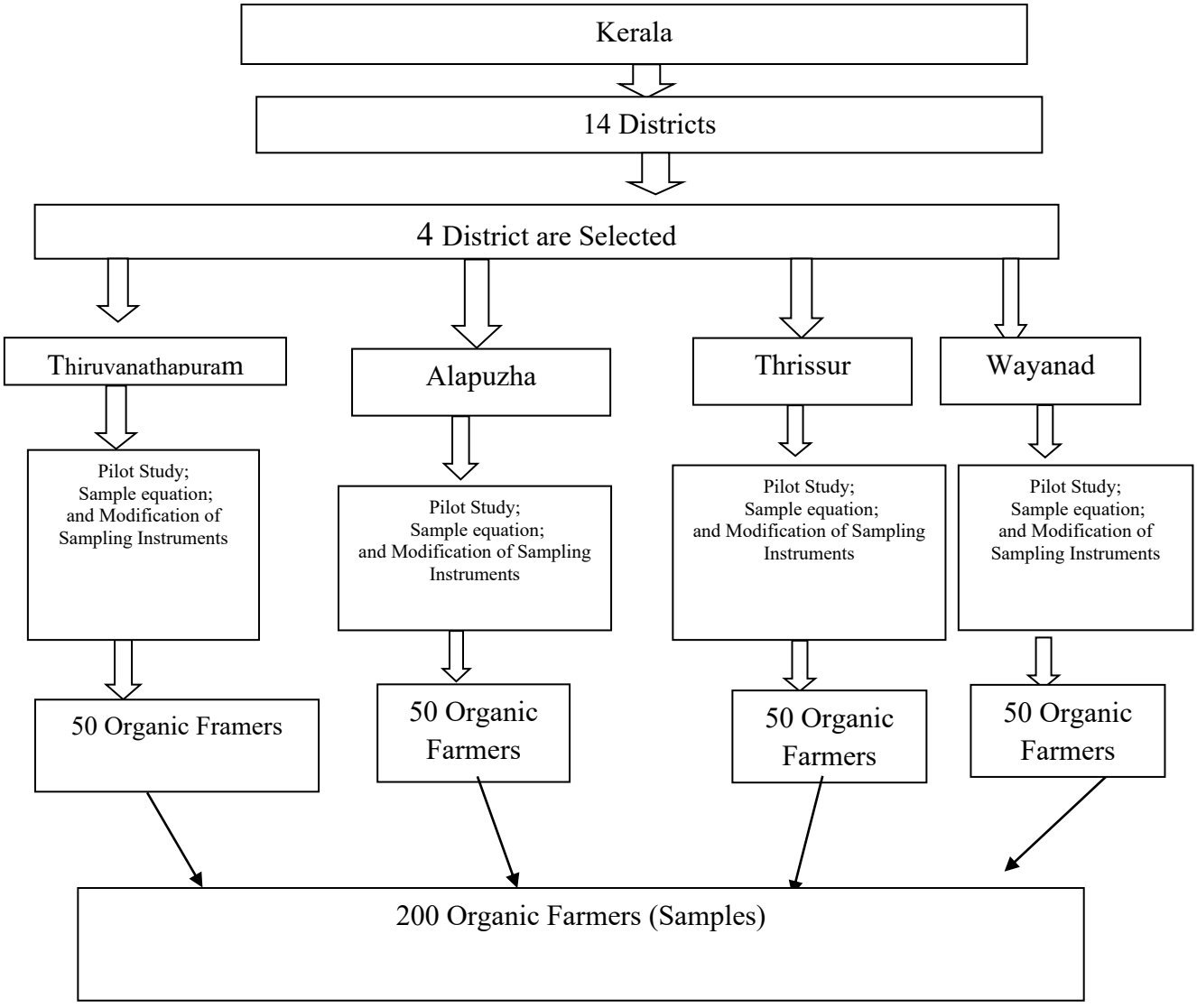
To find answers for this research questions the study developed five objectives. The objectives are included in the chapter-1 under the sub heading of objectives of the study and hypothesis of the study.

3.3. Sampling Frame Work

As the objective of the study is to understand the economic impact of organic farming in Kerala is through measuring efficiency and functioning of the selected Organic farming units in selected districts in Kerala. The sample was taken from the four districts of Kerala. Out of 14 districts, four districts are selected as advised by the agronomists of Kerala Agriculture University and various NGOs (see Chart 1).

Chart 1

Sampling Frame Work



Source: Prepared by the investigator

The sample districts are Thiruvananthapuram, Alappuzha, Thrissur, and Wayand. Fifty organic farmers are selected from each district. The total sample size is two hundred and one organic farming units is also selected from the same districts. Well-structured interview schedule is used to collects information from the farmers. The study has three main components

1) The survey of selected organic farmers in sample district

2) Discussion with organizers of the organic farming units in Kerala by using well-structured interview schedule.

3) Locate speech case studies of farming units in the sample area. A structured case study schedule is used to gather the information from the organizers of the farming society Questionnaire survey was followed by visit to selected farmers from the organic units.

4) Periodical visit were made to the farm covering on season of agricultural activities in the farming units. The qualitative date collected through direct observation and verification of farm records in available to record the problems faced by organic farmers and the recommendations by them.

Assess the profitability productivity and viability of the organic farming units,

This study utilizes annual data regarding the cost of cultivation by the organic farmers in the selected districts in Kerala 2016-2020 for comparison of performance and Technical efficiency of different organic farming units. The list of all considered district is provided below in table 3.2. The study takes four inputs and one output variable for performance evaluation of organic farming in India. The four inputs are the farm area (measured in hectare), the number of organic farmers, organic manure, and bio-fertilizers used in organic production. The output is total organic production (pure organic production + organic production in the conversion period). This study considers conversion period production as a part of purely organic production because it does not affect the performance level if we include only pure organic production output (Yadava and Komaraiah, 2020).

1. Farm Area-cultivated farm area (organic +conversion) in hectare (ha)

2. Farmers- Number of farmers engaged in organic farming

3. Bio-Fertilizers - quantity of bio fertilizers used in a year in kilogram (carrier +liquid base)

4. Manure-Total manure used

5. Total production-total quantity of output produced (organic production + production in the conversion period)

Table 3.1
Sampling Frame Work

Sl.No	District	Geographical Division	Population	Sample Size
1	Thruvananthapuram	Midlands	228	50
2	Alapuzha	Lowlands	245	50
3	Thrissur	Midlands	270	50
4	Wayanad	highlands	241	50

Source: Prepared by the Investigator

The data sources and description of variables considered for organic farming performance are detailed below.

Table 3.2

Input-output Variables Used for organic Farming Performance Measurement

Sl.No	Variable Name	Description	Source
1	Gross cropped Area	Cropped area for all food crops for all seasons in a year	Primary source
2	Agriculture Labour	Labour involved in agricultural activities	Primary data
3	Fertilisers	Vermi-compost Green manure etc are used in a year in KG	Primary data
4	Live stocks	No. of Total live stock	Primary source

Source: Prepared by the Investigator

The performance assessment of organic farming in Kerala, in the inter temporal context is difficult for researchers. The primary constraints are related to district -wise input-output data availability. Nevertheless, the conventional farming and organic farming are different in technology and practice adoptions, but we should try to include similar featured variables for both farming systems. This homogeneity of

input-output variable choices will help to compare these farming systems. The present study targets those input-output variables for organic production closer to considered input-output variables of organic farming production.

This study considers prominent input variables like farm area, agricultural labour, and fertilizers as input. Despite these considered input variables, livestock can also be treated as an input for farmers depending on production needs ,as decided by the farmers either uses livestock as input or output. Agricultural productivity considering livestock as an input variable and recommended a noticeable input (fixed asset type input) for agricultural production.

In the last objective, this study explores the productivity and profitability the organic products. Productivity of organic farming is measured through the Technical efficiency of the farm and profitability is measured through the market demand for organic products and by using the consumer surplus. The term consumer surplus means that it is the net difference between the actual price of the products and consumer willing to pay for the same. The factors measuring the consumer surplus are categorized into two heads that is price of the commodity and quality of the commodity. The multi-linear regression model is used to analyse the relationship between various input factor and output. Details of three broad head and their representative proxy variables are provided in empirical chapters of the thesis.

3.4. Positive and Interpretivist Approach.

Positive approach is widely known approach as the scientific approach or quantitative approach. This approach views reality as objective and which can be measured and revealed (Gall et al., 2007). In positive research approach, investigator apply theories include data collection and organizing data in to quantifiable variables, testing hypotheses and uses of statistical tools for analyzing data.

Interpretivist approach is commonly a known as a qualitative approach. Qualitative methods can be differentiated as instead of relying on relying empirical inferences it rely on close association of the researcher and the respondents (Lincoln 2005). In interpretivist approach research is based on induced methods. This approach promotes the value of qualitative data and the writing styles of qualitative purists

comprise a detailed description with loaded information as compared to the detached and formal style of writing followed by the quantitative purists.

3.5. Research Approach Adopted in the Study

The study conducted extensive literature survey, identified the work related and personal life related variables of the organic farmers. Based on the various agricultural theories conceptual model is formulated. Hypotheses are developed in order to test the relationship between variables in the proposed model. Data was collected through the well-structured questionnaire and interview schedule is used to gather information from the scientific experts of the organic farming. Data recording sheet given to each selected farmers to note the routine expenditure related to their farm activities separately in annually. The study collected data, with clear theoretical focus and provides inference from empirical analysis. Hence this study follows positive approach rather than interpretivist.

3.6. Population

The present study the targeted population is the all those farmers who are practicing organic farming in entire Kerala, Kerala is the state which encourage organic farming as a holistic farming practice, So the organic farmers are distributed in entire state, but the volume of the farmers are not identical in each districts. The geographical features of the each district and the number of depends of the agricultural live hood are also different. The study was conducted in Thiruvananthapuram, Thrissur, Alapuzha, and Wayanad districts of Kerala.

3.7. Sampling Frame and Sample Size

In the present study out of 14 districts four districts selected as a sample districts on the basis of the number of number of farmers engaged in organic farming. The research cell of Kerala Agricultural University provides the detailed list of registered organic farmers in Kerala. The simple random method is used to take sample from the selected district. The large concentration of the organic farmers is, Thrissur, Thiruvananthapuram, Alapuzha, and Wayanad. Fifty organic farmers are selected from each district. The total sample size is two hundred. One farm selected from each district two measure the productivity and profitability of organic farming in Kerala. In

the present study case study approach is used to access the origin and functioning of the societies.

3.8. Data Collection and Procedures

The search for answers to research questions and analysing research objectives calls for data collection. Data can be facts, figures, or other relevant materials of past or present, that serve as a base for the study and analysis. The process of collecting the data involves the collecting the information or opinions from target participants regarding the research questions or topic of research. Diverse methods have been identified in the research literature to collect data such as using post services, meeting face to face with the sample respondents, making telephonic conversions, sending electronic mails or a combination of these methods. In this section, researcher explains in detail type and source of data, methods used for data collection, scaling of instruments and development of instruments.

In Social science research, the collected data can be pertaining to human beings, relating to organizations or territorial areas (Krishna Swami, 2000). data pertaining to human being consists of demographic and socio-economic characteristics such as age gender, marital status, education, income, family size, etc and other behavioural variables like attitudes, intentions, opinions and awareness. Organizational data consists of information's relating to its origin, functions, performance etc. Territorial data represents geographical characteristics, population and economic structure, degree of development of divisions like village, cities, districts, states and nations.

The present study deals with data pertaining to human beings, both demographic variables like age, gender, income, family status are considered for measuring socio economic status of the sample respondents. Behavioral variables like perceptions on organic farming and opinion regarding their farming practices. Organizational data and Territorial data are used to access the performance of organic farming and territorial data used to explain the geographical features.

The nature of data can be either primary or secondary, so as the data source primary data refers to the information obtained first hand by researcher on the variables elated to the field of study. The source of primary data can be individuals,

focus group etc. It consists of readily available compendia and compiled reports and statistical statements whose data may be collected and used by some researcher for their study. Source of secondary data were government publications, websites, internet, text books, published thesis, publications in journals, newspaper etc. In the present research researcher used both primary and secondary data from both the sources.

3.9. Methods for Data Collection

Method of data collection refers to the way or mode of gathering data. There are various methods for data collection such as observation interviewing, survey, experimentation, simulation and projective techniques. However in social science, survey research adopts observation interviewing and administering questionnaire or combination of these for collecting data. The data for the present study was collected using a combination of these methods by using data collection tools like interview schedule, unstructured questionnaire and personally administered questionnaire and finally collected data through the observation method.

3.10. Pilot Study & Pre-Testing

Pilot study is a small scale replica of the main study. It is the rehearsal of the main study covering preparation of a broad plan, collecting data with constructed tool and processing it. Here the researcher delivered the instruments to a pilot group consists of 25 organic farmers in Adatt grama panchayat at Thrissur District. The research scholar conducted pilot study from the period of January 2020.

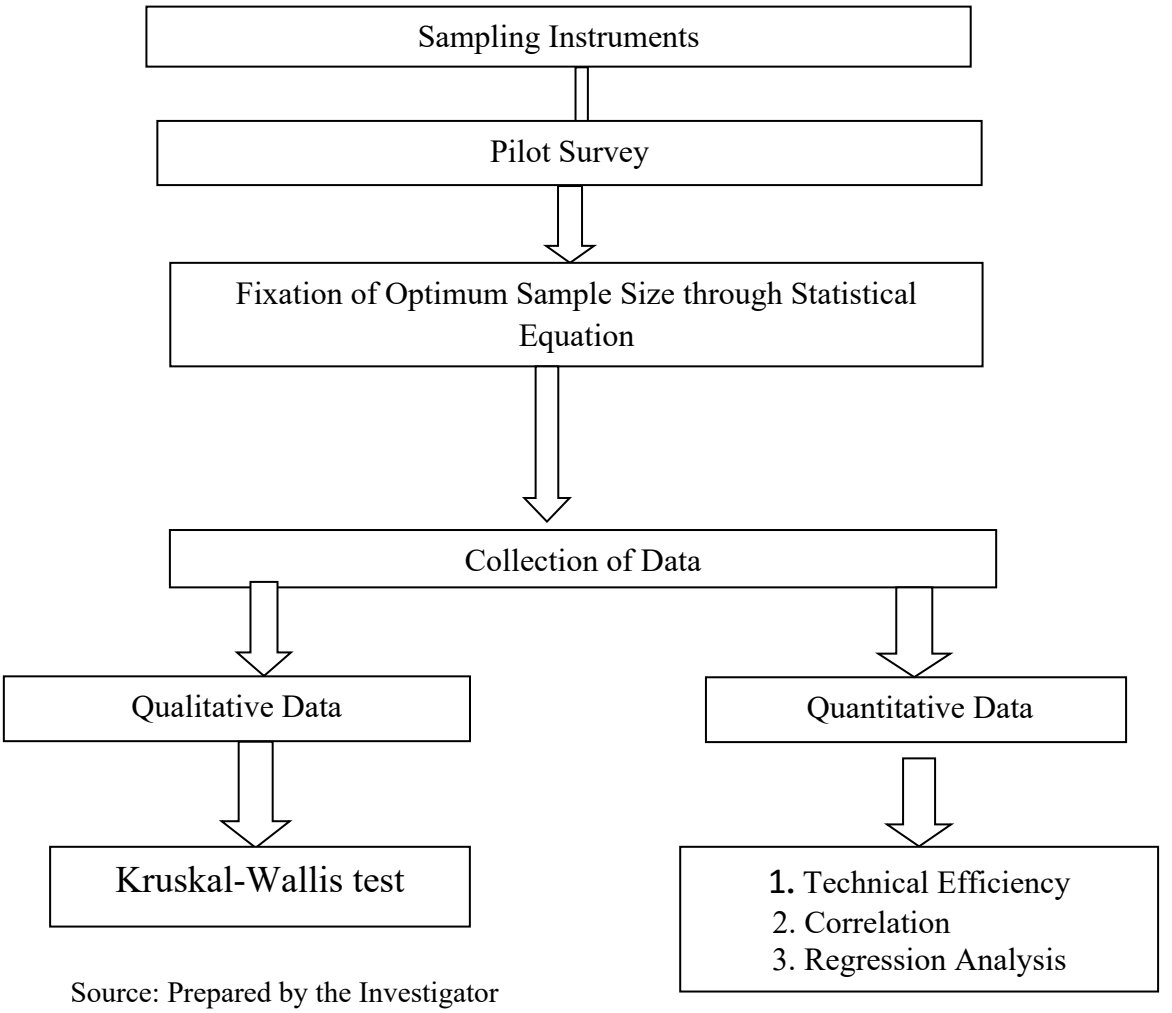
3.11. Data Collection and Processing the Data

After finalizing the questionnaire, the next step was to conduct actual data collection. As explained in the sample design, 200 samples were randomly selected from Thiruvananthapuram, Alapuzha, Thrissur and Wayanad districts representing various agro climatic zones and practicing organic farming .The personal interview conducted among each farmers. Actual data collection was conducted from July 2020. Then the researcher moved to the data processing stage. Data processing is an intermediate stage between data collection and data analysis. The collected data was coded and analyzed with the help of SPSS statistical package.

3.12. Agricultural Performance Measurement

The performance measurement or performance management of an operation unit can be evaluated through the output per unit of input consumption in the production process, commonly known as productivity or efficiency (relatively) of the performing unit (Yadava & Neog, 2019). Decision-Making Units' (DMUs) performance often depends upon different variables involved in the production process, and these DMUs can be firms, industries, institutions, policymakers, or the government itself (Donnell, 2018). Performance assessment enhances different notions of efficiency. Based on the performance evaluation of DMUs, further investigations provide information about the best and worst performers and how the peer-performing units can improve their efficiency. In addition to performance measurement, the benchmarking gives further in-depth information about the production process.

Chart 2
Analytical Frame Work



Source: Prepared by the Investigator

1. Production technology is characterized by the type of inputs and resources available. For a given commodity, many different technologies may exist, reflecting different economic, environmental, and agronomic conditions

2. A farm is technically inefficient when it does not produce the maximum level of output that can be expected given the type of available inputs.

The basic notions of performance evaluation are intuitive and straightforward, and the production theory combines the concepts of technical efficiency, scale efficiency, and allocative efficiency. Furthermore, some of these concepts are operationalized as per requirements (Huguenin, 2013). For example, the concept of technical efficiency, which has been carried out in this study for performance comparison, can be used for input optimization (input-oriented), output optimization (output- oriented), and for both (optimization of input and output both at the same time). The basic notions of technical efficiency for output optimization purpose are as follows;

$$\textit{Technical Efficiency} = \frac{\textit{Actual Output}}{\textit{Maximum potential output}}$$

Historically the measures of performance efficiency started with Farrell (1957), who provided defined the firms' efficiency based on the work of Koopmans (1951) and Debreu (1951). Farrell proposed that the firm efficiency consisting two modules: technical efficiency (i.e., ability to obtain maximum output with given inputs) and allocative efficiency (i.e., ability to utilize the inputs in optimal proportions while the price of inputs is available).

The combination of technical and allocative efficiency postulates total economic efficiency. It is not always possible to get the price of the inputs, and without price information, the allocative and economic efficiency cannot be estimated. The performance efficiency measures can be decomposed into various other notions such as cost efficiency, profit efficiency, revenue efficiency, etc.; this decomposition additional information in the data.

3.13. Decomposition of Performance Efficiency

Measurement techniques do not hold any functional relations between input and output; instead, it estimates based on available technology sets of input and output. A production process may be technically inefficient if the available technology exhibits higher outputs with the same inputs (output-oriented model) or the same output is attainable with lower inputs (input-oriented model). These two production efficiency possibilities based on the orientations of measurements shape the frontiers differently.

3.14. Stochastic Frontier Analysis (SFA)

The stochastic frontier approach is a parametric approach for performance efficiency Measurement. The SFA method is independently developed by Aigner et al. (1977) and Meeusen and Broeck (1977). In production function econometric model estimation, the SFA considers the error term has two main components; the first component accounts for the model's random statistical error. The second component accounts for the inefficiency during the production process (Coelli, 1995).The SFA approach requires a priori form of production functional, and in the TE estimates, generally, Cobb Douglas and log translog production are used. The Cobb Douglas-based SFA estimation is smooth and has a convex isoquant, and alternatively translog model has not these benefits, and also, it is not monotonic.

The study's third objective uses primary as well as the secondary data for analyzing the role of government towards promoting organic farming in Kerala and the attainment of various programmes introduced by the government is accessed through the primary data collection from the sample respondents and by the various government authorities. The fourth and fifth objective of the study is an examination of the socio economic status of the organic farmers, performance of organic farming in Kerala and analyse the productivity and profitability of organic farming, for measuring the socio economic background socio-economic variables like family income, Economic status, employment, education etc are considered by using simple statistical tools like average (mean, median and Mode) percentage etc.

The chapter mentions the research questions and arrives at the hypotheses are empirically tested. Overall the chapter brings a clear idea about the methodology adopted in the study including the approach of research, research design, Data collection procedure, pre testing, pilot study, data collection and processing the data .The chapter covers the actual blue print of the research process.

3.15. Kruskal-Wallis Statistic (KW) Test

Kruskal Wallis (KW) test is a non-parametric alternative to one –way ANOVA on rank is a parametric method for testing the samples originate from the same distribution. It is used for comparing two or more independent samples of equal or different sample sizes. KW test is also used to analyse the variables measured I ordinal level. The KW technique tests the null hypothesis that the k samples come from the same population or from identical population with the same median.

Chapter 4

Organic Farming In Kerala: An Empirical Investigation

4.1. Introduction

Organic farming is gaining gradual momentum across the world. Growing awareness of health and environment issues in agriculture has demanded production of organic food which is emerging as an attractive source of rural health generation. While trends of rising trends of rising consumer demand for organic are becoming discernible. Sustainability in production of crops has become prime concern in agricultural development. The term organic farming is getting popularity in recent times. India being agricultural nations and backed by legacy of organic farming has a tremendous potential to make a mark in the international markets. In view of its unique position the consumers and importers in organic foods in the world over are looking forwards in India. It is due to the potential of the producers and suppliers. It is due to the potential of the producers and suppliers. Therefore development of organic marketing in India offer good opportunities both for domestic use and promotion of international trade in organic products (Ramesh, 2005).

Organic farming is an organic agricultural system that originated early in the twentieth century in response to rapidly evolving agricultural practices, in an effort to improve the environment and prevent against adverse environmental impact. Organic agriculture contributes significantly to the global food supply, through the use non – chemical pesticides and fertilizers. It is also beneficial to the local environment impact. Organic agriculture contributes significantly to the global food supply, through the use of non-Chemical pesticides and fertilizers. It is also beneficial to the local environment by reducing food miles, air pollution, water pollution and greenhouse gases. More than 25% of the world's produce is produced organically, including meat, eggs, dairy products, sugarcane, fruits, vegetables, coffee, tea and coffee. Organic farming is based on the principles of natural agriculture, conservation of soil and biodiversity, respect for human health and the reduction of use of chemical fertilisers and pesticides. This has made organic farming difficult in some parts of the world, especially in terms of access to land and working conditions for the people who work on them. For these, reasons organic farming can be a complex and time-consuming activity, as it requires an appropriate climate, soil structure and management strategies. Organic farming can also be quite expensive due to the labour and equipment involved, but it is generally more-cost effective than conventional

farming. In return, organic farming helps protect the environment and ensure healthier quality foods, as conventional farming uses synthetic chemicals and toxins that may be harmful to the environment (Joshi, 2001)

These are many benefits to organic farming, including a reduction in food waste, lower production costs, better soil and water quality, improved pest control, more organic products, reduced fuel emissions and less food borne diseases. However, one of the most important benefits of organic farming is the assurance of quality produce. Organic food products are usually free form harmful pesticides, herbicides and fertilizers. These chemicals may be dangerous to humans and damage the soil, potentially leading to food insecurity. In addition, the absence of these chemicals means a smaller carbon footprint.

4.2. Organic Farming in India

4.2.1. Principles of Organic Agriculture Practices

Principle of Health

The role of organic agriculture, whether in farming, processing, distributing, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In view of this, it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects. Modern period people are more health conscious that is the base fact for transforming from conventional method to organic method.

Principle of Ecology

Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustaining them. Organic management must be adapted to local conditions, ecology, culture and scale. The reduction of inputs by reuse, recycle and the efficient management of materials and energy will contribute to improve environment quality and will conserve resources. Ecological balance is the prime concern for human being and other living organisms. Conventional farming methods slowly kill the environment and breaking the equilibrium of the environment, it has a adverse impact to the human beings.

Principle of Fairness

This principle emphasizes that those involved in organic agriculture should conduct human relationship in a manner that ensures fairness at all levels and to all parties farmers, workers, processors, distributors, traders and consumers. It also insists that animals should be provided with the conditions and opportunities of life according with their physiology, natural behavior and well-being. Natural and environmental resources that are used for production and consumption should be managed in a socially and ecologically fair way and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs.

Principle of Care

This principle states that precaution and responsibility are the concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, it must consider valid solutions from practical experiences, accumulated traditional and indigenous knowledge and prevent significant risks by adoption appropriate technologies and rejecting unpredictable ones, such as genetic engineering.

4.2.2. Background of Organic Farming in India

The Indian Agriculture is traditionally organic and farmers were following cultivation till the middle of the last century. During the period the production of food grains has increased four folds from 50.82 mt in 1950-51 to 212.05 mt on 2003-2004. But the indiscriminative and excessive use of chemicals during this period has put forth a question mark on sustainability of agriculture in calling attention for sustainable production which will address soil health and eco-friendly agriculture. Organic farming appears to be one of the options for sustainability. Organic agriculture in India starts in 1900 onwards. The year 2000 is very important year for India on the field of organic farming. There are four major events during the year 2000 (NPOP, 2000)

(1). The planning commission constituted (2000) a steering group on agriculture which identified organic farming as a national challenge and suggested it should be taken in the form of a project as major trust thrust area of 10th plan. The group recommended organic farming in rain fed areas and in the areas where the consumption of agro chemicals is low or negligible.

(2). The National Agriculture policy (2000) recommended promotion of traditional knowledge of agriculture relation to organic farming and scientific up-gradation of organic farming in Kerala.

(3). The Department of Agriculture and co-operation (DAC) and Ministry of agriculture constituted (2000) a task force in organic farming.

(4). The ministry of commerce launched the National Organic Programme in April 2000 and Agricultural and Processed Food Products Export Development Authority (APEDA) is implementing the National Programme for Organic Production (NPOP).

4.2.3. India's Position in Organic Farming

India exported 135 organic products under 18 categories. The total volume of export was 44,476 tons in 2020 but the quantum of export was increased 888187 million tons in 2021. The overall growth of organic food exports was 50.5% over the year 2021. Around 60% of the country's organic products were exported to the Economic Union, 8% to Japan and the rest of Canada, Australia and East Asian countries, India ranked 33rd in terms of total land under organic cultivation, and 88th in terms of ratio of agriculture land under organic crops to total farming areas.

4.2.4. India's Advantages in Organic Farming

India is endowed with various types of naturally available organic cultivation of crops. Indian market shows there is a progressive demand for organic food products. A study was organized by International Competence Centre for Organic Agriculture (ICCOA) in major cities of India it is found that the market potential for organic product in the metros is Rs.1462 crores, out of this 562 is available from modern retail. Market potential for India is estimated at Rs. 2300 crores. Delhi and Bangalore are top two cities in terms of market potential.

Table 4.1
Use of Organic Manures in India (2020)

A.	Crop residue	3.865 million tones
B.	Animal dung	3.854 million tones
C.	Green manure	0.223 million tones
D.	Bio-fertilizer	0.370 million tones

Source: NPOP statistics, 2021

The consumers express very high demand for organic products. It is found that consumer is ready to pay only 57% more for items at a regular consumption, while organic products are available at a premium of 15 to 20%. The market for organic products can be developed at 2 levels. The first one is Niche market which can be developed by creating awareness about certified organic branding and selling through special stores. The second level is mass market. The gain in promoting organic food in mass market is enormous. It is considered that all the consumers want safe healthy products at affordable price. The difficulty in taping this market is also very high, the reason being high cost of certification and quality assurance mechanism.

4.2.5. Relevance of Organic Farming in India

The need for organic farming in India arises from the unsustainability of agriculture production and the damage caused to ecology through the conventional farming practices. But the productivity was very low. Food production was not enough for the population. The green revolution became the Government's most important programme in 1960s, conventional and organic fertilizers replaced by chemical pesticides. Before green revolution it was feared that millions of poor would die of hunger in the mid 1970's. However, the green revolution within few years showed its impact and the country reduced its import. In 1990s, India had surplus food grains and once again became an exporter of food grains. The productivity of Indian agriculture has been boosted by green revolution. In due course of time its harmful effects on eco-system hampered the productivity of soil. The conventional agriculture practices the world over promoted an overriding quest for accumulation of wealth. Therefore, there is a need to have complementarily used of organic farming to sustain and extent the productivity. Now these days the use of organic farming is considered as a crucial parts part of agriculture. Chemical farming products becomes

poison's food. It affects the health with stagnation in its crucial agriculture. They have advocated that "organic farming" initiatives are providing indications on how to reap marginal profits from this sector (Perkins, 1997).

The agriculture and allied sectors in India provide employment to 65% of the workers and accounts for 30% of the national income and India have concerned much more than any other nations of the world as agriculture is the source of livelihood of our people it is the foundation of the economic development of the country .there were times when people lived close to nature, land, water and air. The most fundamental resources supporting the human life have degraded into such an extent that they now constitute a threat to the livelihood of millions of people in the country.

The area under cultivation cannot be increased and the present 140million hectares will have to meet the future increase in such demands. There is a strong reason for decline in cultivated area because of urbanization, which in turn will export much pressure on the existing cropped area. The new technologies he helped men to increase agriculture production. Modernization of Indian agriculture is based on the use of high yielding variety seeds, chemical fertilizers, irrigation and pesticides and also on the adoption of multiple cropping systems with the extension of area under cultivation. It also puts severe pressure on natural like land and water (Das, 2004).

The organic production of meat products like poultry, livestock fisheries are in not satisfactory level in India. The production is not limited to the edible sector but also produce organic products, cosmetics, functional food products body care products etc. there are three types of organic producers in India. Traditional organic traders who flow for subsistent needs, commercial farmers who have surplus and export their produce through different channels and private companies which either have their own farms or organize large conversion programs with growers India of certified organic products. Cotton leads among the products exported (16'503 million tons) India exported 86 items in 2007-2008 with the total volume of 37533 metric tons.

4.2.6. Major Organic Markets in India

The organic products are available in the domestic market are rice, tea, coffee pulses and vegetables. Wholesalers, traders, super markets and own shops are the major channels in the domestic markets which are mainly in the metropolitan cities, and accounts for only 75% of total organic production. The exports of organic products are dealt with by export companies NGO interventions and various types of organic products are provided by the government as the man advantage of Indian organic product markets.

Table 4.2
Major Organic Markets in World (2020)

Place	Market
Asia	Japan, Singapore
Europe	Nether lands, U.K. Germany, Belgium, Sweden, Swifter land, France Italy, Spain, USA and Canada
Middle east	Saudi Arabia and UAE

Source: Department of agriculture and co-operation, ministry of agriculture 2021

4.2.7. Central Government Policies for Organic Agriculture in India

The policy of ministry of Agriculture seeks to promote technically sound economically viable, environmentally Non-degrading and socially acceptance use of natural resources in favor of organic agriculture. The policy seeks to promote organic farming for strengthening rural economy, promoting value addition acceleration growth of Agro business and securing fair standard of living for the farmers and agricultural workers and their families. The 10^{th} five year plan emphasizes encouragement to organic farming with the use of organic waste integrated pest management and integrated in coordination with department of agriculture and cooperation Nutrient management. Even 9^{th} five year plan had emphasized the promotion of organic products with the use of organic and bio inputs for the promotion of sustainable agriculture. Agriculture Ministry is promoting organic farming in the country with the help of various associations such as National Horticulture Mission for North east. Rashtriya Krishivikas Yojana etc. Indian Council of agriculture research has initiated on all India Network projects on organic farming

to ensure the development and promotion of scientifically proven methodologies in organic farming.

4.2.8. Tradeoff between Organic and Sustainable Agriculture

Most of the components of organic agriculture are invariably contained in sustainable agriculture practices. Sustainable practices address the most vital requirements in agriculture, viz the immediate problem of feeding the present population, the long term problem of meeting future food needs and preventing the deterioration of the natural resources that agriculture depends on sustainable agriculture envisages judicious use of present technologies and development of innovations that would enhance productivity and producing without causing irreversible environmental degradation. Good agricultural practice or good agronomy are essential for the success of sustainable agriculture. Agriculture professionals for analyzing the success of sustainable farming systems and to identifying ways of improving the productivity, profitability and resource, efficiency are using by agro-ecological approach. The ultimate goal of agro-ecological design is to integrate farm components. So overall biological efficiency is improved, biodiversity is preserved and agro-eco-system, productivity and its self-regulating capacity are maintained.

4.2.9. Constraints of Organic Farming India

High price expectations, delayed delivery quality restrictions, lack of production, high cost of inputs, lack of certification, huge expense on certification marketing networks are some of the constraints in marketing organic products internationally. In domestic market, market does not provide any incentive to organic production.

Farming policies in India have traditionally not favoured organic agriculture though the country has strong potential for organic farming. The problem is that India is not working to adopt appropriate organic standards and policies like many other countries. However the policy makers are increasingly realizing that fact and are introducing many fiscal and risk reduction strategies to promote organic farming in the country. Organic farmers are still facing some concerns for instance. Most of the organic market oriented programs are an arrangement between trading companies and

farmers in which the companies are clearly dominant which puts farmers at a disadvantage.

Table 4.3

An Overview of Organic Farming India (2020)

Area under certified	4339184 hectare
Total Farm Production	34996800
Number of farmers	1,599010
Total quantity exported	888179 million tones
Value of total export	707849 lakhs

Source: Department of Agriculture and Co-operation, Ministry of agriculture 2021.

Experts say that for the promotion of organic agriculture. Besides, the most efficient way to do this is by inviting the private sector to provide marketing services and even required investment for organic farming.

Table 4.4

Area of Organic Cultivation and Organic Production in Kerala (2020)

Sl.No	Cultivated Area	Hectare
1	Cultivated Area (Organic +In- Conversion)	2657889
2	Wild harvest Collection Area	1681295.61
	Total Area	4339184.61
Organic Production		
1	Farm Production	3468991.98 MT
2	wild harvest production	27808.36 MT
	Total Production	3496800.34 MT

Source: Source: NPOP statistics, 2021

The table 4.1 shows that area of organic cultivation in India in 2020, the total cultivated area is 2657889 hectare and the wild harvest area is 1681295.61 hectare. Organic production includes the total farm production and wild harvest production. The total farm production was 3468991.98 (99.2%) million tonnes in 2020. The total organic production was 3496800.34 million tonnes out of that 27808.36 (.8%) tonnes comes under the wild harvest production. The 99.2% of the organic production was comes from the farms and only 2% of the production was from wild harvest production.

The table 4.2 shows the various operators related to organic farming in India . As per the NPOP statistics 2021 exhibits five group are involved in organic farming and its promotional activities. The main operators of the organic farming are

individual farm producers, ICS groups, and organic processors, traders and wild operators. The total number of operators is 10795. The total number of registered organic farmers is 1599010 in India 2020. To grow organic farming in a widely, policy makers should provide farmer friendly data base that deliver market knowledge. The country should do way with fertilizer subsides which are acting as hindrance and limiting the scope of adoption of organic agriculture in a big way. Organic agriculture in India has made good progress during the last 6 years with a combined effect of farmer's effort, NGO's work, government interventions and market forces. Indian organic agriculture has reached a stage where it can play, a significant role not only in the growing domestic market but also in global organic food trade.

Table 4.5

Operators Statistics of Organic Farming in India (2020)

Sl. No	Category	Number
1	Individual farm producers	3495
2	ICS Groups	4791
3	Total Processors	1703
4	Total Traders	745
5	Wild Operators	71
6	Total Operators	10795
7	Total Farmers	1599010

Source: Source: NPOP statistics, 2021

In fact organic farming in India is experiencing a real boom and the country has tremendous potential to grow crops organically and emerge as a chief provider of organic products in the international market. I India organic farming has a market that is demand oriented. The organic farming is properly planned and executed ;It will become an important foreign exchange earner and money –spinner for the farmers .According to experts for many Indian farmers the approach seems to other a new option for ensuring their livelihood as they can reduce production costs and at the same time ,gain access to markets with better prices for their products while India could have to growing share in supplying export markets , the Indian domestic market for organic farming food appears as a sleeping gland which need to be awakened. Organic farming in India needs to minute attention to market intelligence regarding which crops grows where to sell, destruction channels, competition market access etc. there is also a need to identify and assign ample number of committed service

providers who will act as transfer of technology to identified farmers and connect the certification agencies with the farmers (Reed and Holt, 2006)

Organic farming generally implies to modes of agricultural production which avoids the use of synthetic fertilizers, pesticides and herbicides. It also aims in to recreating a virgin earth and a serene and primitive environment through intelligent selection of production procedures. An organic farming system excludes the use of synthetic inputs such as synthetic

4.3. Organic Farming in Kerala

Agriculture has a good potential in agriculture sector. The organic farming in Kerala shows a increasing trend that is the area of farming and number of registered organic farmers are increasing trend. Kerala Agricultural University has published the adhoc package of practices and recommendations for organic farming in Kerala. Kasaragod district witnessed harshness of chemical pesticides. Kerala organic farming is not limited to crop production alone. Kerala has a rich potential to the production of wide variety of agricultural crops. There are so many initiatives taken by the government and various organizations in promotion of organic farming in Kerala. Government started a state wide intensive programme Jaiva Keralam and formulated new agricultural policy in 2007 to promote organic farming in Kerala.

4.3.1. Organic Farming and Organic Markets in Kerala

The Consolidated organic statistics (2020-2021) by National programme for Organic Production (NPOP), Kerala belongs to the 11th position to compare with other states in India. Kerala has an organic cultivation 48364.18 hectare; it is comparatively low with comparing other states like Maharashtra (371722.62 hectare) and Rajasthan (29686.29 hectare). The table 4.5 shows the area under cultivation of organic farming in Kerala, it shows decreasing and increasing trends in area under cultivation, in 2015-16 the total area under cultivation was 44788.50 ha; and it is decreased in 2016-17 and 2017-18 area under which 43701.88 ha; and 34160.14 ha; respectively. But from the period of 2017-18, it shows an increasing trend in the case of area under organic cultivation. It clearly indicates a positive trend on organic farming. The Table 4.6 shows Kerala's position in organic farming during the period

2020-21, the state belong to the 14th position in the case of area under cultivation. Total area under the organic cultivation was 48364 ha; out of that 45070 ha is farm area and the remaining is organic area under wild cultivation .i.e., (3293 ha). The total farm production is 27850 million tons.

Table 4.6
Area under Organic Cultivation in Kerala (2020)

Period	Area under certified
2015-16	44788.50
2018-19	40911.24
2020-21	48364.18

Source: National Policy for Organic Farming Data 2021

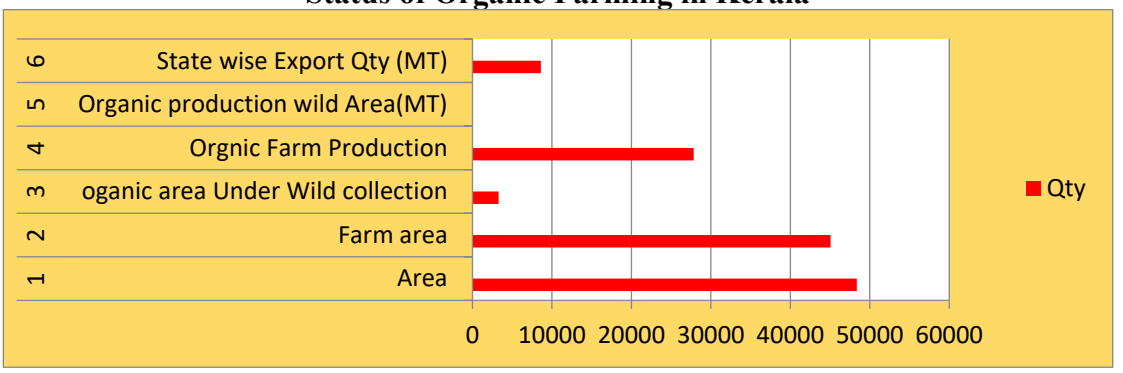
Export is the one of the best indicator to access the economic performance of organic farming Kerala attained 4th position in state wise organic exports with export of 8610.66 million tons.

Table 4.7
Status of Organic Farming in Kerala (2020)

Sl. No	Particulars	Qty	Position
1	Area	48364	14
2	Farm area	45070	11
3	organic area Under Wild collection	3293.8	15
4	Organic Farm Production	27850	10
5	Organic production wild Area(MT)	3.5	14
6	State wise Export Qty (MT)	8610.66	4

Source: NPOP Statistics 2020-21

Figure 4.1
Status of Organic Farming in Kerala



Source: NPOP Statistics 2020-21

4.3.2. Organic Markets in Kerala

The concept of group marketing was developed with focus on empowering and facilitating the farmers to take more effective decisions for marketing of their produce. The concept of group marketing's thereby provides self-help groups,

numbering about 200-300 farmers, come together under the banner of Swasarya Karshaka Samithi (SKS) and trade their produce collectively. This helps the farmers to have volume thereby being a better position to negotiate with the wholesalers in order to optimise their returns and large induces traders to buy from the Swasarya Karshaka Samithi (SKS). It directly helps to reduce the transportation cost and time. The main highlight of this samithi is

1. Production centre oriented marketing system
2. Framers owned markets
3. Expert management committee.
4. Ensure market information and support from VFCK
5. Adopting proper accounting methods and regular auditing
6. Reduced size of marketing chains.

There is a rich potentional for promoting organic farming in Kerala in the intensity of inorganic agriculture is not severe with comparing the neighbouring states in India. While the national average consumption of fertilisers and pesticides during 2020 was 120kg/ha and 340/ha resepectively, It was only 80/Kg and 224kg/ha respectively in Kerala. These points to the positive side of agriculture in Kerala for the consumption of hazardous chemicals and therefore the chances of redeeming farmers to organic agriculture are quite high. By realising these realities Kerala Agricultural Department commenced organic farming promotional activities. Currently there are a number of registered certified farmers in the state, mainly targeting export markets.

Kerala also has accredited organic certifying agencies for providing certification and catering the needs of organic farmers. Pokkali and kaipad cultivation, Cultivation of Jeerakasal and Gandakasala varieties of paddy cultivation in Wayand District and home staed farming systems all over the state are default Organic. The main organic markets in the Kerala

1. KADS Open markets in Thodupuzha

2. Thermal Organic Bazaar Thiruvanathapuram.

3. Eco shops in Thissur and Kozhikode

4. Jaiva krishi Sevena Kendram in Kannur

5. Self-help groups of Women like Kudumbasree and Janasree

These markets are encouraged to undertake organic farming of vegetables and they run organic markets successfully. Understanding the growing demands, private entrepreneurs have also entered into the organic food business.

Organic farming makes agriculture become more rewarding and appreciable, sustainable and respectable, sustains soil fertility by preventing the loss of soil and leaching of minerals protects and enriches bio-diversity microorganisms, soil flora and fauna, plants and animals. Organic farming helps to improves and maintains agro ecosystem and natural landscape for sustainable production. The Organic farmers are mostly on renewable on-farm resources. It encourages consumption of renewable energy resources mechanical and other alternative sources of fuel. It includes domestic animals are an essential part of organic system which helps maintaining soil fertility and also increases the income of farmers.

4.3.3. Role of Kudumbashree to Promote Organic Farming in Kerala

The main vision of the kudumbasree in the field of organic farming is to promote organic farming and agricultural commodities with organic certification. Kudumbasree has ventured into realm of organic cultivation with a missing of bringing 10,000 Hectare under of organic farming in 2020 clusters in all districts. During the current year the mission expects an involvement of around one lakh kudumbasree women farmers in 20000 Joint Liability groups. Joint family groups are group of women farmers comprising of 4 to 10 members Undertaking farm livelihood activities, these groups are the foundation of all agricultural movements in Kudumbasree aiming at social and economic empowerment through sustainable agricultural development. National centre of Organic Farming (NCOF) approved regional council will give necessary support and guidance and training for the smooth function of the organic farming. NCOF has also facilitated the certification process.

4.3.4. Self Helps Groups and Organic farming in Kerala

Self Help Groups are the backbone of Vegetable fruits promotion council of Kerala. Self-help groups are groups of farmers with identified common objectives, task group identities and neighborhood. The council is moulding the self-help groups as the basic local institutional units for introducing innovative interventions in

horticulture. In rural area the farming societies is formed through the creation of small self-help groups. The self-help groups created with to twenty members in each group. The main objectives of these groups are creating employment opportunities among the rural people.

4.3.5 Technology Development for Promoting Organic Farming

Participatory Technology Development (PTD) is an approach which ensures the active involvement of the farmers in technology up gradation and refinement. Farmers playing the key role in technology development and its diffusion. Development in technology in the field of agriculture will leads to scientific development in farming methods government introduces many programmes and measures to strengthen organic agriculture in Kerala.

4.3.6. Extension Programme of Organic Farming in Kerala

The extension approach is marked with features like office-less extension, frequent farm and home visits by professionally qualified extension personnel and massive awareness programmes like campaigns and demonstrations. The extension officers of VFPCK include Managers, Deputy Mangers and Assistant Managers who operate based on a present schedule and are always accessible to the farmers and regular field visits and providing necessary technical advice regularly. This helps farmers to appraise their problems and solve them.

4.3.6.1. Demonstrations in Organic Farming in Kerala

Demonstration is very effective extension method to disseminate new technology. VFPCK demonstrate proven technologies to farmers to convince them about the feasibility and applicability of new practices. Scientifically proven practices such as box method of vermin-composting, preparation of organic pesticides like neem oil emulsion, neem oil-castor oil emulsion, safe handling of pesticides, high yielding varieties, improved production technologies etc are demonstrated to farmers. Self-help groups farmers' visits the demonstration plots to have a firsthand experiences of the techniques.

4.3.6.2. Campaigns

VFPCK organises campaigns to create mass awareness and invoke collective action through campaigns, extension messages reach maximum number of people at the shortest possible time. Need based campaigns are organised on the field of vermin composting, formation of organic manures, usage of organic components, controlling measures of plants diseases.

4.3.6.3. Supply of Seeds

Vegetable seeds of 19 different types of High Yielding Crops suitable to the Agro Climatic conditions of the State are produced by 104 trained Seed Growers under the technical guidance of the Seed Technologist. This is a shining example of how Public-Private Participatory (P.P.P) models can attain excellent results. These units have nurtured and developed a harmonious and long standing relationship with the farmers of Chittur taluk of Palakkad over the past 14 years to achieve what many thought impossible till recently. This unit is today widely acknowledged as the only centre capable of engaging in the commercial production of vegetable seeds in Kerala and operating in an economically viable manner.

4.3.6.4. Uniqueness of VFPCK Seed Production Programme

1. Seed Production without formal contract
2. Commercial seed producer in Kerala
3. Lion share of vegetable seed production in public sector
4. Competitive price when compared to other PSU's in Kerala
5. Exclusive fully fledged Seed Testing Lab for Vegetables
6. Well trained trustworthy and efficient seed growers
7. Plays vital role in promoting high yielding varieties
8. In VFPCK Seeds are produced by farmers for the farmers
9. VFPCK acts as a facilitator to maintain genetic and physical purity of seed

4.3.7. Pest and Disease Surveillance and Early Warning System

Pest and disease surveillance and forecasting system provides advanced information on the possible occurrences of pest and diseases so that the farmers can take adequate precautionary measures against pest and disease attack. Plots of major crops will be selected for pest and disease surveillance in each district. The professionally qualified field staff will regularly monitor the plot and the information will be recorded in the observation cards regularly. Accordingly, the message including pest and disease management practices will be communicated to the farmers.

4.4. Comparison of Organic and Conventional Farming in India

Agriculture is the prime sector for employment generation and food in many developing countries like India. The green revolution in India resulted in yield enhancement. The emergence of the green revolution in India had intensified the chemical fertilisers used in farming practices. This movement was a short run remedy for food production and food security. The use of heavy and improper chemical fertilisers degraded the soil fertility and raised the cost of organic production. The chemical intensification has also poised the environmental degradation as well as the fertility level of the soil at present the desire for sustainable agriculture is a global need, but how to do so is remain elusive (Rigby, 2001).

According Ikerd (1993), Sustainable agriculture can define as asystem that at can maintain and keep usefulness in the long run for society. The various alternative farming systems are proposed to solve agriculture sustainability problems led by the conventional agriculture system (Bowler, 2002). Today organic farming has become one of the most prominent alternative farming systems that can improve soil fertility, reduce production costs, improve plant nutrients, assure health benefits, and transform overall agriculture into sustainable agriculture. However the relative yields from both farming systems differ across the regions (Ponti et.al, 2012). The world has been witnessed a movement towards organic agricultural production and transformation in recent decades. India has the maximum number of organic farmers worldwide but contain only 1% total organic land it is very challenging for the Indian farming system to cope with comparatively diverse production output either in the short-run or long run.

The essential difference between organic and conventional farming is that conventional farming is that conventional farming relies on chemical intervention to fight pests and weeds and provide plant nutrition. That means synthetics pesticides, herbicides, and fertilisers. Organic farming relies on natural principles like bio-diversity and composting instead to produce healthy and abundant food. Importantly, organic production is not simply the avoidance of conventional chemical inputs, nor is it the substitution of natural inputs for synthetic ones. Crop rotations and the use of composted animal manures and green manure crops, in ways that are economically sustainable in today's world. In organic production overall system health is emphasized and the interaction of management practices is the primary concern. Organic farmers implement a wide range of strategies to develop and maintain biological diversity and replenish soil fertility (USDA, 2007). The conventional and organic farming methods have different consequences on the environment and people. The conventional and organic farming methods have different consequences on the environment and people. Conventional agriculture causes negative impact to the soil and society it increase greenhouse gas emissions, soil erosion, water pollution, and threatens organic farming has a smaller carbon footprint.

4.5. Conversion of Conventional Farmland into Organic Land

The conversion from a conventional to an organic system requires a transitory period, where the organic practices are applied progressively following an organized plan. During this period it is important to analyse carefully the actual situation of the farm and identify the actions to be taken (Florez, 2003). Features of farm, Soil analysis, climate, organic matter are the indicators used to analyse the farm.

4.5.1. Farm with High External Input

The majority of intensively managed farms in Africa, Latin America and Asia that strongly rely on external inputs are larger farms. Such farms mostly grow a few annual or perennial cash crops relying heavily on the use of fertilizers for plant nutrition and pesticides and herbicides for pest, diseases and weed control. On such farms crops are often grown without a planned rotation and farm animals are not integrated into the nutrient cycle. Diversification is usually low on these farms: Trees and brushes are mostly removed to facilitate extensive mechanization, and crops are

mostly grown alone. Potential challenges in conversion of such farms, establishing a divers and balanced farming system with a natural ability to regulate itself usually takes several years. Major efforts may be necessary to be store natural soil fertility is re-established and yields rises again. New approaches and practices usually involve a lot of learning and intensive observation of crop development, and dynamics of pests, diseases and natural enemies (Gavrilov,1962).

However, the conversion process can be achieved, if the following practices are implemented: Diversify the farming system: Select appropriate annual crops for the area and rotate them in a planned sequence. Include legume crops such as beans or leguminous feed crops in the rotation to provide nitrogen to the subsequent crops. Plant hedges and flower strips to encourage natural enemies and to control pests. Start recycling valuable farm by-products. Establish on-farm compost production based on harvest residues and manure, if available, and mix the compost with the topsoil. This will bring stable organic matter into the soil and improve its structure and its capacity to feed the plants and store water. Green manures can provide plenty of plant material to feed soil organisms and build up soil fertility. Introduce farm animals into the system. Farm animals provide valuable manure and diversify farm income through additional animal products. Grow cover crops. Cover crops or lay out mulches in perennial crops provide protection to the soil.

4.5.2 Farm with Low External Input

Farmers working with little external inputs based on traditional practices may grow many different crops in a densely mixed system on the same piece of land changing crops randomly. A few livestock such as chickens, pigs, cattle and /or goats may be kept, which scatter the manure in their feeding places, hence providing very little manure for the gardens. The trees may be extensively cut for firewood and charcoal burning. Brush and trash burning may be a common practice especially during land preparation. Harvests are probably low and increasingly becoming difficult due to unreliable and insufficient rains.

The harvests may just be sufficient for feeding the family and little may be left to sell for income Traditional farmers fulfill some principle of organic farming already by relying on farm-own resources, growing different crops simultaneously

and raising livestock. However, there are still practices, which clearly distinguish such farms from organic farms. The following challengers need to be addressed for conversion: Avoid burning of crop residues after harvest as this is, in most cases, not a viable solution, since it destroys valuable organic material and damages soil organisms. Establish a well-organized diversification systems including a 'planned' crop rotation and intercropping systems.

Accumulate knowledge and practice regarding efficient use of farm own resources, especially for compost production to manage and improve soil fertility. Avoid indiscriminate tree cutting for firewood and charcoal burning Establish a system to collect the animal manure for composing. Apply measures to prevent loss of soil through erosion and protect it from drying out. Pay special attention to satisfy feed and health requirements of the farm animals. Avoid infection of seeds with diseases, gain knowledge on disease cycles and preventive measures. Avoid harvest and storage losses. Some practices for conversion in this system are implement planned crop rotation and intercropping system. A combination of annual and perennial crops including leguminous green manure cover is needed. Combined with 15 properly selected or improved crop varieties with good resistance to plant pests and diseases, will facilities the crop and soil management. Proper integration of animals into the farming regularly collected for compose making. Growing nitrogen fixing legumes between annual crops is another possibility to feed the soil and the crops. Additional measures to control soil erosion such as digging trenches and planting trees along the hillside, and covering the soil with living or dead plant material should be implemented.

4.5.3 Creation of Mixed Farm

Mixed farms, crops and farm animals may be integrated, whereby the animal manure is collected and used in the gardens after having kept it for a few weeks to root. Some soil conversation measures may be implemented, such as mulching in perennial crops and trenches to reduce erosion. Occasionally herbicides, pesticides and treated seeds may be used to control weeds in fruit and vegetable production. Farmers of such mixed farms are obviously familiar with some of the organic farming practices. Such farmers will find it easy to learn new methods from other farmers or

from a trainer and to implement organic practices throughout the farm. Implement organic practices to manage the soil and to control weeds instead of using herbicides.

4.5.4 Degraded Land

Land may be degraded due to shifting cultivation, overgrazing, over-cultivation or deforestation, salinity after years of intensive irrigation with ground water, or water logging and flooding. Such land may take more efforts and patience to establish good growing conditions. At the same time, organic practices are an excellent approach to recover such soils. It may require specific practices to stop soil degradation and to re-establish soil fertility. Such practices include digging of terraces or sowing an intensive fallow with a leguminous green manure crop that grows well on poor soils.

4.5.5. Conversion of Degraded land

Many experience show that organic farming is promising approach to improve degrade land and bring it back into production. In most cases, the increase of organic matter plays a key role to improve the quality of degraded soils, excessive use of irrigation water, especially in arid and semi-arid climates. These salts can be reduced slowly by ensuring proper irrigation an building up the structure of the soil with compost to allow natural drainage of the excess salts. In a first period salt tolerant crops may be grown. Acid soils can be reclaimed by adding lime and well-made compost. Flooded soils can be improved by creating drainage channels to drain off the excess water. Converting a farm to organic farming in an area with very little rainfall and high temperatures or strong winds will be more challenging than converting a farm located in an area with well distributed rainfall and favourable temperatures. At the same time, the improvements that follow implementation of organic practices will be more obvious under arid conditions than under ideal humid conditions. For example, compost application into topsoil or into planting holes will increase the soils water retention capacity and the crop's tolerance to water scarcity (Tybrik,2004)

In very warm and dry climate, losses of water through transpiration from plants and evaporation from soils are high. These losses may be further encouraged by strong winds, enhancing, soil erosion. The soils' organic matter content is generally

low, as biomass production is low, implying that the availability of nutrients to the plants is highly reduced. Under such conditions, the key to increasing crop productivity lies in protecting the soil from strong sun and wind and increasing the supply of organic matter and water to the soil. Soil organic matter can either be increased through compost or through cultivation of green manure crops. In the case of compose production the challenge is to increase production of plant biomass, which is, needed for compost production.

4.5.6. Conversion of Dry Climate

In warm and humid climate, high above ground biomass production and rapid decomposition of soil organic matter imply that the nutrients are easily made available to the plants. But it also involves a high risk that the nutrients are easily washed out and lost. Under such conditions a balance between production and decomposition of organic matter is important to avoid depletion of soil. Combining different practices to protect the soil and feed it with organic matter proved to be the most effective approach to choose. These practices include creating a divers and multi-layer cropping system ideally including trees, growing nitrogen-fixing cover crops in orchards and applying compost to enrich the soil with organic matter and in this way increase its capacity to retain water and nutrients (Ismail,197)

4.5.7. Step by Step Conversion of Organic Faming

The procedure of conversion of a farm commonly consists of three steps. In a first step it is recommended to collect information on appropriate organic farming practices. In a second step, the most promising organic practices should be implemented in the entire farm. Support from an experienced extension officer or farmer is usually very helpful to give guidance in the process. Successful organic farming requires considerable knowledge on the functioning and the possibilities of management of natural processes. Interest in learning about the possibilities to support natural processes to sustain and improve harvests is essential for successful organic farming. Farmers who are interested in adopting organic farming practices are recommended to get in contact with farmers in the area, who already practice organic farming to learn from them. Some farmers may be good at making compost, some at growing green manures, and some at making plant or manure tea. Learning from

experienced farmers allows to get firsthand experience under local conditions, and thus to learn about the advantages and potential challenges related to implementing organic methods. Basically, farmers who are interested in converting their farm to organic agriculture are confused with the following questions.

1. How to improve soil fertility

2. How to keep crops healthy

3. How to best increase diversity in the farm

4. How to keep livestock healthy

5. How to determine price to organic products and how to sale them.

After having collected information about the requirements, the potentials and the main practices related to conversion, farmers should start to learn from, their own experience on their farms. To minimize risks of crop failure and losses of animals, and avoid frustrating overload, farmers are recommended to implement organic practices step-by-step to a limited extent, selecting specific practices at a time and testing them on selected plots or selected animals only. But which practices should one choose to start with? As would seem natural, farmers should start by applying practices that are of low risk and investment, require little specific knowledge, limited additional labour, and with high short term impact. Mulching - Covering the soil with dead plant material is an easy way to control weeds and protect the soil in annual crops. This practice can be implemented into most existing cropping systems.

The main question may be, however, where to get appropriate plant material from. Intercropping-Growing two annual crops together, commonly a leguminous crop like beans or a green manure crop in alternating rows with maize or another cereal crop or vegetable is a common practice in organic farming to diversify production and maximize benefits from the land. In inter-cropping, special attention must be paid to avoid competition between the crops for light, nutrients and water. This requires knowledge on arrangements, which promote growth of at least one of the crops. Composting is an application of compost to the fields can have a major

impact on crop growth and yields. To start compost production, farmers will need enough plant materials and animal manures, if such are available.

In case such materials are scarce, farmers would first have to start producing plant materials on the farm by sowing fast growing leguminous plants that build a lot of biomass, and by introducing some livestock on the farm for manure production, if this proves appropriate. To get familiar with the process of making compost, farmers should be instructed by an experienced person. Proper compost production requires some knowledge and experience and additional labour, but is low in investments. Green manuring-The practice of growing a leguminous plant species for biomass and incorporation into the soil may be new to most farmers. Nevertheless, this practice can greatly contribute to improvement of soil fertility. Green manures can be grown as improved fallows, as seasonal green manures in rotation with other crops, or in strips between crops. Proper green manuring first requires information on appropriate species. Initially, bio-control agents may be applied but organic pest management is best achieved through ecological approaches that establish a pest/predator balance. While the choice of resistant varieties of crops is paramount, other prevention methods include: choosing sowing times that prevent pest outbreaks; improving soil health to resist soil pathologies; rotating crops; rotating crops; encouraging natural biological agents for control of disease, insects and weeds; using physical barriers for protection from insects, birds and animals; modifying habitat to encourage pollinators and natural enemies; and trapping pests in pheromone attractants. Appropriate seeds and planting material, use of healthy seeds and planting materials, and robust and/or improved cultivars can make a big change in crop production. The practice may require some information's on selection of seeds and planting materials including availability of improved varieties and seed treatments. Generally, locality-adapted seeds are proffered because of their resistance to local conditions.

4.5.8 Implementation of Organic Farming Practices

Looking at the organic farm as being 'one organism', the focus does not lie on cultivating specific crops only, Rather, the focus is on choosing crops that can easily be integrated into the existing farming system and will contribute to its improvement. But the choice also depends on the farmer's knowledge on the right management of the crops, their contribution to a diverse family diet or their

demand in the market. Besides growing crops for food, farmers may need to grow leguminous cover crops to provide high-protein feed for livestock and to be used as green manures to feed the soil. Planting trees for shade, as windbreak, for firewood, feed, mulching material or for other uses, can be recommended in most situations.

a) In the first place, organic farmers should grow enough food for the family. But they may also want to grow crops for the market to get money for other family needs. The farmers should also grow crops that contribute to improvement of soil fertility. Farmers who keep livestock need to grow pasture grass and legumes.

b) Basically, farmers should select crops with low risk of failure. Cereals and legumes such as maize, sorghum, millet, beans and peas are especially suitable for conversion, since they cost little to produce, generally have moderate nutrient demands and are robust against pests and diseases. In addition, many of the traditional crops can be stored and sold in domestic markets. High-value short term crops, such as most vegetables, are more delicate to grow and highly susceptible to pest and disease attack. Therefore, they should not be grown on a larger scale, unless the farmer can sustain some losses in harvest.

c) The crops to grow for sale should include crops that can be sold at the farm gate, at the roadside market or can be transported directly to nearby markets in urban centres. Choosing the right crop to sell on the market may require some market information. Decision making for crops for local or export markets requires detailed information from traders or exporters on the crops, requested varieties, quantities, qualities, regularity and season.

d) High-value perennial crops such as fruit trees take at least 3 years until the first harvest from the date of planting. This makes them appropriate crops for the conversion period. For 24 new plantations, species and varieties must be carefully selected to suit the organic market and production requirements. For conversion of an existing orchard, it might be necessary

to replace old existing varieties, if they are very susceptible to diseases and the product quality does not match with the market requirements.

e) The success of a crop will also depend on provision of favourable growing conditions. The better a crop variety matches local soil and climate conditions. andis tolerant or resistant to common pests and diseases, the better it will grow.

f) Planting of hedges other crops and/or ago forestry trees can be valuable to help establish a diverse farming system

g) Growing leguminous green manures provides nutrients to the soil. Green manures do not provide immediate income, but in the long-term, they make the soil fertile and productive for the future.

Many farmers want to see quick results and often ask how long it takes for organic crops to grow. Organic farming does not aim to make crops grow faster. Crops will grow faster and larger when they have better growing conditions than before. Although conventionally grow crops can be made to grow faster by intensive use of synthetic fertilizers and sprays. Organic crops are nurtured to grow at their normal, natural rate in order to be less susceptible to pests and diseases and build up good physical and nutritional structure. However organic farmers do a lot to make their crops grow healthy and to produce good yields. In a third step, implementation of organic practices throughout the entire farm should be considered, once sufficient experience with different practices has been gained. As soon as organic practices are implemented throughout the entire farm a farmer can claim to be an organic farmer. 25 Commonly, consistent application of organic practices marks the beginning of a long process of improving the production system:

1. Improving soil fertility based on the recycling of farm own organic materials and enhancement of farm own biomass production.
2. Encouraging positive interactions between all parts of the production system (the farm ecosystem) to enhance self-regulation of pests and diseases.
3. Optimizing the balance between feed production and livestock. Farming organically also means continuously learning from personal observation, from outside experiences, sharing experiences with other organic farmers and

implementing new information on the your farm, making it increasingly more sustainable.

4.5.9. Mulching in Organic Agriculture

Mulching is the process of converting the topsoil with plant material such as leaves, grass, twigs, crop residues, straw etc. A mulch cover enhances the activity of soil organisms such as earthworms. They help to create a soil structure with plenty of smaller and larger pores through which rainwater can easily infiltrate into the soil, thus reducing surface runoff. As the mulch material decomposes, it increases the content of organic matter in the soil. Soil organic matter helps to create a good soil with stable crumb structure. Thus the soil particles will not be easily carried away by water. Therefore, mulching plays a crucial role in preventing soil erosion. In some places, materials such as plastic sheets or even stones are used for covering the soil. However, in organic agriculture the term 'mulching' refers only to the use of organic, degradable plant materials. Protecting the soil from wind and water erosion soil particles cannot be washed or blown away.

Improving the infiltration of rain and irrigation water by maintaining a good soil structure no crust is formed, the pores are kept open Keeping the soil moist by reducing evaporation: plants need less irrigation or can use the available rain more efficiently in dry areas or seasons Feeding and protecting soil organisms, organic mulch material is an excellent food for soil organisms and provides suitable conditions for their growth Suppressing weed growth: with a sufficient mulch layer, weeds will find it difficult to grow through it. Preventing the soil from heating up too much: mulch provides shade to the soil and the retained moisture keeps it cool. Providing nutrients to the crops: while decomposing, organic mulch material continuously releases its nutrients, thus fertilizing the soil.

The kind of material used for mulching will greatly influence its effect. Material which easily decomposes will protect hardy materials will decomposes will protect the soil only for a rather short time but will provide nutrients to the crops while decomposing. Hardy materials will decompose more slowly and therefore cover the soil for a longer time. If the decomposition of the mulch material should be accelerated, organic manures such as animal dung may be spread on top of the mulch,

thus increasing the nitrogen content. Where soil erosion is a problem, slowly decomposing mulch material (low nitrogen content, high C/N) will provide a long-term protection compared to quickly decomposing material. 30 Weeds or cover crops, Crop residues, Grass, Pruning material from trees, Cuttings from hedges, Wastes from agricultural processing or from forestry, while mulching has a lot of advantages, it can also cause problems in specific situations. Some organisms can proliferate too much in the moist and protected conditions of the mulch layer. Slugs and snails can multiply very quickly under a mulch layer. Ants or termites which may cause damage to the crops also may find ideal conditions for living.

When crop residues are used for mulching, in some cases there is an increased risk of sustaining pests and diseases. Damaging organisms such as stem borers may survice in the stalks of crops like cotton, corn or sugar cane. Plant material infected with viral or fungal diseases should not be used if there is a risk that the disease might spread to the next crop. Crop rotation is very important to overcome these risks. Water management in organic practices: Practices Scarcity of water for agriculture is a common phenomenon in many countries. In some regions it is almost impossible to grow crops without irrigation. Even in areas with large amounts of rainfall in the rainy season, crops may get short of water during dry periods.

Organic farming aims at optimizing the use of on-farm resources and at a sustainable use of natural resources. Active water retention, water harvesting and storing of water are important practices, especially for organic farmers. Organic farmers know that it is more important to first improve the water retention and the infiltration of water into the soil. Keep soil moisture, during dry periods, some soils are more and some are less in a position to supply crops with water. The ability of a soil to absorb and store water largely depends on the soil composition and on the content of organic matter. Soils rich in clay can store up to three times more water than sandy soils. Soil organic matter acts as storage of water, just like a sponge. Therefore, crop residue or a cover crop protects the soil, prevents crusting on the surface, and slows runoff. Roots, earthworms and other soil life maintain cracks and pores in the soil. Less water runs off, and more sinks into the soil. Reduce evaporation: A thin layer of mulch can considerably reduce the evaporation of water from the soil. It shades the soil from direct sunlight and prevents the soil from getting

too warm. Shallow digging of the dry top soil can help to reduce the drying up of the soil layers beneath (it breaks the capillary vessels). A better retention of water within the soil saves costs on irrigation. Better use of season's rainfall: Ripping during the dry season allows farmers to plant earlier right at the start of the rains.

4.5.10. Water Conservation and Organic Farming

A green manure or cover crop is not always a suitable way of reducing evaporation from the soil, due that they also use water. In dry areas, you should consider using other types of mulch, such as crop residues or plant remain brought in from outside the field. That will help conserve moisture in the soil where it can be used by the crop. During strong rains, only a part of the water infiltrates into the soil. A considerable part flows away as surface runoff, thus being lost for the crop. In order to get as much of the available rainwater into the soil, the infiltration of rainwater needs to be increased. The most important for achieving a high infiltration is to maintain a topsoil with a good soil structure containing many cavities and pores (e.g. from earthworms). Cover crops and mulch application are suitable to create such a favorable top soil structure. Further, they help to slow down the flow of water, thus allowing more time for the infiltration. Some techniques to harvest water include: Planting pits are hand-dug circular holes which collect water and store it for use by the crop. Each pit is about 20 cm across and 20 cm deep. After planting, the holes are left partly open so they collect water. Planting pits take a lot of work to dig when the soil is dry. But they produce good yields in areas where otherwise crops might die because of a lack of water. Once made, the pits can be used again, season after season. Leave the soil covered, and add compost or fertilizer to the pits to increase their fertility. Upper: Sketches of trenches and semi-circular bunds, lower: photos of a circular bund around a coconut palm and beans with mulch in plant pits

In areas with low rainfall, there may not be enough water to grow a crop over the whole area. On gentle slopes (less than 3%), one possibility is to use contour bunds and catchment strips. Catchment strips are areas where no crops are planted. When rain falls on this ground, it runs down slope and is trapped by the contour bund. Plant rows of crops behind the bund to use this water. This can produce a good yield even with very little rain. Mulch the cultivated areas with crop residues to prevent erosion, help water sink in, and slow evaporation.

4.5.11. Crop Planning and Management in Organic Farming

In many traditional agricultural systems a diversity of crops in time or space can be found. Knowing that different plants have different requirements for nutrients, a good crop planning and management is required in order to optimize the use of nutrient in the soil. Crop rotation, intercropping, cover crops and green manures represent the main alternatives to the farmers to manage soil health and fertility. The first three practices will be described in this section. Crop rotation means changing the type of crops grown in the field each season or each year (IIRR and ACT 2005). It is a critical feature of all organic cropping system. because it provides the principal mechanisms for building healthy soils, a major way to control pests, weeds and to maintain soil organic matter (Mohler and Johnson 2009). It increases soil fertility: legumes (such as groundnuts and beans) fix nitrogen in the soil. When their green parts and roots rot, this nitrogen can be used by other crops such as maize. The result is higher, more stable yields, without the need to apply expensive inorganic fertilizer. It helps control weeds, pests and diseases: planting the same crop season after season encourages certain weeds, insects and diseases. Planting different crops breaks their life cycle and prevents them from multiplying.

It produces different types of output: growing a mix of grain, beans, vegetables and fodder means a more varied diet and more types of produce to sell. In some ways, crop rotation takes the place of ploughing the soil: it helps aerate the soil, recycles nutrients, and helps control weeds, pests and diseases. Intercropping, strip cropping and relay cropping bring many of the same advantages as rotation. a) Crop selection Crops produce many different things: food, fodder, firewood, fence poles, thatch and medicines. Farmers grow some crops (such as cotton) only for cash. For other crops, such as cereals or vegetables, you may be able to sell what you do not use yourself. If your objective is marketing, make sure that there is a market of your main output or rotation crop. This depends on many factors: the amount of rain or moisture in the soil, the season (some crops and varieties do not grow well at certain times of year), and the soil fertility, among others. What are the roots like? Tall cereals (millet, maize, sorghum, etc.), finger millets and some legumes (e.g., pigeon pea and sunn hemp) have strong roots that penetrate deep into the soil-up to 1, 2 m for tall cereals.

Their roots improve the soil structure and porosity, so are a good choice if the soil is compacted (Reganold, 1989).

4.5.12. Steps for Using Green Manures

In order to ensure a permanent plant cover it is important to consider the following aspects: o Timing of soil cultivation o Timing of planting or sowing o Producing seedlings and transplanting them o Mixed cultivation o Intercropping o Cover crops o Mulching o Timing of weeding o Sowing of a green manure crop in the off-season Expected effect on yields o Availability of suitable species o Costs of seeds o Availability of water o Availability of labour o Additional use of side-crops o Reduction of the risk o Food security. A well-kept field record book is a great help in remembering which crop has in the past been grown in a particular plot within the field or farm. This is useful especially if the records also show past incidents of plant pests or diseases in each plot in the farm. For example, soil diseases and pests can build up during the life of a susceptible crop. If the same crop or a similar type belonging to the same family is grown in the same field, it will suffer from the accumulated pests and diseases from the previous crop (s) and may not grow well. This can be avoided if the soil is left fallow (not cropped) for a while, or a different crop is planted which is tolerant or resistant to the particular pest or disease. Better still is to plant a crop from a different family which will not share a same complex of pests and diseases. This will result in decline of soil problems and the original crop can be grown successfully again.

4.5.13. Nutrient Management in Organic Agriculture

Soil is a living system and soil identify is the key to agricultural productivity. The maintenance of the fertility of the soil is the primary step in any agricultural system. The plethora of microorganism inherent in any soil system ensures that nutrient cycle is in place and the large substrate is broken down to minute particles that can be easy assimilated by the plant's root system. Therefore farmers should maintain the inherent soil fertility by replacing the nutrients removed by the crops or livestock grazing by using green manures, animal manures (raw or composted) and other natural fertilizers (e.g. rock phosphate).

The input and output of plant nutrients must be monitored through a soil testing program, to ensure that nutrient depletion does not take place. Soils deficient in nutrient cannot support either crop production or active populations of beneficial microorganisms, which are essential for a productive soil. Improvement in agricultural sustainability requires, alongside effective water and crop management, the optimal use and management of soil fertility and soil physical properties Both rely on soil biological process and soil biodiversity. This requires the adoption of management practices that enhance soil biological activity and build-up long term soil productivity and health; the main practices to enhance soil fertility include the use of organic fertilizers such as,

1) Compost and vermin-compost

2) Green manures

3) Animal manure

4) Microbial fertilizer

5) Mineral fertilizers

The Composting is the process of transforming organic materials of plant or animal origin into humus in heaps or pits. Compared with uncontrolled decomposition of organic material, decomposition in the composting process occurs at a faster rate, reaches higher-temperatures and results in a product of higher quality. Within the process of composting, three main phases can be distinguished: the heating phase, the cooling phase and the maturing phase.These systems do not heat-up during the composting process. They are handy if there is a continuous supply of wastes (e.g. kitchen waste). However, they lack the advantages of the heating phase. Batch-fed systems (all material is composted at once): These systems lead to a hot composting process. They offer the advantages of reduced nutrient loss death of weed seeds and diseases as a result of the high temperature of composting, the process is fast (within a few weeks) and it results in a compost of superior quality. If little water is available, composting in pits may be more appropriate since humidity is conserved better in pits than in heaps. Vermi composting: is a method of composting using earthworms. Earthworms speed up the composting process, aerate the organic material and enhance the finished compost with nutrients and enzymes from their digestive tracts.

Vermi composting allows you to create compost round the year, indoor during the winter and outdoor during the summer.

Green manures are plants grown to accumulate nutrients for the main crop. When they have built up maximum biomass, they are worked into the surface soil. As they are usually cut before flowering, growing a green manure is thus different from growing a legume crop in the rotation. Once worked into the soil the fresh plant material releases nutrients quickly and will be fully decomposed within a short period of time. Old or coarse material (e.g. straw, twigs, etc.) will decompose at a slower rate than fine material and will therefore contribute more to the build-up of soil organic matter than to fertilizing the crop. An alternative to sowing a green manure crop in the field is to collect fresh plant material from elsewhere and work it into the soil. They penetrate the soil with their roots, make it more friable and bind nutrients, which would otherwise be washed away. They suppress weeds and protect the soil from erosion and direct sunlight. If legume plants are used, nitrogen is fixed from the air into the soil. Some green manures can be used as fodder plants or even to provide food for human consumption (e.g. beans and peas). By decomposing, green manures release all kinds of nutrients in the correct mixture for the main crops to utilize thus improving their yield. The incorporated plant material encourages the activity of soil organisms, and builds up organic matter in the soil. This improves soil structure and water holding capacity. Green manuring is thus an inexpensive way to improve soil fertility and the nutrition of the main crops grown.

Labour is required for tillage, sowing, cutting and incorporation of plants into the soil, and is most intensive where the amount of helpful equipment available is small. If green manures are intercropped with the main crops, they compete for nutrients, water and light. When old or coarse plant material is incorporated into the soil, nitrogen may be temporarily immobilized and therefore unavailable for plant growth. If food and space are in short supply it may be more appropriate to grow a food crop rather than a green manure and recycle the crop residues, or to intercrop a green manure crop with the main crop. The benefits of green manures occur over the long term and are not always visible immediately.

The green manure is using following manner

a) Sowing the green manure, if grown within a crop rotation, the time of sowing must be chosen such that the green manure can be cut down and worked into the soil before the next crop is sown. Green manures need water for germination and growth. The ideal seed density must be tested for each individual situation. It depends on the species chosen. In general no additional fertilization is necessary. If legumes are grown in a field for the first time, inoculation of the seeds with the specific rhizobia may be necessary to profit from nitrogen fixation of the legume.

b) Working the green manure into the soil. The time gap between digging in the green manure and planting the next crop should not be longer than 2 to 3 weeks, so as to prevent nutrient losses from the decomposing green manure. Crushing: Green manures are worked in most easily when the plants are still young and fresh. If the green manure plants are tall or contain bulky and hard plant parts, it is preferable to chop the plants into pieces to allow easier decomposition. The older the plants, the longer decomposition will take. The best time to dig in green manure plants is just before flowering. Depth of incorporation: Green manures should not be ploughed deeply into the soil. Instead they should only be worked in to the surface soil (in heavy soils only 5 to 15 cm deep, in light soils 10 to maximum 20 cm deep). In warm and humid climates the material can also be left on the soil surface as a mulch layer.

4.5.14. Microbial Fertilizers

The microbial fertilizers mostly consist of organic material and some source of sugar or starch, which are fermented together with specific species of microorganisms. The products are living organisms and need to be applied cautiously. They should not be used when expired, since the organisms may be dead. Although some research has been done on the use of microorganisms and positive effects may be proven, there is still little experience with such products. To find out the effect of a certain product, it is recommended to test them in small scale and compare with an untreated plot. Remember though: microbial fertilizers cannot substitute an appropriate humus management in the farm. Most of the bacteria and fungi present in the purchased

products are generally present in soil. Microbial inocula, therefore, enhance the presence of the specific organisms. Some farmers make their own microbial fertilizers to save on costs .Some microbes add nutrients to the soil through mineralisation. Others add nitrogen by fixing it from the atmosphere. These include Rhizobium and Azotobacter. Other microbes, such as Mycorrhizal fungi, help to supply plants with phosphorus. Azospirillum and Azotobacter are bacteria that can fix nitrogen. Pseudomonas species are a diverse group of bacteria that can use a wide range of compounds that plants give off when their roots leak or die. They are able to solubilize phosphorus and may help to suppress soil borne plant diseases (Sharma, 2005)

The mineral fertilizers, which are allowed in organic agriculture, are based on ground natural rock. However, they may only be used as a supplement to organic manures. If they contain easily soluble nutrients, they can disturb soil life and result in unbalanced plant nutrition. In some cases, mineral fertilizers are ecologically questionable as their collection and transport is energy consuming and in some cases natural habitats are being destroyed.

4.5.15. Basics of Organic-Pest and Disease Management

Knowledge about plant health and pest and disease ecology helps the farmer to choose effective preventive crop protection measures. As many factors influence the development of pest and disease, it's crucial to step in at the most sensitive points. This can be accomplished through the right timing of management practices, a suitable combination of different methods, or the choice of a selective method. Some important preventive crop protection measures are the following ones.

1. Selection of adapted and resistant varieties: Choose varieties which are well adapted to the local environmental conditions (temperature, nutrient supply, pests and disease pressure), as it allows them to grow healthy and makes them stronger against infections of pests and diseases.
2. Selection of clean seed and planting material Use safe seeds which have been inspected for pathogens and weeds at all stages of production. ? Use planting material from safe sources.

3. Use of suitable cropping systems Mixed cropping systems: can limit pest and disease pressure as the pest has less host plants to feed on and more beneficial insect life in a diverse system. Crop rotation: reduces the chances of soil borne diseases and increases soil fertility. Green manuring and cover crops: increases the biological activity in the soil and can enhance the presence of beneficial organisms (but also of pests; therefore a careful selection of the proper species is needed).

4. Use of balanced nutrient management: Moderate fertilization: steady growth makes a plant less vulnerable to infection. Too much fertilization may result in salt damage to roots, opening the way for secondary infections. Balanced potassium supply contributes to the prevention of fungi and bacterial infections.

5. Input of organic matter: Increase micro-organism density and activity in the soil, thus decreasing population densities of pathogenic and soil borne fungi. Stabilises soil structure and thus improves aeration and infiltration of water. Supplies substances which strengthen the plant's own protection mechanisms.

6. Application of suitable soil cultivation methods facilities the decomposition of infected plant parts. Regulates weeds which serve as hosts for pests and diseases. Protects the micro-organisms which regulate soil borne diseases.

7. Use of good water management: No water logging: causes stress to the plant, which encourages pathogens infections. Avoid water on the foliage, as water borne disease spread with droplets and fungal diseases germinate in water.

8. Conversation and promotion of natural enemies provide an ideal habitat for natural enemies to grow and reproduce. Avoid using products which harm natural enemies.

9. Selection of optimum planting time and spacing most pests or diseases attack the plant only in a certain life stage; therefore it's crucial that this vulnerable life stage doesn't correspond with the period of high pest density and thus that the optimal planting time is chosen. Sufficient distance between the plants reduces the spread of diseases. Good aeration of the plants allows leaves to dry off faster, which hinders pathogen development and infection.

10. Use of proper sanitation measures: Remove infected plant parts (leaves, fruits) from the ground to prevent the disease from spreading. Eliminate resides of infected plants after harvesting.

Weed management in Organic Agriculture: Organic farmers give first priority prevention of the introduction and multiplication of weeds. The management practices aim at keeping the weed population at a level that does not result in economic loss of the crop cultivation or harm its quality. The goal is not to completely eradicate all weeds, as they also have a role to play on the farm. For example, weeds provide cover that reduces soil erosion. In addition, most of the biological diversity in our fields comes from the presence of weeds.

They provide habitat for both beneficial bio-control insects and mycorrhiza fungi. Because weeds offer pollen and nectar they allow bio-control insects to maintain their populations and therefore, serve as a valuable instrument in controlling pests. However, weeds may also alter reduced between the crop plants. In this darker and more humid environment, diseases find ideal conditions in which to spread and infect plants. As we have seen many times up to this point, a basic working principle in organic farming is to prevent problems, rather than to cure them. This applies equally to weed management. Good weed management in organic farming includes creating conditions which hinder weeds from growing at the wrong time and in the wrong place and then become a serious problem for the crop cultivation. Competition by weeds doesn't harm the crop throughout the whole cultivation period in the same way.

The most sensitive phase of a crop to weed competition is in its early growth stage. A young plant is vulnerable and depends highly on an ideal nutrient, light and water supply for a good development. If ii has to complete with weeds at this stage, the crop may grow weak, which also makes it more vulnerable to pest and disease infections. Weed competition later in the cultivation period is less harmful. However, some weeds may cause harvesting problems and reduce the crop yield in that way. Therefore, weeds should not be completely ignored after the most critical growth period of the crop, but in general, they become less important. These considerations should influence the selection and timing of weed management measures. In general, such measures aim at keeping the weed population at a level which doesn't result in

economic loss of the crop cultivation or harm its quality. Several preventive measures may be applied at the same time. The importance and effectiveness of the different methods depend to a large extent on the weed species and the environmental conditions.

4.5.16. Soil Fertility

Any soil cultivation has a more or less destructive impact on soil structure. in tropical soils, regular tillage accelerates the decomposition of organic matter which can lead to nutrient losses. The mixing of soil layers can severely harm certain soil organisms. Soil after tillage is very prone to soil erosion if left uncovered before the onset of heavy rains. Minimum tillage systems on the other side help to build up a natural soil structure soil structure with crumbly top soil rich in organic matter and full of soil organisms. Nutrient losses are reduced to minimum as there is no sudden decomposition of organic matter and nutrients are caught by a dense network of plant roots. Soil erosion won't be a problem as long as there is a permanent plant cover or sufficient input of organic material

4.5.17. Animal Husbandry in Organic Farming

Integrating animal husbandry into crop producing farms is one of the principles of organic farming. In temperate and arid zones, animal husbandry plays an important role in the recycling of nutrients, while it is less emphasized in the humid tropics. The caring, training and nurturing of animals is considered an art in many farming communities. Integrating animals into a farm help creating a closed or semi-closed system where energy and nutrients are recycle. Animals can convert non-edible biomass into food, while increasing soil fertility with their manure. Many farm animals have a multi-functional role, for example produce dung which is of great importance for soil fertility. yield products such as milk or eggs for sale or own consumption continuously. Recycle by-products such as straw or kitchen waste. Serve as draught animals for tillage or transport. Produce meat, hides, feathers, horns etc. Serve as an investment or a bank. Help in pest control (e.g. dugs) and weed management (Lotter, 2003)

The significant of each role will vary from animal to animal and form farm to farm. It will also depend on the individual objectives of the farmer. There are several reasons for taking up animal husbandry as a part of your farming activities or even as the main one. In most smallholder farms, fodder cultivation will compete for space with the cultivation or crops. Fodder cultivation is economically more beneficial compared with crop production must be assessed case by case. However, there are some options for integrating fodder crops in farms without sacrificing much land. Below are some examples Grass or leguminous cover crops in tree plantations. Hedges of suitable shrubs, shade or support trees, Grass on bunds against soil erosion, Grass fallows or green manures in the crop rotation, Crops with by-products such as paddy straw or pea leaves 97. The management of pastures is crucial for a good herd management. It is also important to practice appropriate management throughout the year.

4.6. Modern Agriculture and Organic Farming

"The side-effects of the modern agricultural chemicals and machines raise serious questions about the overall benefits of the new technology. Chemical fertilisers and pesticides pollute our air and water. Agricultural chemicals, including hormones and antibiotics leave residue in food that may cause cancer or genetic damage. Soil and energy resources are being depleted. Instead of recycling our wastes back onto land as fertilizer, we allow them to pollute our water. We use non-renewable energy resources to produce artificial fertilizer. In the future we may be forced to make radical adjustments on such agricultural practices" (Oelhaf, 1978).

The adverse environmental and social impacts of modern agriculture are universal. Pretty (1995) summarized them as follows. 'contamination of water by pesticides, nitrates, soil and livestock wastes, causing harm to wildlife, disruption of ecosystems and possible health problems in drinking water. Contamination of food and fodder by residues of pesticides, nitrates and antibiotics, damage to farm and natural resource by pesticides, causing harm to farm workers and public, disruption of ecosystems and harm to wildlife. Contamination of the atmosphere by ammonia, nitrous oxide, methane and the products of burning, which play a role in ozone depletion, global warming and atmospheric pollution; overuse of natural resources, causing depletion of groundwater and loss of wild foods and habits and their capacity

to absorb wastes causing water-logging and increased salinity. The tendency in agriculture to standardize and specialize by focusing on modern varieties, causing the displacement of traditional varieties and breeds new health hazards for workers in the agrochemical and food processing industries(Wander 2004).

There is an alarming reduction in agricultural production during the last three decades, the factors which contribute to reduction in the agricultural output is scarcity of labour, very high wage rates compared to neighbouring state etc. Agriculture is not main occupation of the people only 17% of the populations are real farmers fully dependent on agriculture. Many of the farm land are not cultivated treated as plain land. On this background, the policy makers in Kerala think about alternative farming system change from systems which follow only non-conventional farming methods by avoiding the use of harmful materials in agricultural practices through the better cultivation of crops on soils best suited to them. Currently about 7000 farmers practices organic farming in the state as NPOP (National Programme for Organic Production) standards, covering a total area of 5750 hectare. But non-certified organic cultivation which has not been done is expected to much more than conventional farming.

Kerala has increasing the momentum of organic farming to comparing to the other states. Government of Kerala introduces many measures to enrich the organic farming and reducing the problems faced by the organic farmers. There are two types of organic agriculture in Kerala one is focused for export (certified process) and another is domestic consumption of the state. At present, the market price of conventional products and demand for the products are comparatively high, because of lack of awareness non-affordability of price of organic products are still in dilemma by the consumers.

Chapter 5

Government Initiatives on Organic Farming in Kerala: Strategies and Constraints

5.1. Introduction

It is quite natural that a change in the system of agriculture in a country of more than a billion people should be a well thought out process, which requires utmost care and caution. There may be several impediments on the way. An understanding of these problems and prospects will go a long way in decision making. The most important constraint felt in the progress of organic farming is the inability of the government policy making level to take a firm decision to promote organic agriculture unless such a clear and unambiguous direction is available in terms of both financial and technical supports, from the centre to the Panchayat levels, mere regulation making will amount to nothing .The following are found to be the major problem areas for the growth of organic farming in the Kerala.

5.2. Problems and Constraints of Organic Farmer in Kerala

Kerala government provides a action plan for promoting organic agriculture in Kerala, it improves the socio-economic condition of the organic farmers in Kerala. Organic farmers face several constraints while processing organic farms. The main problems faced by the organic farmers are

1. lack of Awareness
2. Marketing problems –Non availability of local markets
3. Shortage of Bio-Mass
4. High input cost
5. Absence of adequate agricultural polices
6. Less intervention and market support from the local government
7. Low yields
8. Inability to meet the export demand
9. Lack of quality standards to bio-manures
10. Improper accounting standard
11. Political and social factors

5.2.1. Lack of Awareness

It is a fact that many farmers in the country have only vague ideas about organic farming and its advantages as against the conventional farming methods. Use

of bio-fertilizers and bio pesticides requires awareness and willing on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is vital to increase productivity. Farmers lack knowledge of compost making using the modem techniques and also its application. The maximum they do is making a pit and fill it with small quantities of wastes. Attention on the application of composts/organic manure is also lacking. The organic matter is spread during the months when the right moisture level is absent on the soil. The whole manure turns into wastes in the process .The required operation is of course labour intensive and costly, but it is necessary to obtain the desired result.

5.2.2. Output Marketing Problems

It is found that before the beginning of cultivation of organic crops, their marketability and that at a premium over the conventional produce has to be assured. Inability to obtain a premium price, at least during the period required to achieve the productivity levels of the conventional crop will be a setback. The main marketing problems faced by the organic farmers are lack of domestic organic markets and market pricing for organic products, branding, advertisement, and higher price to compare other farming products.

5.2.3. Shortage of Biomass

Many experts and well informed farmers are not sure whether all the nutrients with the required quantities can be made available by organic materials. Evan if this problem can be surmounted. They are of the view that available organic matter is not simply enough to meet the requirements. The crop residues useful to prepare vermin-compost are removed after harvest from the farms and they are used as fodder and fuel. Even if some are left out on the farms termites etc destroy them. Experiments have shown that crop residues ploughed back into soil will increase productivity and a better alternative is conversion into compost. The small and marginal cultivators have difficulties in getting the organic manures compared to the chemical fertilizers, which can be bought easily, of course if they have the financial ability. But they have to either produce the organic manures by utilizing the bio-mass they have or they have to be collected from the locality with a minimum effort and cost Increasing pressure

of population and the disappearance of the common lands including the wastes and government lands make the task difficult .

5.2.4. High Input Costs

The small and marginal farmers in India have been practicing a sort of organic farming in the traditional farming system. They use local or farm renewable resource and carry on the agriculture practices in an ecologically friendly environment. However, now the cost of the organic inputs is higher than those of industrially produced chemical fertilizers and pesticides including other inputs used in the conventional farming system. The groundnut cake, neem seed and cake, vermin-compost, silt, cow dung and other manures, etc. applied as organic manure are increasingly becoming costly making them unaffordable to the small cultivators. So the higher input cost is the one problem faced by the organic farmers in Kerala. The cost of organic inputs is very high in the local markets of Kerala. The chemical fertilizers are easy available in local markets. But the availability of organic manures is limited. The producers of the organic manures impose high prices to these manures. During the field discussion it is understood that shortage and cost of organic inputs are the serious constraints faced by the organic farmers in Kerala.

5.2.5. Marketing Problems of Organic Inputs

Marketing of organic inputs are other constraints faced by the organic farmers in Kerala. The chemical fertilizers very easy to available in local markets .The number of organic input stores are also very low in compare with chemical stores. The distances of organic depots are also high it causes increasing the cost of organic inputs. Bio-fertilizers and bio-pesticides are yet to become popular in the country. There is a lack of marketing and distribution network for them because the retailers are not interested to deal in these products, as the demand is low .The erratic supplies band the low level of awareness of cultivators also add to the problem. Higher margins of profit for chemical fertilizers and pesticides for retailing, heavy advertisement campaigns by the manufacturers and dealers are other major problems affecting the markets for organic inputs in Kerala.

5.2.6. Absence of an Appropriate Agriculture Policy

National self-sufficiency in food production, product and input supplies, etc. is vital issues which will have to be dealt with in an appropriate agriculture policy of Kerala. These are serious issues the solution for which hard and constant efforts along with a national consensus will be essential to go forward. Formulation of an appropriate agriculture policy taking care complexities is essential to promote organic agriculture in Kerala in a big way. The contribution of local self-governments and institutions like krishi bhavan and krishi vijana Kendra are very poor in the case of organic farming. Many strategies and policies are formulated by the government to promoting organic farming in Kerala. But the estimated progresses of these policies are not achieved. The main factor behind that the improper attention of the local self-government institution.

5.2.7. Lack of Financial Support

The developing countries like India have design a plethora of national and regional standards. In attune with those of the developed countries the adoption and maintenance of such a regulatory framework and its implementation will be costly. The cost of certification, a major component of which is the periodical inspections carried out by the certifying agencies, which have freedom to fix timings, type and number of such inspections appears- to be burden for the small and marginal farmers of course, the fees charged by the international agencies working in India before the NPOP we prohibitive and that was a reason for the weak response to agriculture even among the large farms in the Kerala. Supports for the marketing of organic products are also not forth coming neither from the state nor from the Union Governments. The financial assistance extended to the conventional farming methods are absent for the promotion of organic farming in India. During the field visit it is under stood that many of the organic farmers face the problem of financial crisis. During the conversion period the yield from the farm are low to compare with conventional land. There is no financial support from the government at this period to support organic farmers. Number of farmers expressed their fatigue that it is very difficult to survive this conversion period.

5.2.8. Low Yields

In many cases the farmers experience some losing yields on discarding synthetic inputs on conversation of their farming method from conventional to organic. Restoration of full biological activity in terms of growth of beneficial insect's populations, nitrogen fixation from legumes, test suppression and fertility problems will take some time and the reduction in the yield rates is the result in the interregnum. It may also we possible that it will take years to make organic production possible on the farm. Small and marginal Farmers cannot take the risk of low yields for the initial to-3years on the conversation to organic farming. There are no scheme to compensate the during the gestation period. The price premiums on the organic products will not be munch help as they will diapered one significant Quantities of organic farm product are made available. The output of organic farming is low in the initial stage of conversion and its shows an increasing slowly. The transformation period the yield is too low and the conversion period the organic farmers have less experience in applying organic manures and organic pesticides. The preparation of organic inputs is also need the expertise helps. The case studies conducted by the researcher it is understood that output creation through organic methods require adequate time and knowledge. They also advised group farming method is most important strategies for improving the quantum of output.

5.2.9. Inability to Meet the Export Demand

The lack of domestic markets, the organic farmers are compelled to produce for export market. The quality standards of organic products in the export markets are preferably high to compare the domestic markets. The farmers are very difficult to assure quality of these products. So they are failed to produce for export demand. India is known in the world organic market as a tea supplier and good potential to export Coffey, vegetables, sugar, herpes, spices and vanilla. Spite of the several initiatives to production and export organic produces from the country, the aggregate production for export came to only about 14000 tones. Trading corporation is also engaged in exporting of organic fruits, vegetable, coffee from India .The country could export almost 85percent of the production indicating that demanding not a constraint in the international markets for organic products

5.2.10. Vested interests

Hybrid seeds are designed to respond to fertilizers and chemicals. The seed, fertilizer are and Pesticide industry as also the importers of these inputs to the country have stake in the conventional farming. Their opposition to organic farming stems from these interests

5.2.11. Lack of Quality Standard for Bio Manures

The need for fixing stranded and quality parameters for bio-fertilizers and bio manners has a risen with the increasing popularity of organic farming in the Kerala .There are a very large number of brands of organic manures, claiming the high levels of natural nutrients and essential elements. But most farmers are not aware of the pitfalls of using the commercially available bio manure products while the concept of organic farming itself lays the great stress on the manures produced on the farm and the farm and farmers, household, many of the branded products available in the market may not be really organic. Elements of chemicals slipping into the manures through faulty production methods could make the product not certifiable as organic. The process of composing which is a major activity to be carefully done is achieved usually by one of the two methods, vermin-composting or microbe composting (Tschirley, 2005)

While the former is ideal for segregated waste material without foreign matter, microbe composting is suitable for large scale management of solid wastes, especially in cities and meters. Even though the farmer is using manure produced by different methods, proper parameters for bio manure are yet to be finalized. Most farmers are still unaware of the difference between bio-manure and bio-fertilizer, it is point out while bio manure contains organic matter which improves the soil quality, and bio-fertilizers are nutritional additives separated from the organic material, which could be added to the soil, much like taking vitamin pills. Bio-fertilizers do nothing to enhance soil quality while the loss of soil quality has been the major problem faced by farmers in Kerala in these days.

5.2.12. Improper Accounting Method

An understanding of the real costs of erosion of health, the loss of welfare of both humans and other living things and the computation of these costs are necessary

to evaluate the benefits of organic farming. These costs will have to be integrated effects of in organic agriculture .An economic evaluation of the bad effects of in organic agriculture and internalization through environmental taxes is proposed for a market based approach to promote organic farming in Kerala. Basically the farmers in Kerala has a minimum awareness of keeping accounts properly this will makes difficulties in the calculation of expenditure and agricultural practice. It is a problem faced by the organic farmers in Kerala. Qualitative elements of organic farming are not considered for accounting. The environmental and ecological sustainability of organic practices are not considered. The reasons behind the actual market fluctuations are also neglected in organic accounting process.

5.2. 13. Political and Social Factors

Agriculture in Kerala is subject to political interventions with the objectives of dispensing favours for electoral benefits. Subsidies and other supports from state government is a one of the crucial determinant of the growth of organic farming in Kerala. Government controlled prices of inputs like chemical fertilizers The public sector units' dominant role in the production of fertilizers government support/floor prices of many agricultural products supply of inputs like power and water either free of coast or at a subsidized rate are the tools often used to achieve political objectives. Any movement for the promotion of organic farming in Kerala will have to counter opposition from the sections who benefit from such policies in the conventional farming system. In the absence of alternative employment opportunities and other considerations, the organized workforce particularly in the public sector fertilizer, pesticide and seeds industries is also likely to oppose moves on the part of the government to promote organic farming on large scale.

5.3. Strategies for Promoting Organic Farming in Kerala

The Government of Kerala introduces many policies and strategies in co-ordination with the agriculture department to promote organic agriculture in Kerala, (Government of Kerala Action Plan for Promoting Farming, 2007)

5.3.1. Ensure Seed Sovereignty of the Farmers and the State

Establish seed villages begin programmers for the production of seeds, seedlings planting Materials and traditional animal breeds at the panchayat level so as to become self-sufficient. In the availability of good quality local seeds, both indigenous and breeder seeds developed by the KAU and other institutions of agricultural research. Begin at the farmers, group levels, seed banks and seed cooperatives to produce, store share and supply good quality seeds. Production programmers along with them KAU and other institutions of agriculture research. Develop storage facilities protection measures using traditional methods Ensure maintenance of traceability chain mandatory at the Local Self Government Institution level by the BMC with regard to seeds produced, sold, transferred and shared in the panchayat to protect the farmers from spurious low quality seeds, including hazardous genetically modified seeds Declare and ensure GM free villages and state Establish a mechanism to regulate the prices of seeds Ensure supply of locally suitable seeds in each agro-climatic zone

5.3.2. Phase out Implementation of Organic Farming Policy

Conduct an initial assessment of the status of organic farming in the state including cultivated, certified and non-cultivated wild organic areas in the state .develop a clear road map to convert 20% of the total cultivable area, focusing on potential crops and areas, to organic every year, and achieve total conversation in the five year plan. Develop a clear plan of action with budgets for incorporation into the planning process of Local Self Government Institutions for phasing in organic farming in the State. Special thrust should be initially given to complex, diverse and risk areas such as rain-fed districts and tribal districts (Kerala Government action plan,2007).

5.3.3. Compact Area Group Approch in Organic Farming

Encourage the formation of organic farmers groups, clups, self help groups and cooperatives for the purpose of cultivation, input production seed/seedlings/planting materials production, certification and marketing . Each group should be of a minimum five members as stipulated under the marketing .Each group

should be of a minium five member as stipu;lated under the participatory Gurantee System of certification. Group approaches of organic farming encourage productivity of the organic farms and increasethe attitude of farmers toward organic farming.

5.3.4. Soil Quality and Ensure Water Conservation Measures

Ensure organic farming approach in all watershed development areas and extend support including capacity building and finacial assistance for soil amd water conservation measure throug ongoing watershed delopment programmes. The government integrates the varoius institutions presently involved in watershed management and introduce organic farming as a key componnet Kerala Agricultural University and other research institutions should devlop suitable crop combinations and locally suitable technology, through participatory reaserch with farmers. Encourage landowners and part- time farmers to utilize their lands for organic farming, if left unutilized,failing which Local Self Government Institution should take action to ensure the same. Formulate legislative measures to rejuvenate and protect traditional water resources including fresh water lakes, surangas and ensure rain water conservation,restriction of bore wells, especially in dark zones and reaching of existing bore wels, open wells and ponds, and other conservation measure so as to improve ground water table and also conserve top soil. Estalish testing facilities for soil, water micronutrients and microorganism at least at the block and introduce the system of providing Soil Health Cards. Promote bio-fencing and thus help ensure soil and water conservation and, availability of GREEN manure and green leaf manure Conduct traing programmes for resource persons at the Local Self Government Institution Level on soil and water conservation measures.

5.3.5. Promote Mixed Farming Approach

Make crop-livestock intergrated farming as part of organic farming, with women centered ownership and management in the farmer households and groups. Develop Bee-keeping , fisheries and similar enterprises as part of the mixed farming programme. Promote decentralized production of livestock feed from locally available resaouces, but excluding spurious ingredients such as growth promoters and hormones. Document and popularise traditional knowledge related to animal health care. Develop linages between organic farmers and livestock growing farmers for

exchange of manure for fodder . Encourage mixed cropping of trees and medicinal plants through organic farming.

5.3.6. Conservation and Improvement of Agro-Biodiversity

Documents realted to agro-biodiversity and realted traditional knowledge and practice, both cultivated and un-cultivated, in each Panchat Encourage the establishment of model agro-biodiversity conversation farms under the supervision of krishibhavans Develop programmes for farmers to collect, Purify and multiply tradional seeds. encourage protection of traditional agricultural systems and agricultural heritage of kerala.

5.3.7. Encourage the Use of Renewable Energy Sources

Assistance in terms of expertise and finances should be given for use of biogas plants, solar energy and wind energy units wherever feasible to reduce dependence on external energy sources. Develop appropriate small farm machinery for reducing energy, cost and drudgery. Organic farming methods encourage the use of renewable energy resources.

5.3.8. Organic Farming in Education Institutions

Introduce organic farming in educational institutions through academic inputs. A specific campaign shall be started among students to ensure that they take organically grown food. Set up a system in all schools in Kerala to have organic vegetable and fruit gardens as well as paddy, in potential regions, as part of inculcating among the children the love for organic farming and biodiversity conservation and, perpetuation in their households. Necessary support schemes may be formulated and implemented through the local self-government institutions encourage schools to have seed banks and seed farms in the premises, wherever feasible, to produce and supply good quality seeds for the use in their nearby regions. Promote children-farmer interfaces in each school, which shall include visits to organic farms. Encourage schools to link with organic farmers for supply of rice, vegetables, fruits, pulses, milk, egg and honey as part of the noon-meal and nutritional supplement programmes (Mithra, 2006). The ICDS can also be encouraged to supply organic food processed and prepared through SHG's for the Anganwadi's. Provide

suitable incentives to baby food industries that use organic inputs and processes. The discussion with agriculture officers in the selected districts it is revealed that krishibhavans take initiatives to promotote organic agriculture in school level. Mid-day meal programmes are established programmes in all schools, for ensuring the quality of noon meals in the schools in participation with school students. The School authorities and representatives of local bodies are instructed organic vegetable farming in the schools level. It is the real encouragement of the students to enter in to organic farming

5.3.9. Reorient Research and Extension

Kerala Agricultural University conducted various studies in various agricultural practices. The Kerala Agricultural University would set up a special multi-institutional special task force to re-orient the Research, Education and Extension systems to support the Organic Farming Policy and the transition of the State's agriculture to organic farming. The Kerala Agricultural University shall develop package of practices and model demonstration farms for organic farming in different agro-ecological zones. Introduce as part of the course curriculum, both at under and post graduate levels, interactions with leading organic farmers, groups and NGO's promoting organic farming in the state. Develop participatory research programmes with organic farmers on all aspects of organic farming. Identify and screen native livestock fish breeds which are locally adaptable and resistant to parasites and diseases. Develop herbal remedies for control of diseases and pests of livestock, crops, and fish. Research in the field of organic farming will help the development in Kerala organic farming. The Discussion with agro scientists in the agricultural university, It is understood that people are more conscious about chemical health hazards but the involvement of the youth in farming practices are decline. The recent time the majority of the farming work is done by the migrated labour from other states under the supervision of land owners. It was the major reason for organic agriculture sector becomes static position.

5.3.10. Phase out Chemical Pesticides

The over consumption of chemical pesticides inversely effect to the environment and reduce the environment sustainability. To ensure phased restriction

ban of sale and use of chemical agricultural inputs such as fertilizers, pesticides, fungicides and weedicides parallel to the implementation of the organic farming policy in the region. Through necessary legislation stop the sale and use of the highly toxic Class-1a and 1b pesticides as a preliminary step. Declare and maintain ecologically sensitive areas with rich biodiversity and natural resource base as Chemical Pesticide and Fertilizer-Free Zones. Regulate the sale and use of pesticide through necessary legislations, enforcing a prescription based system ensuring that pesticides are sold only on a case-to-case basis after obtaining prescription from the Agriculture Officer. Strictly prohibit the sale of pesticides to children, pregnant women and non-farmers generate a database on the non-agricultural use of pesticides and regulate its sale and use. It is the time for driven out the chemicals from the farm land to protect our environment and human beings for future generations

5.3.11. Local-Self Government and Organic Farming

Local self-government plays important role to promote organic farming in Kerala by integrating the various government departments and schemes. The major departments are agriculture, animal husbandry, forest, fisheries local bodies, finance, revenue, industries etc. and other milk marketing societies, farmers organizations, Societies, Self-help groups and various farming associations are integrated their activities together for speedy approval and implementing organic farming.

India is growing at a rapid pace and so is the use of technology in the growing sectors of the country. A major mass of the population is still dependent and practicing agriculture as its primary source of income. India has been in a continuous tryst with its farming infra, practices and associated communities since independence. With the sector still contributing around 15-20% to the national GDP of the country over few decades, and its diverse cum changing needs across its regions, India has been driving necessary and timely interventions at Industry, Institution, and individual farmer level for its constant manifestation.

Measures or interventions to cater to the larger farming community are of utmost necessity given the diverse needs of farming in India. As one positive amendment of the existing policy or introduction of fresh clauses to benefit the growing aspirations or expectations of any farmer, may hamper farm’s productivity in

the longer run. For instance, increased subsidy on chemical fertilizer purchases by the farmer groups may deteriorate the soil health in the long run which as well, worsens the cash flow a farmer may have to budget y-o-y. In this direction, introduced technology-driven aids like the soil testing centers across the country have made a considerable impact on the farmer's choice of crop, cropping pattern, level of mechanization and irrigation solutions.

5.3.12. Organizational Set-up for Promotion of Organic Farming

Set up a Three-tier system for implementation of the Organic Farming Policy, Strategy and Action Plan. Set-up and Organic Farming Authority of Kerala (OFAK) with the primary goal of promoting organic farming and facilitating an effective, smooth and time-bound transition of the State's agriculture from the conventional chemical intensive farming to the sustainable organic farming. The Authority would act as an umbrella model integrating agency for organic farming and related programmes of the various departments. It would also be an agency to liaison with national and international bodies in this matter, and would also access, generate funds, grants and support for implementation of the strategies. The Authority will consist of a General Council and Executive Committee. The better organizational set up in the field of organic farming brings the growth and development of organic farming in Kerala.

5.4. Organic Farming and Good Agricultural Practices

The state government proposed to assist organic farming, the main components of the scheme is assistance for certification, empowerment of GAP clusters promotional assistance for GAP clusters, green manuring, and model units for organic manure preparation and safe to eat food production including participatory guarantee system, certification through vegetable fruit promotion council in Kerala. Organic farming of fruits and vegetable s are promoted through VFPCK. The central Assistance sponsored scheme Paramparagat Krishi Vikas Yojana (PKVY) is also be utilized for promoting organic farming and developing organic clusters. In order to promote the organic agriculture assistance is provided to procurement of quality seeds, land preparation, and other cultivation requirements and promotion of crop production activities in tribal lands to ensure the food and nutritional security to tribal

people. The table 5.1 shows the assistance provided by the state government for promoting organic agriculture. An amount of Rs.50 lakh is providing for assistance to formation of organic clusters under proper registration and certification. An Amount of Rs.25 lakh is earmarked for Attappady tribal village programme to support traditional crops from production to marketing and Rs.6 lakh is provided for cultivation of traditional millet in idukki district.

Table 5.1
Assistance for promoting Organic Agriculture in Kerala (2019)

Sl .No	Particulars	Amount (Rs. in lakh)
1	Formation of New organic clusters	50.00
2	On farm production of bio-inputs	50.00
3	Assistance for Eco shops for marketing	25.00
4	Organic farming of fruits and vegetables through SHGs and Certification	75.00
5	Support for implementation	40.00
	Total	240.00

Source: Source: Research Institute of Organic Agriculture Statistics, 2020

The market development activities by VFPCK will be in convergence with the similar activities carried out by the Department of Agriculture Technology dissemination, trainings and campaigns shall be organized jointly with the Department of Agriculture.

Table 5.2
Expenditure Incurred for Factors strengthening for Organic agriculture In Kerala (2019)

Schemes	Amount
Market Development	970
Market intervention support for price stabilization	2000
Share capital to Horticrop.	20
Assistance to Kerala State Ware housing Corporation for construction of Godown cum Agriculture complex	30
Assistance to Kerala State Ware Hosing corporation for Computerizaion	10
Total	3030

Source: Research Institute of Organic Agriculture Statistics, 2020

The Government of Kerala provides various schemes for promoting and strengthening organic agriculture in 2019. The weekly markets will be established with the support of local self-government. An amount of Rs.3030 lakhs were allotted for strengthening organic markets. The table 5.2 shows Rs.970 lakh is for market

development and Rs.2000 lakh for market intervention and support for price stabilisation. Support will be provided only to select existing markets having turn over Rs.2 lakh per market with in a grade markets. The table 5.3 shows the expenditure for strengthening organic markets in Kerala. Government of Kerala will be provided support to select existing markets having turnover Rs. 2 lakh per markets. An amount of Rs.150 lakh is earmarked for operational expenses of urban and rural wholesale markets and districts procurement centres and Rs.40.00 lakh for agro mark net and market intelligence. The establishment and functioning of these markets will be introduced in accordance with e-NAM guidelines to facilitate unified markets for agricultural commodities. Karshakamithra engaged for effective coordination of marketing of surplus farm produce including the use of social media for marketing of surplus farm produce including the use of social media for marketing.

Table 5.3
Expenditure for strengthening Organic agriculture markets in Kerala (2019)

Sl.No	Component	Amount(Rs. Lakh)
1	Operational expense of wholesale markets and districts procurement centers	150.00
2	Agro marknet & Market Intelligence	40.00
3	Additional support to Weekly markets	50.00
4	Market development activities of VFPCK	500.00
5	Prices Board	80.00
6	Engaging Karshaka Mithras and training and postal based service	75.00
7	Participation in Agrifair	20.00
8	WTO cell-Operational expenses	5.00
9	Online market platform(New)	50.00
10	Share capital to Horti crop	20.00
11	Market intervention support for price stabilization	2000.00
12	Assistance to Kerala state ware housing corporation for computerisation	10.00
13	Assistance to Kerala state ware housing corporation for construction of godown cum agriculture complex	30.00
	Total	3030.00

Source: Research Institute of Organic Agriculture Statistics, 2020

An amount of Rs.75 lakh is earmarked for engaging Karshaka Mithras for participating interstate and national level agriculture fair shops, to gain more exposure to farmers and entrepreneurs for which Rs.20.00 lakh is set apart. An amount of Rs. 80.00 lakh is set apart for the functioning of Agricultural Prices Board and conducting market study by board and Rs.50.00 lakh is earmarked for developing online market platform.

The objective of the component on market intervention support for price stabilisation is to launch procurement operations through designated agencies on selected agricultural commodities during harvesting seasons with the view to guarantee remunerative prices to the growers. The outlay is meant for providing incentives to the procuring agencies based on the terms and conditions prescribed by the Government of Kerala. Out of an amount of Rs.3030.00 lakh an amount of Rs.2000.00 lakh is spent for market intervention support and Rs.20.00 lakh is set apart as share capital to horti-crop. The e-vipani portal functioning in the call centre at Small framers Agribusiness Consortium (SFAC) will continue with the activities of tapping the markets opportunities for ensuring maximum price for framers produce and linking farmers. An amount of Rs.30 lakh is set apart for Kerala state ware housing corporation of godown cum agriculture complex and an amount of Rs.10.00 lakh for computerization of Kerala state warehousing corporation.

5.5. Bio-Diversity and Promotion of Organic Farming

It is proposed to conserve the traditional and indigenous varieties available in different crops, including paddy and millets, especially in tribal habitats by providing assistance for cultivation and multiplication of seeds of these varieties by tribal, local farmers Clusters and other organizations. Provision under the scheme would be utilised for procurement and distribution of seeds of these traditional varieties for promotion of cultivation in other areas and districts. The organic farming cell at the Directorate of Agriculture will maintain a register of the indigenous varieties of all crops. An amount of Rs.25.00 lakh is earmarked for the scheme. The centrally sponsored programmes 60% of the state share on Krishi Umathi Yojana from the central government and remaining 40% share assured by the state. As part of this rationalisation of CSS, the number of schemes was reduced and new concept of umbrella schemes was introduced incorporating the schemes suitable to the state and having the flexibility to implement and design sub-schemes. The central budget will provide allocation under each umbrella scheme based on a transparent criterion. In order to facilitate scheme implementation for development of organic farming in Kerala.

5.6 Agro Service Centres and Service Delivery

Agro Service Centres (ASC) is established at block level to facilitate integration of various services. The main services provided by agro service centres are mechanization, ATMA based extension, credit support, weather advisory services, soil testing support and other technology based services to promote organic farming in Kerala. In order to provide full-fledged service to the farmers at a single point, it is necessary that the various requirements of farmers such as agricultural inputs, farms related information like credit, marketing, financing, registration are brought under a service centre. The agro service centers support transfer of technology and service delivery. The local self-government is expected to provide additional infrastructure support to the agro service centres. These centres act as technology and information disseminating centres with facilitating role in field visits. A mobile farm clinic is also established at the block level and grama panchayat level to provide solution to the field problems equipped with audio visual and online support. The agro service centres work to support all promotion activities of organic farming as well as mechanization.

Table 5.4
Expenditure for Factors Strengthening for Organic Agriculture Markets (2019)

Sl. No	Component	Amount(Rs. Lakh)
1	Establishment of new Krishi centres	250.00
2	Strengthening of existing Karshika Karma Sena	60.00
3	Strengthening existing Agro service centre/Krishisree centres based on business plan	50.00
4	Group insurance schemes to members of Karshika Karma Sena	20.00
5	Operational Expenses including wages to mobile clinic	110.00
6	Functional expenses of KSANM	200.00
7	Honorarium to data entry operators of NEGP	210.00
	Total	900.00

Source: Research Institute of Organic Agriculture Statistics, 2020

5.7. Revitalisation of Agriculture Sector in Wayanad

The agrarian economy of Wayanad district has been under distress in recent years. Wide fluctuation in prices has brought in high degree of instability in farm incomes. The State and Central Government have come out with intervention packages for the revival of the livelihood of the affected population. Wayanad district

plays the first position in production of wide varieties of organic products and export of organic products among the 14 districts.

In addition, it is informed by the organic farmer in the wayanad districts, natural calamity during south west monsoon period of 2018 and 2019 has caused huge crop loss and destruction of land. The overall production and output of the organic sector was declined in the flood. The fertility of soils is declined due to high soil erosion in the flood. The government of Kerala takes many initiatives to revitalize the organic lands in wayanad. Too revive the integration on Pepper cultivation in the district is already in the declining phase due to the incidence of pests and diseases, loss of standards due to insect agrarian economy of the district, it is proposed to implement a cafeteria of focused intervention, with appropriate backward and forward attack as well as declining productivity. Integrated Pepper Development Programme promoted for which an amount of Rs. 1000.00 lakh is set apart. Assistance for planting new standards, area expansion of pepper, whole farm development, integrated management of quick wilt, pepper rehabilitation programme, establishment of nurseries, area wide integrated pest management, grafting, production of planting materials from orthotropic shoots, setting up of nurseries, micronutrient application, dolomite application to correct acidity, root development activities and other need based support are the activities supported under this component

Table 5.5
Expenditure Incurred for Revitalization of Agriculture Sector in Wayanad (2019)

Sl. No	Component	Amount (Rs.Lakh)
1	Integrated pepper and coffee Development	1000
2	Area expansion of nutmeg, ginger and turmeric	125
3	Restoration and flood mitigation	210
	Total	1335

Source: Research Institute of Organic Agriculture Statistics, 2020

A comprehensive planting material production strategy will be evolved with the support of nurseries supported in previous years. Tree spices especially nutmeg, has been severely damaged in the consecutive floods and landslides of 2018 and 2019. To revive the crop in the Wayanad district an amount of Rs.50.00 lakh is set apart under the component area expansion of nutmeg. Cultivation of other spice crops like ginger and turmeric will also be rejuvenated. This includes Rs. 20.00 lakh set apart for

rejuvenation of other spice crops like ginger and turmeric. The project implementation will carried out in integration with the leads. Wayanad is the worst affected district in the floods and landslides of 2018 and 2019. Heavy damage has been caused to the farmer fields due to landslides. An amount of Rs.285.00 lakh is set apart for restoration and flood mitigation programmes in Wayanad district through the Department of Soil Survey & Soil Conservation. The component wise break up is shown above:

5.8. State crop Insurance Scheme

The crop insurance scheme was in operation covering 25 major crops grown in the state since 1995 was restructured in 2016-17 by brining considerable enhancement in the crop loss compensation. The crop insurance scheme is a supportive measure to organic farmers because the agro- climatic situation of Kerala has a rapid change in modern period. So the forecasting of weather is very difficult. The farming systems and crop rotations of Kerala depend upon the various agro-climatic zones. So the crop insurance scheme is a supportive measure to organic farmers from the unexpected loss of their farms. The crop insurance fund is operated with contributions from the participating farmers by way of registration fee and premium and government contribution. In addition to the existing crops, minor fruits apiculture and floriculture will also be included under the scheme. An amount of Rs.2000.00 lakh is earmarked for the scheme during 2020.

5.9. Krishi Padasala-Approach for promoting Organic Farming

The farmers have to be made aware of the concept organic cultivation as well as updated on scientific and technologies aspects at fields at filed level for profitable cultivation with the objective of imparting knowledge to farmers on these aspects an amount of 50.00 lakh is earmarked exclusively for krishi padasala approch. The main objective of this krishi padashala approach is providing adequate training and demonstrations to the organic farmers in the related fields. The Krishi padashala approach provides a gate way to trained organic farming practices. This will results the output and confidence level of the organic farmers in Kerala. Under this scheme the farmers have a good provisions to clear their doubts and time based advise for their farming practices. These training and awareness programmes proposed under the

various schemes will be coordinated and conducted by Samithi. Krishi bhavan plays an important role for promoting krishi padasala approach. With the support of Krishi bhavans, the farmers sale their organic products by arranging organic melas at ural level.

5.10. Post-Harvest Management & Value Addition Programmes

Small farmers agro business consortium is an exclusive society focused on increasing income of small and marginal farmers through aggregation and development of agro business. SFAC has pioneered the formation and growth of framers producers and organisations and farmers producers companies for promoting organic agriculture. The table 5.6 shows the expenditure incurred for post-harvest management in organic products in Kerala. The governments provide support for organic farming units to sustain in organic farming. The maximum support for the individual units will be limited to Rs.50 lakh. An amount of Rs.200.00 provided for supporting value addition units and marketing under government sector, co-operative sector, Kudumbasree units in a project based manner. Out of this amount of Rs. 50.00 lakh is earmarked for promotion of value addition in organic rice and marketing .An amount of Rs.50.00 lakh incurred for operational expenses of SFAC. Apiculture and production of honey and its value added products have immense potentionals in Kerala state. The support for apiculture and honey production will be continued for the benefit of honey growers and promotion of value added honey products through state horticulture mission. An amount of Rs.25.00 lakh is set apart for promoting apiculture.

Table 5.6
Expenditure Incurred for Post-Harvest Management in Kerala (2019)

Sl. No	Components	Amount (Rs.Lakh)
1	Assistance to small and medium agro processing Units	400
2	Assistance to individual or self-help groups based on value education units at micro level	300
3	Support of value addition units and marketing in Govt. Sector/PSUs/Co-operative/Kudumbasree units	200
4	Promotion of apiculture and production of honey and its value added products through FPOs	25
5	Operational support of SFAC	75
6	Assistance to Kerala Coconut Development Corporation for value added products.	100
7	Support to Agri-start up and agri-business incubators	100
8	FPO post development and maintenance	10

Source: Research Institute of Organic Agriculture Statistics, 2020

5.11. Office Automation in Agricultural Sector

This scheme aims to implement 'e-Office' in Agriculture Department. It envisions developing IT and communication infrastructure like Virtual Classroom Facility in various locations/offices and Mini Computer Labs at Directorate, in the Office of the Agricultural Production Commissioner, 14 Principal Agricultural Offices, Call Center, RATTCs, FTCs and other training centres for the promotion of Organic agriculture. To strengthen the IT and e-Governance initiatives, procurement of latest hardware, computing and networking devices, software, procurement for development of other IT and e-Governance infrastructure and their maintenance and high speed connectivity are essential and to be met from this scheme.

The table 5.7 shows the expenditure incurred by the Kerala government to provide infrastructure facilities in agriculture office in the entire state. An amount of Rs.250 lakh is allotted in 2020. These amounts are allotted under the preparation of E-Office (Rs.80 lakh), establishment of virtual classroom and computer training and facilitation centers (Rs.30lakh), cyber extension (Rs.10lakh), and connectivity to various offices (Rs.100 lakh). The 40% of the total allocated expenditure is used to connectivity of various offices at districts and state level. Rs.10 lakh is allotted for procurement of computers, accessories, networking and site preparation. The post-harvest management schemes mainly focused on the post-harvest methods to their outputs. Programmes related to conversion of organic inputs into final goods. The post harvesting plans are improve the conditions of local markets assuring quality and price stabilization of the organic products in the entire Kerala. This progrmme is help to improve the space utility, time utility of the organic products in Kerala.

Table 5.7
Expenditure incurred IT Infrastructure in Kerala (2019)

Sl. No	Components	Amount (Rs. Lakh)
1	E-office	80
2	Establishment of virtual classroom and computer training and facilitation centres.	30
3	Cyber extension	10
4	Connectivity to various offices	100
5	Procurement of computers, accessories and networking and site preparation	10
6	Development of management information system and DBT	20
	Total	250

Source: Research Institute of Organic Agriculture Statistics, 2020

5.12. Development of Flowers and Medicinal plants

Table 5.8 reflects the expenditure incurred for the development of fruits, flowers and medicinal plants, an amount of Rs. 2515.00 lakh is set apart during 2021-22. It is envisaged that 25 percent of beneficiaries of the project will be women.

Table 5.8
Expenditure incurred for Development of Fruits and Medical plantation in Kerala (2019)

Sl. No	Components	Amount (Rs. Lakh)
1	Development of Fruits	2190
2	Development of Flowers	100
3	Development of medical plants	50
4	Procurement, trading and processing of jackfruit through VFPCK.	75
5	Subhiksha Keralam	100
	Total	2515

Source: Research Institute of Organic Agriculture Statistics, 2020

A massive programme for fruit development introduced in 2020 in the state with the objective of popularizing cultivation of fruit crops will be continued. Production and supply of planting material, area expansion programmes, management, harvesting, cold storage, processing, value addition and marketing, supply chain development and all programmes for holistic fruit promotion and enhancement of farmer's income will be supported through this scheme. Thrust will be given for promotion of exotic fruits like litchi, rambutan, avocado, mangosteen etc. in addition to indigenous fruits. Homestead and commercial cultivation of fruits promoted.

Table 5.8 shows an amount of 2190.00 lakh is earmarked for fruit development in the state, for progeny orchards, propagation, and production enhancement through area expansion, irrigation support, hardening units, popularizing fruit plants for homesteads as well as commercial cultivation giving thrust to exotic fruits. Development of indigenous fruits like banana, pineapples etc are also included in the programme. The facilities available with the Departmental Farms /nurseries shall also be utilized for development of orchards. An amount of 500.00 lakh is set apart for cold chain development in banana and other tropical fruits

5.15. Rice Development

The scheme on rice development thrusts upon promotion of paddy cultivation in the state through group farming and area expansion programmes like fallow land cultivation, single crop to double crop and upland rice cultivation concentrating on the rice growing agro ecological units with natural endowments for augmenting rice productivity. The cultivation of organic rice is very appreciable in wayand, Thrissur and Alapuzha and palakad districts. Kerala is the prime exporter of organic rice. Jeerakashala, Adatt matta, Wayanadan Organic matta these are the different varieties of organic rice available in domestic and foreign markets.

Table 5.9 shows an outlay of Rs. 11614.00 lakh is provided for rice development during 2020 an amount of Rs.300.00 lakh is earmarked for cultivation of paddy in the fallow lands under Subhiksha Keralam. Rice fallows will be brought under sustainable cultivation with the active involvement and convergence of Mahatma Gandhi National Rural Employment Guarantee Scheme The implementation will be as per the guidelines issued as part of the subhiksha Keralam programme. The project was continued in 11th Plan with an allocation of Rs. 101.00 crore where as in the 12th Plan, the project merged into the Central Sector Scheme National Mission on Sustainable Agriculture (NMSA) under program component Soil Health Management with total outlay of Rs 293 crores (out of which Rs. 57 crore meant for continuation of NCOF) for the activities of organic farming as mentioned below.

1. Promotion of organic farming in the country through technical capacity building of all stake holders including human resource development.

2. Technology dissemination & strain supply.

3. Statutory quality control of bio fertilizers and organic fertilizers under the Fertilizer Control Order (FCO, 1985).

4. Promotion of low cost Participatory guarantee system-India (PGS-India) for organic certification.

5. Promotion of production of quality organic and biological inputs by support for organic input production units under Capital Investment Back Ended Subsidy Scheme through NABARD.
6. Awareness and publicity through print and electronic media.

Table 5.9
Expenditure incurred for office Rice Development in Kerala

Sl. No	Components	Amount (Rs. Lakh)
1	Group farming	6473
2	Area expansion	155
3	Registered seed Growers programme/Seed Village	250
4	Loyalty to owners of cultivable paddy land	4000
5	Special assistance for Pokkali, Kaippad cultivation	200
6	Assistance for immediate	136
7	Operationalisation of paddy and wet land Act	50
8	Assistance for immediate repair and maintenance of damaged Bunds- de and repair silting, repair of machineries etc	50
9	Subikshakeralam	300
	Total	11614

Source: Research Institute of Organic Agriculture Statistics 2020

All farmers opined that the fundamental need is to create awareness in the society on the ill effects of modern agriculture and the positive qualities of organic agriculture. It was suggested that the government and other institutional agencies should support development of model organic plots in the different regions of the state where farmers can learn the techniques. While rapid transition to organic farming is not advisable, even phased reversion can cause temporary financial risk, which can be reduced if there is support from the authorities. Some of the farmers disagreed –their opinion is that each farm should become self-sufficient in their manure requirements. As more and more farmers turn to organic methods, it was felt that organic farming experts should guide new farmers. Marketing of the organic produce was one area that required projection. As there are at present no methods in Kerala for quality assurance, this has to be developed and the produce graded accordingly. Many of them felt that the NGO sector has a major role in propagating organic farming. It was suggested that local networks of farmers should be formed and they should be given opportunity to interact with others farmers. Environmental problems such as industrial pollution, dams, deforestation, land reclamation, etc. have to be addressed and rectified for agriculture to sustain in the state. Further, scientific

research has to be conducted into every aspect of organic farming so that it is acceptable to all. During the primary survey and regular field visit it is understood that there are many policies and programmes are

5.16. Prospects of Organic Farming in Kerala

Kerala agriculture should be able not only to maintain but also must strive to increase the production of food grains. It appears that given the availability of organic infrastructure, minimum efforts for conversion due-to the low use of chemical farming methods and the limit of the public investment, organic farming can be progressively introduced. The potential areas and crops, which fulfill the above constraints, could be explored and brought under organic agriculture. The rain fed. Tribal, north-east and hilly regions of Kerala, agriculture production in these areas is still almost on the traditional eco-friendly lines and making the farmers aware of the methods of organic farming may not be very difficult.

A strategy to prevent sudden and substantial yield losses is to convert to organic production in phases to reduce the risks during the initial years. The question of the vast requirement of organic matter to the country's farms in order to switch over to organic agriculture is also answered. Chemical fertilizer is applied only in 30 per cent of the cultivated area, which is irrigated, and the remaining land is under rainfed agriculture with almost no fertilizer application. Also the rainfed area under cultivation accounts for only 40 per cent of the food grain production of the country (Veeresh, 2003). The introduction of organic farming in these areas will allay the fears of a sudden sharp decline of food Production which many fear may drive the nation to food imports. Thus the demand for biomass for the production of organic manures can also be controlled in a phased manner. Moreover, the simple technologies with low input use have been developed for dry farming and they can be transferred to the farms for organic cultivation. The resulting increases in productivity and sustainability of production will increasingly contribute to the betterment of Ac economic condition of the dry- land farming community, which is one of the poorest in the country.

An estimate indicates that about 600 to 700 million tones of biomass are available to be converted to manure. Such conversion increases the nutrient value

from 0.3-04 to 1-2 per cent. Attempts can also be made to increase the supply of biomass by allocating a portion of the cultivated area to grow tree manure crops. These plants can be harvested to be used for making composts. Schemes can be devised to grow green manure crops in the public lands on the lines of the social forestry programmes. There are several alternatives for supply of organic soil nutrients like vermi-composts and bio fertilizers exist. Technologies have been developed to produce large quantities of these nutrients. Crop specific bio fertilizers for cereals, millets, pulses and oil seeds are also available vermi-composting and bio-fertilizer manufacturing can be undertaken to increase the supply of organic manure to meet the demand.

The basic rules and regulations for accreditation and certification of organic products are in place in Kerala. A Congenial socio-cultural environment prevails in kerala for the promotion of organic agriculture. The farmers of Kerala had been practicing eco-friendly agriculture for centuries till the advent of the 'green revolution' which was based on the conventional farming methods prevailed in the western countries. Still many small and marginal farmers, because of many reasons, have not fully adopted the conventional farming and they follow more or less the traditional environment friendly system. Organic farmers mainly use local or own farm derived renewable resources and manage self-regulated ecological and biological processes for their farming practices. As pr the discussion with organic farmers groups in the selected districts, it is revealed that many of the farmers are engaged in agro related activities. Number of farmers has cattle farming and own live stocks, these live stocks directly or indirectly provide manures for organic farming. This has become necessary to cultivate the acceptable levels of crop, livestock and human nutrition products and above all to protect both the crops and humans from pests and diseases through the use of bio-chemicals and bio fertilizers. Such a situation is suitable for making the farming community aware of the organic farming methods to make the switch over less troublesome.

Kerala can enjoy a number of benefits from the adoption of organic farming. The price premiums for the organic products are the main high light of organic farming. But the price of organic organic products are high the real benefits of these price is enjoyed by the sellers. Organic farmers only enjoy the farm price. The farm

price of organic products is low in compare with market price of these commodities. There is no adequate mechanism to support the minimum price to the organic farmers. Another important benefit of organic farming is conservation of the natural resources in terms of improved soil fertility and water quality, prevention of soil erosion, preservation of natural and agro-biodiversity are major benefits. As a result organic farming is favorably affect to the environment and its stability .organic farming methods conserve the nature for future generation without compromising the needs of present generations. Economic and social benefits like generation of rural employment, lower urban migration, improved household nutrition, local food security and reduced dependence on external inputs will be large gains in the Indian conditions. The protection of environment and the consequent increase in the quality of human life will be other contributions of organic farming. Recent period the overconsumption of chemical fertilizers leads to the negative impact on human beings and the society. On the other side organic farming methods are conservation methods to the environment and people.

There is a good demand for organic products in the domestic market, but the supply of the organic products are low which is not matched by supplies. The linkages between the two do not exist which in turn discourage production. The wholesalers/traders play a major role in the distribution of organic produces as they originate from the small farms. The wholesales and traders collect the organic outputs from the farm itself. The NGOs and registered organizations with the help of government support for exports. These will effects of the conventional-farming system are felt in Kerala in terms of the unsustainability of agricultural production, Environmental degradation, health and sanitation problems, etc. Organic agriculture is gaining momentum as an alternative method to the modem system. It appears that India is lagging far behind in the adoption, of organic farming. So far, the only achievement seems to be the laying down of the National Standards for Organic Production (NSOP) and the approval of 4 accreditation agencies (all government bodies) whose expertise is limited to a few crops.

5.17. Institutional Mechanisms and Organic Farming in Kerala

The institutional framework for sustainable agriculture development covers a spectrum of formal bodies, organizations, networks, and arrangement that are

involved in its policy making or implementation activities. An ideal institutional frame work enhances the integration of the three pillars ecological, (social and economic) of sustainable development. In order to spread the organic movement throughout the state the government of Kerala came with new policy on organic farming. The policy document promises the integration of different institutions of better implementation for the better implementation of the policy throughout the state.

The present study was aimed to study the existing organisational networks and institutional mechanisms for the promotion of organic farming in the state. Kerala is famous for its position of exports of organic products and also pioneering efforts in the organic farming movement. So it was important to find the various institutions and other organizations involved in the promotion activities of organic farming in Kerala. The following institutions were selected

1. Kerala Agricultural University
2. Organic Cell , Department of agriculture ,Kerala
3. Non- governmental organisatons (NGOs)
4. Certification agency.

Interview with the head of these institutions revealed that many formal and informal institutions are involved in the promotion activities of organic farming in Kerala. Discussion helps to indentifying the main categories of institutional network that could make a positive impact on organic farming. The institutional network is as follows.

1. Government

2. Non- Governmental organizations

3. Certification agencies

4. Farmer's Society

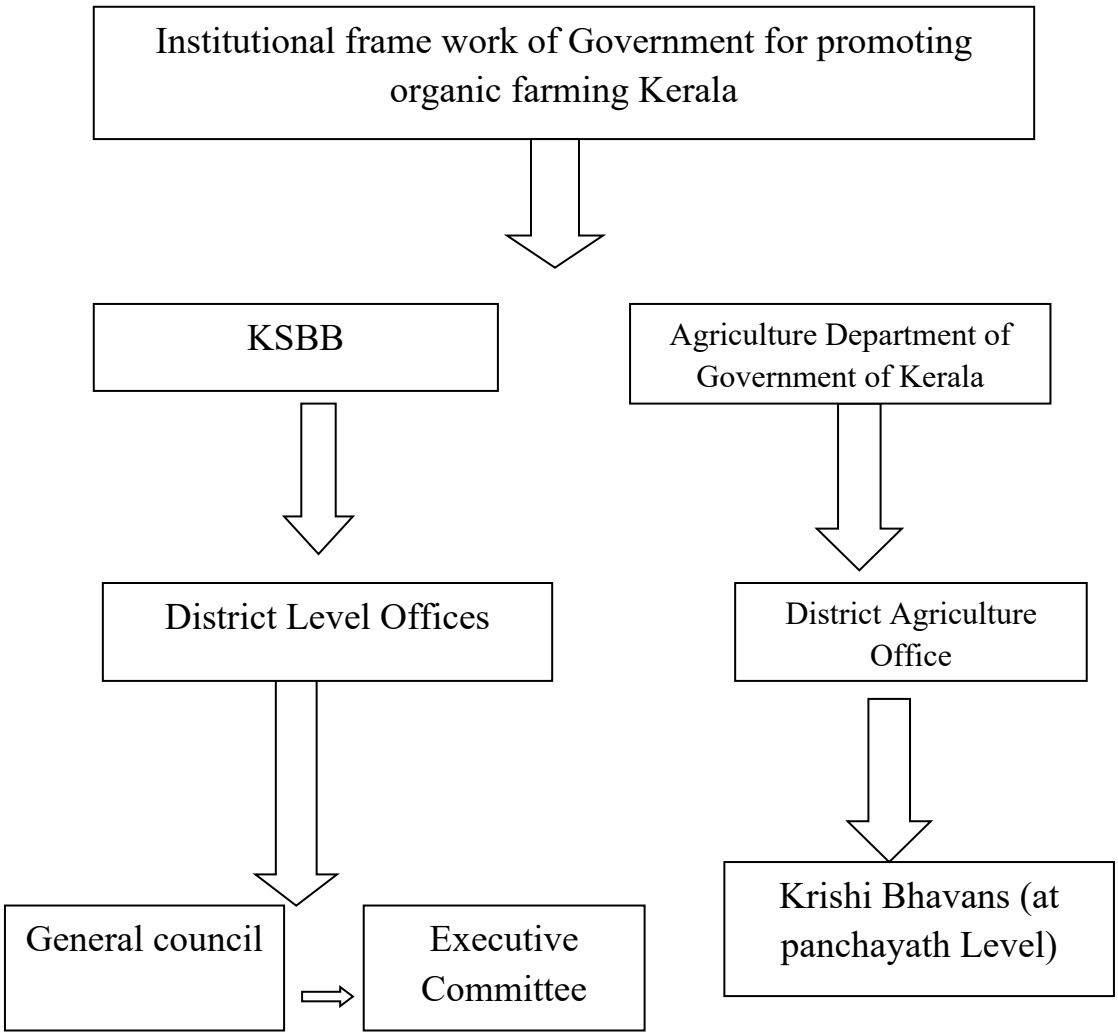
5. Educational Institutions

6. Family

The state government was promoting organic agricultural practices through the implementation of new programmes and policies. The main agencies are engaged

with these activities on behalf of government are Kerala state biodiversity Board (KSBB) and the agriculture department. The primary responsibilities of these institutions are formulation of the state organic farming policy and the latter was doing the implementation.

Chart 5.1
Institutional Mechanism for promoting Organic farming in Kerala



Source: Kerala State Action Plan, 2015

Farmers' groups, one of the important components of the institutional network were also playing a crucial role in the organic farming movement. A case study presented on adat model exhibits the importance of farmers' groups for promoting organic farming. The major farmers' associations formed through the efforts of organic farmers of the state were identified from Marappanmoola of Wayanad district. Karunapuram of Idukki district and Thaloor of Alappuzha. The first two group were mainly cultivating organic spices and beverage crops whereas the third group was concentrating on organic rice and vegetables. The majority organic farmers are the members of the Padashekara samithi. Self Help Groups. Krishibhavans and combined efforts of other local institutions make organic farming is more fruitful.

Educational institutions plays important role to make a good attitude toward organic farming among the young generations. Among the different educational institutions schools plays a fundamental role in promotion of organic agriculture by cultivating organic vegetables for their midday meals. Krish bhavans provide all necessary support to the schools for promoting organic agriculture through providing high quality of seeds, ensuring the availability of green manures, and promoting simple input development technology units like composting and vermi composting within the school compound. There was no doubt in the fact that the different intuitions have a good access to each corner and play a major role in promoting organic agriculture. Among the different network's the farmers groups and Non-governmental organisations plays most important role in promoting organic agriculture in Kerala.

Chapter 6
An Assessment of Organic Farming in Selected Districts in Kerala: A Survey Based Analysis

6.1. Introduction

Kerala Located in southwest India, it is a narrow coastal strip bounded by on the northeast Tamil Nadu on the east and Arabian Sea on the west. The state is about 580 km long and 130 km broad at the widest point. Temperature ranges from a minimum of 19-26oC to a maximum of 27-37 C and rainfall ranges from 1943mm-3667mm.Though one of the smallest states in India with a geographical area of 38863 km (1.18% of the Indian Union), Kerala has a diverse physiography a range of altitude from sea level to about 2690m. Kerala is divided into three distinct natural zones such as lowlands, midlands and the highlands, forming parallel belts running across the length of the state from North to South. Lowlands are the low-lying coastal belt on the west, densely populated (1385 p/. km2), where rice and coconut are the main crops. The highlands consist of the Western Ghats mountain range forming the eastern part of the State. Rubber, Spices, Coffee and Tea are the major crops in the highlands. The midlands, a varied terrain of small valleys and hills in between, have a wide variety of crops including rice, tapioca, banana, plantain, coca, clove, nutmeg, ginger, pepper, areca nut, cashew, coconut and rubber (Economic Review, Various Years).

Kerala accounts for several important agricultural commodities such as Pepper (95% of India's production), Rubber (92%), Cashew (85%), Cardamom (70%), Ginger (60%) and Coconut (43%). Other than plantations and paddy fields, rural Kerala is abounding with homestead farms that have an astonishing variety of crops. Predominance of perennial tree crops, very small operational holdings (average size 0.36 ha.), and mainly rain-fed farming are the singular features of Kerala's agriculture.

6.2. Geographical Features of Kerala

Kerala is bordered by land on three sides and the Arabian Sea at the west. It shares its border with the state of Karnataka at the north and the rest of Kerala shares it border with Tamil Nadu. In fact, almost the whole of the western and southern frontiers of Kerala is surrounded by Tamil Nadu. On the basis of physiography of Kerala is divided into three geographical regions.

Though small in size, Kerala is a land affluent in water resources. 44 rivers , of which 41 are west flowing and 3 flow east. Apart from these 44 main rivers, their tributaries and distributaries and a countless number of streams and rivulets crisscross the land making it green and fertile and also serves as inland waterways. Aside from these rivers, Kerala is bestowed with a number of lakes and backwater lagoon which add to the beauty of the land. 'Vembanadu' Lake with area of 260 sq km is the largest in the state. 'Shastamkotta' Lake is the largest natural fresh water lake. So the water source of farming is adequate

6.3. Demographic Profile of Kerala

The total population size as per 2011 Census in India is 1,21,08,54,977 as against 1,02,86,18,821 as per 2001 Census.

Table 6.1
Comparison of Demographic Profile of India Vs Kerala (2019)

Indicators	India	Kerala
Total population	1,21,08,54,977	3,34,06,061
Male	62,32,70,258	1,60,27,412
Female	58,75,84,719	1,73,78,649
Sex-Ratio (urban)	929/1000	1084/1000
Sex Ratio- Rural	943/1000	1062/1000
Density of Population	382/Sq.km	860/Sq.km
Literacy		93.91
Literacy Male	82.14	96.02
Literacy –Female	65.46	91.08

Source: Kerala Economic survey, 2019-2020

Kerala has the highest effective literacy rate of 93.91 per cent among Indian states. It was 90 per cent in 2001 Census. In Kerala, 96.02 per cent of men and 91.98 per cent of women are literate as against 82.14 per cent of men and 65.46 per cent of women at the all India level. Sex ratio means number of female population per thousand of male population. The sex ratio of Kerala according to Census 2011 is 1,084 and has improved by 26 points since 2001. It increased from 1,032 to 1,036 from 1981 to 1991. Kerala is the only State where the sex ratio has historically been above unity. The sex ratio of Tamil Nadu is 996, of Karnataka are 973, of Andhra

Pradesh are 993 and at all India level are 943. Another significant feature of the State is that all Districts in Kerala show a positive sex ratio.

The State has 63.9 per cent of its population in the working age group of 15-59, 23.4 per cent and 12.7 per cent in 0-14 age and 60 and above age groups respectively. Among Districts, Idukki has the highest per cent of the working population (66 per cent) while Malappuram has the lowest (61.4 per cent). In the age group of 60 and above Pathanamthitta has the highest per cent (17.9 per cent), while Malappuram has the lowest per cent (8.4 per cent). At the same time, Malappuram has the highest proportion of the population, in the 0-14 group at 30.2 per cent, while Pathanamthitta has a proportion of 19.4 per cent. If the actual number is taken, Malappuram has the highest number both in 0-14 and 15-59 groups (12.4 lakh and 25 lakh). While Ernakulam District has the highest number of people in the elderly group of 60 and above. Wayanad has the lowest number in all age groups, as the district has the least number of total populations (Kerala Economic survey, 2020)

6.4. Economic Indicators of Kerala

Table 6.2

GSDP of Kerala at Constant Prices from 2017-2018 to 2019-2020

Indicators	2017-2018	2018-19	2019-2020
GSDP (in crore)	516189.76	549672.93	568635.52
Primary Sector	47619.23	46004.41	42373.83
Secondary Sector	129866.26	138033.99	141805.63
Territory Sector	283268.51	305303.78	317781.22
Per capita Income	149650.00	158564.00	163216.00

Source: Economic Review, Various Years

The GSDP of Kerala is presented in table 6.2. From the table 6.2, it is clear that the GSDP has been increasing during the period from 2017-18 to 2019-20. Further, primary sector has a crucial contribution towards the GSDP. But, territory sector is a front-runner in GSDP. Therefore, it is essential to give an equal importance to agriculture especially agriculture.

6.5. Land-Use Pattern of Kerala

Land use pattern in Kerala has witnessed major changes in its land use pattern over the years. The major change was the shift from cultivation of food crops to

nonfood crops and increase in area under land put to non-agricultural use. Changes in land use and cropping pattern in Kerala pose a challenge not only to food security but also to the ecological sustainability of the State. An analysis of changes in land use pattern over a period which helps to comprehend the present scenario of agricultural land utilization. As per the land use data of 2019-20, out of a total geographical area of 38.86 lakh ha, total cultivated area is 25.89 lakh ha (66.64 per cent) and the net area sown is 20.26 lakh ha (52.13 per cent). Land put to non-agricultural use is approximately 11.73 per cent and forest area is 27.83 per cent. The cultivable waste and current fallow constituted 2.57 per cent and 1.48 per cent respectively.

The present study focused on the organic farmers' status and their impact in Kerala. It is executed through a primary survey in selected districts in Kerala. The survey results are presented in the following sections. The study was based on the primary data were collected through personal interview of the sample organic farmers by using semi structured interview schedule. This included selected organic farming methods.

6.6. Socio-Economic Status of the Organic Farmers in Kerala

Primary survey shows that the socio-economic background of the farmers is examined by using the variables such as age, income, education and economic status and other from two points. The rest is devoted to the description of organic farming practiced by the farmers. The table 6.3 shows the age-wise distribution of the organic farmers where age is the one of the major indicators to assess the socio economic status of the respondents. It is evident that the 10.5 % of the organic farmers are belong to the age group varies 20-35. It clearly shows that educated youth are not self-encouraging in organic farming. 36% percentage of the organic farmers are belong to the age group of 35-50 i.e. productive age group, under this age group farmers are experienced and they are more capable to understand the various methods of organic farming. Out of the respondents, 38 % of the organic farmers are belonging to the age group of 50-65 in the selected districts in Kerala. Income of the individual and family are the prime indicator of the socio-economic status of the individuals, the table 6.4 clearly shows the income wise classification of the organic farmers among the selected sample districts of Kerala.

Table 6.3
Age wise Distribution of Selected Organic Farmers in Kerala

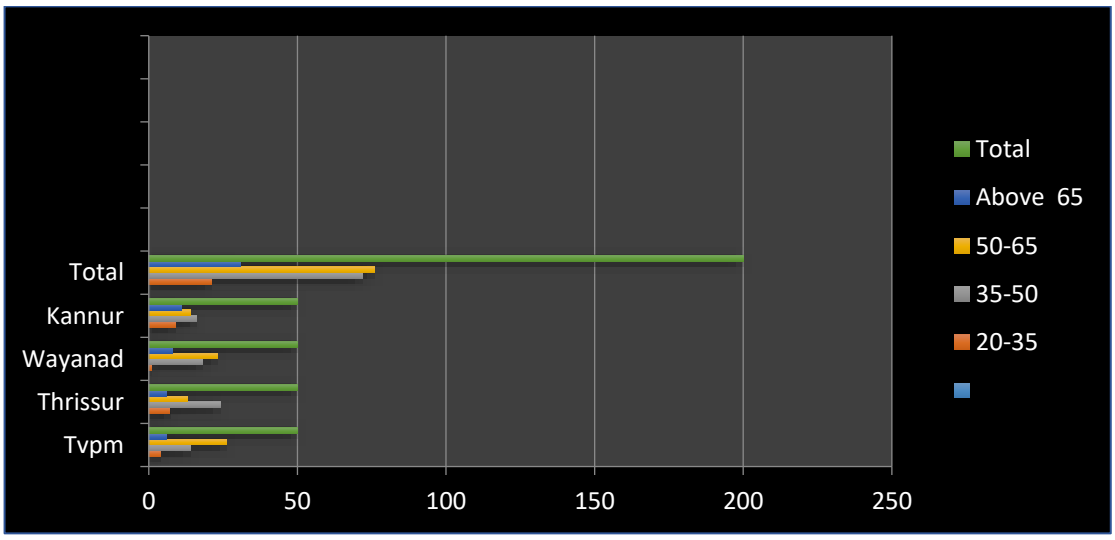
Age Group/Districts	Tvpm.		Thrissur		Wayanad		Alapuzha	
	N	%	N	%	N	%	N	%
20-35	4	8	7	14	1	2	9	18
35-50	14	28	24	48	18	36	16	32
50-65	26	52	13	26	23	46	14	28
Above 65	6	12	6	12	8	16	11	22
Total	50	100	50	100	50	100	50	100

Source: Primary Survey

They are very prominent supporters to organic farming, 15.5 % of the organic farmers are belong to the age group of above 65 years, they are the nominal farmers because their unhealthy situations may not be contribute much.

Figure 6.1

Age wise Distribution of the Organic Farmers in Kerala



Source: Primary survey

The purpose of analysis annual income of the organic farmers are class divided into five category i.e. lower income group belongs to those annual income lies below the Rs.30000/- PA and middle lower income groups belongs to annual income between Rs.30000-Rs.60000. The average income group belongs to 60000-90000 and upper average income group belongs to Rs.90000- Rs.1, 20,000 and finally higher income group they are belongs to income level above Rs.1, 20,000 rupees annually (figure 6.2). Out of 200 sample organic farmers 24% of the organic farmers are belongs to the lower income group. 25.5 % of organic farmers are belongs to the

average income group and 8.5% of the organic farmers are belonging to the higher income group.

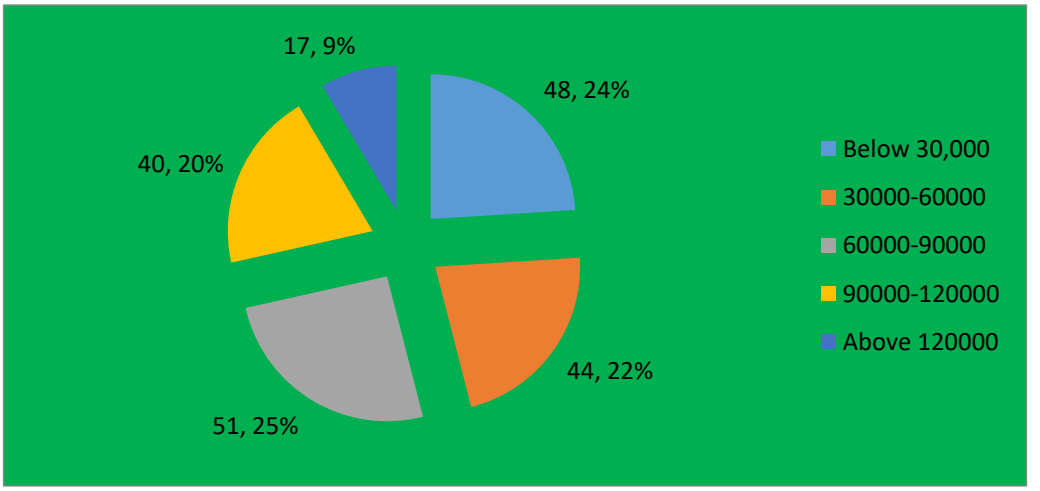
Table 6.4
Income wise Distribution of Organic Farmers in Kerala

Income level	Below 30,000	30000-60000	60000-90000	90000-120000	Above 120000
No. of Farmers	48	44	51	40	17
Percentage	24	22	25.5	20	8.5

Source: Primary Survey

Male female proportion among the organic farmers are another factor to access the socio economic status of the organic farmers , a proportionate proportion of the male female participation means that the women has a equality in employment.

Figure 6.2
Income Wise Classification of the Organic Farmer in Kerala

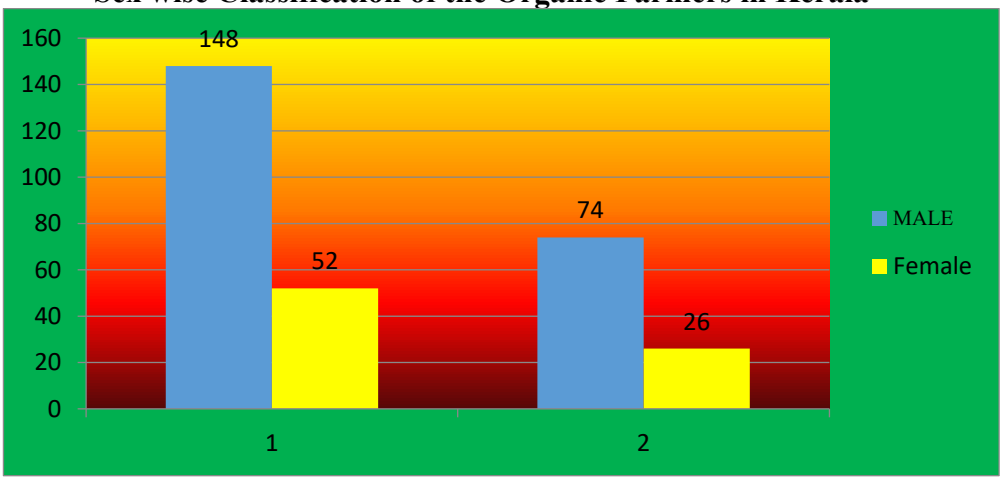


Source: Primary Survey

In Kerala, agriculture women played a crucial role as like men. The figure 6.3 clearly shows the sex wise classification of the organic farmers in selected districts in Kerala. It is evident that 74% of the organic farmers are male farmers and only 26% percentage of the organic farmers is females. It clearly indicates that participation of females in the organic farming is low among the selected sample districts. Size of the family is an another important factor to access the socio-economic status of the resppondents, on the basis of the number of family members family is divided in to three i.e. Nuclear family, small family and large family. Nuclear family is consist of father and mother and two surviving children, small family consists of familywith

grand parents and large family consists of more than more than six members. The figure 6.4 shows the classifiction of the organic farmerson the basis of the nature of the family. Out of two hundred organic farmers from the Thirivanthapuram, Thrissur, Alapuzha, and wayanad.

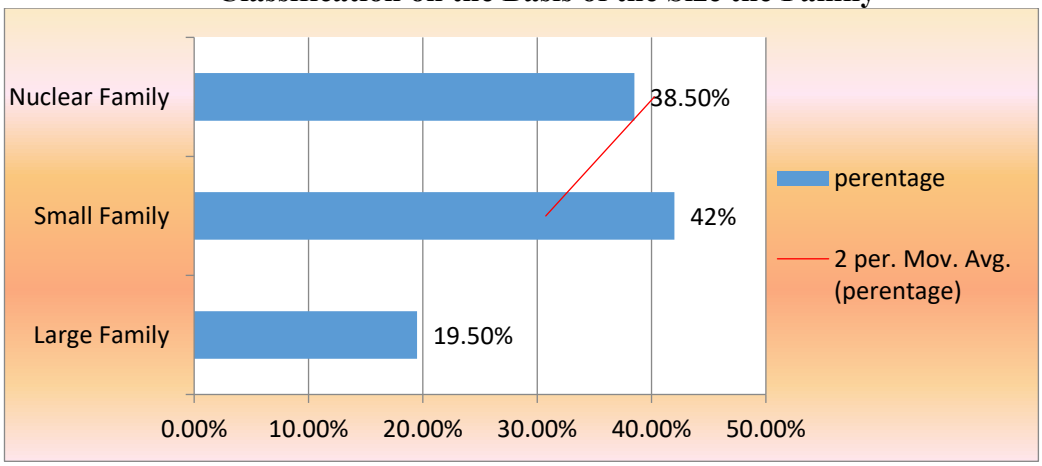
Figure 6.3
Sex wise Classification of the Organic Farmers in Kerala



Source: Primary Data

The consolidated figure 6.4 clearly indicate that 77 (38.5%) of farmers having nuclear family, it is understood that earners of the family is either one or two. Majority of the family having single earner.

Figure 6.4
Classification on the Basis of the Size the Family



Source: Primary Data

The 42% of the farmers having small family the number of dependence in the samll family is comaparitively low to comapare with nuclear and large family. The 20% of the organic farmers having large family consists of more than 8 members. It is clearly understood that family income of the large families is comapritively high in

large families. Number of earners are also good. Economic status of the farmers is an another factor to access the socio economic status of the organic farmers poverty line. One serious issue identfied by the researcher during the survey process, that is real position regarding their economic status was entirely differnet from the actual position. Many of the organic farmers are belongs to the category of APL even if they are not much economically sound and their living condition was very erratic and poor. Some body have no own house and they have only income from agriculture they also belongs to above povery line.

Table 6.5
Income-Slab Distribution of Organic Farmers in Kerala

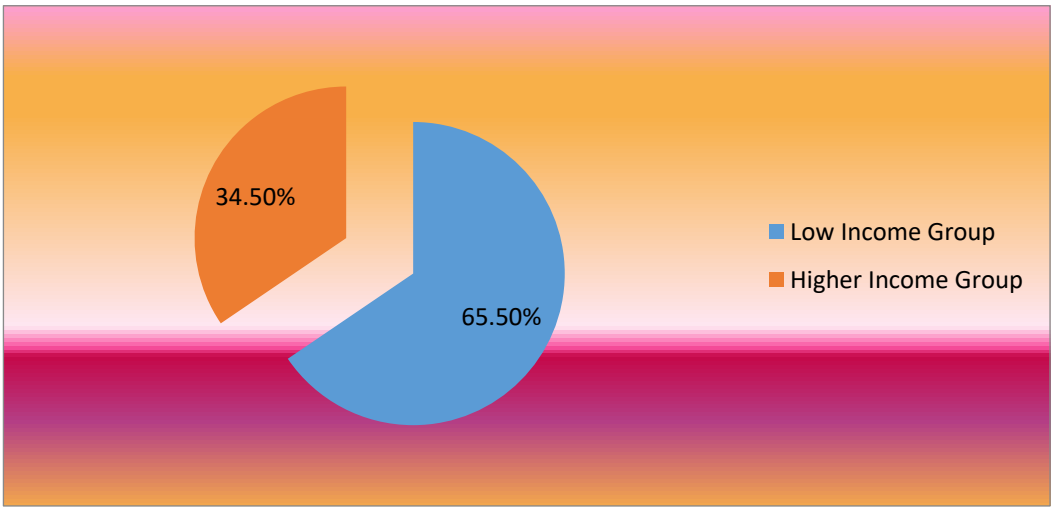
Category	No. of Farmers	Percentage
Low income Group	131	65.5
Higher Income Group	69	34.5

Source : Primary Survey

The term 'economic status' means that better linig condition without burden.There are two categories i.e. APL and BPL, out of 200 organic farmers 112 respondnts are belong to Above poverty line and 88 organic farmers are belogs to below poverty line on the basis of their actual status of their ration card.

Figure 6.5

Classification of the Organic Farmers on the Basis of the Nature of Family



Source: Primary Survey

The economic status of the repondents not mearly acessed through the basis of their ration card. On the other side many of the organic farmers having bettr iving conditions like, own house, own well, ownership of vehicles and consumer durables

but unforunately, due to the administrative default they are belongs to the below On the basis of the observation made by the present study the economic status of the organic farmers are divided into category low income group and higher income group.It is clearly depicted in the figure.6.5. The table 6.6 shows the educational bakground of the organic farmers in Kerala. Out of 200 samples, 22% of the organic farmers are illetrates and 27.5% of the organic farmers are completed primary education. The number of people having education at matriculation and Pre-degree level is 13% and 6% respectively. Education is an another important criteria for evaluating the socio economic status of the organic farmers in Kerala. Education enrich the quality of work and understandabilty of the human being to be an certain extent.

Table 6.6
District wise Educational Status of the Organic Farmers in Kerala

Education/Districts	Tvpm	Thrissur	Alapuzha	wayanad	Total	Percentage
Illiterates	7	13	16	8	44	22
primary level	13	6	20	16	55	27.5
High school level	19	24	7	8	58	29
Matriculation	6	3	6	11	26	13
Plus Two/Pre degree	3	3	1	5	12	6
Degree and above	2	1	0	2	5	2.5
Total	50	50	50	50	200	100

Source: Primary Survey

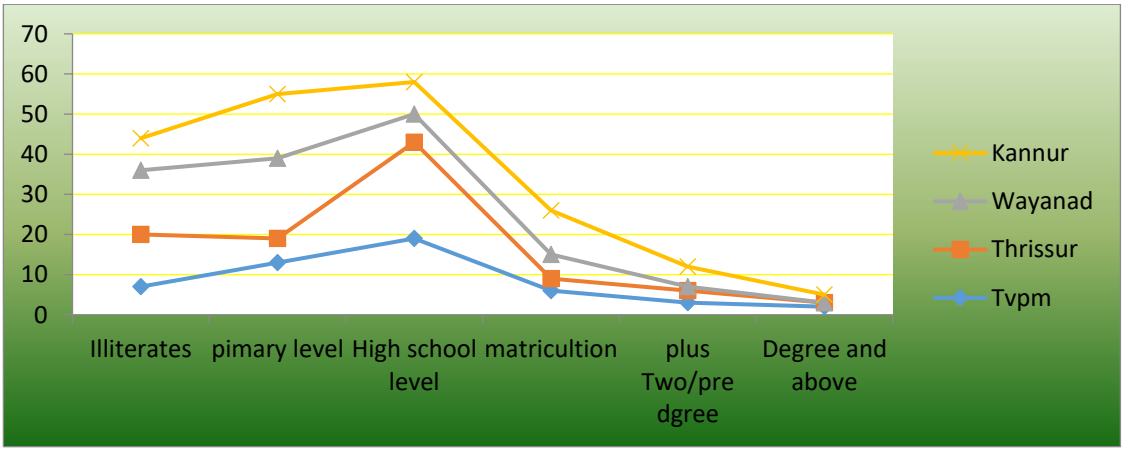
The criteria behind that the ammiities enjoyed by the organic farmers. Out of two hundred organic farmers 131 (65.5%) of the organic farmers are belongs to the lower income group an only 69 (34.5%) of the organic farmers are belongs to the higher income group.

In orgaic farming practices the education of the farmers are playing a crucial role because the farming practices like preparation of vermi-compost, green mannures and other techinques which imprves the fertility of soil are very determining factors of the organic output. The table 6.6 shows that the education wise classifiaction of the organic farmers. The level of education is one of the important indicator of socio-economic progress. In the prsent context, education plays fundmental role to improve the living codition of the society to organic farmers in Kerala. Only 2.5% of the organic farmers having the education level above the graduation in Kerala. Educational wise classifation of the organic farmers are explain with the help of trend lines. Number of farmers engaged in organic farming in all selected districts education

is high school. Out of 50 organic farmers in Wayanad 16 (32%) are illetrates. Thruvannathapuram and Alapuzha districts majority of the farmers are completed their matricultion i.e. 30% and 31% respectively. These are seven General factor to acess the socio-economic condition of the organic farmers in Kerala. The present study is try to identify the socio-economic status of the sample orgnic farmers in the seleted districts so the size of the land holding and dependence on agriculture as a source of income. The rest is devoted to the description of organic farming practiced by the farmers are also treated as the indicators for measuring socio economic status.

Figure 6.6

District wise Educational Status of the Organic Farmers in Kerala



Source: Primary Data

Socio-Economic Development Indicators for Agriculture and related activities considered in this study:-

1. Status of Farmland
2. Area under Cultivation
3. Allied agricultural activities of farmers
4. Water source
5. Method of Irrigation
6. Use of Agricultural Machinery

6.7. Status of Farm Land

According to Alfred Marshal, rent is the reward for the land for its use. Status of farmland is an indicator of ownership of the farmland, if the farmer is the real owner of the farmland the profitability of farming may increase beyond doubt. Many

of the farmers want to pay rent for the cultivated land either the production was profit or loss.

Rent contributes the major share of the cost of production of the farmers the table 6.7 shows the actual status of the farmland of the organic farmers in the selected districts. Out of 200 organic farmers, 144 (72%) farmers having Own land and 5% of the organic farmers are farming at lease land.

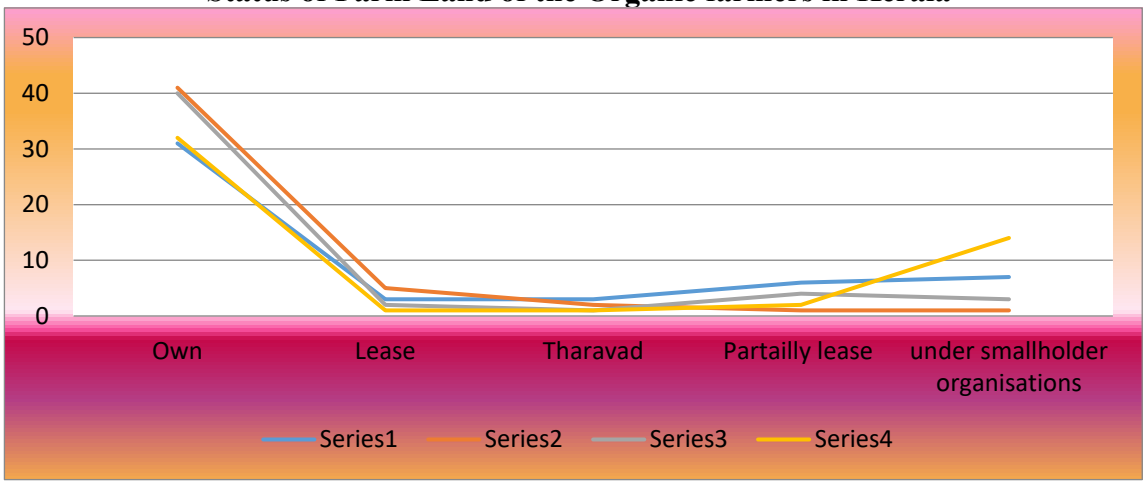
Table 6.7
Status of Farm Land the Organic farmers In Kerala

Status of Farmland /Districts	Tvpm	Thrissur	Alapuzha	Wayanad	Total	Percentage
Own	31	41	40	32	144	72
Lease	3	5	2	1	11	5.5
Tharavad	3	2	1	1	7	3.5
Partailly lease	6	1	4	2	13	6.5
Undersmallholder organisations	7	1	3	14	25	12.5
Total	50	50	50	50	200	100

Source: Primary Survey

The 6.5% of the organic farmers are use land for partially lease and 12.5% of the organic farmers are arming under small holder organizations. Area under cultivation is a factor to access the socio economic status of the organic farmers. Output is an outcome related to various inputs used by the farmers. Cost of production of various organic inputs are incurred certain fixed cost, either the quantity of inputs may higher or lower.

Figure 6.7
Status of Farm Land of the Organic farmers in Kerala



Source: Primary survey

If the area under cultivation of the organic famers increased it reduces the average cost of production. In wayanad district nearly 26% of the organic farmersare

cultivating more than two hectares. The table 6.7 shows the total cultivated area under organic cultivation by the organic farmers, according to the size of the farm land area under cultivatio divided into three category farmers with cultivating area one hectare, in between one hectare to two hectare and finally above three hectare. The 55.5% of the sample are cultivating below one hectare. In distirict wise analysis it is clear that in Thiruvananthapuram district out of 50 farmers 27 farmers (54%) are cultivating below one hectare. The number of farmers cultivating below one hectare in three sample districts are higher than 50% expect wayanad district. 31.5% of the ample respondents are cutivating the area in between one hectare to two hectare.only 13% of the organic farmers are cultivating the farm land above two hectares.

Table 6.8
Area under Organic Cultivation of the Organic Farmers of Kerala

Area under cultivation	Tvpm	Thrissur	Alapuzha	Wayanad	Total	Percentage
Below 1 hectare	27(54%)	31(62%)	21(42%)	32(64%)	111	55.5
1-2	18(36%)	17(34%)	16(32%)	12(24%)	63	31.5
Above 2 hectare	5(10%)	2(4%)	13(26%)	6(12%)	26	13
Total	50(100%	50(100%	50(100%	50(100%)	200	100

Source : Primary Survey

6.8. Agricutural Allied Activities of the Organic Farmers

Allied agricultural activities refers to different agricutural related activities that the respndent was producing along with the cultivation of different crops. Farmers are engaged many other allied activities to stabilise their income through different activities.

Table 6.9
Allied Agricultural Activities of the Organic Farmers in Kerala

Activities	No. of Farmers
Cattle	72
Poultry	44
Piggery	14
Bee	2
Fish	9
Duck	11
Goat	29
Rabit	4
Others	8
None	7
Total	200

Source:Primary Survey

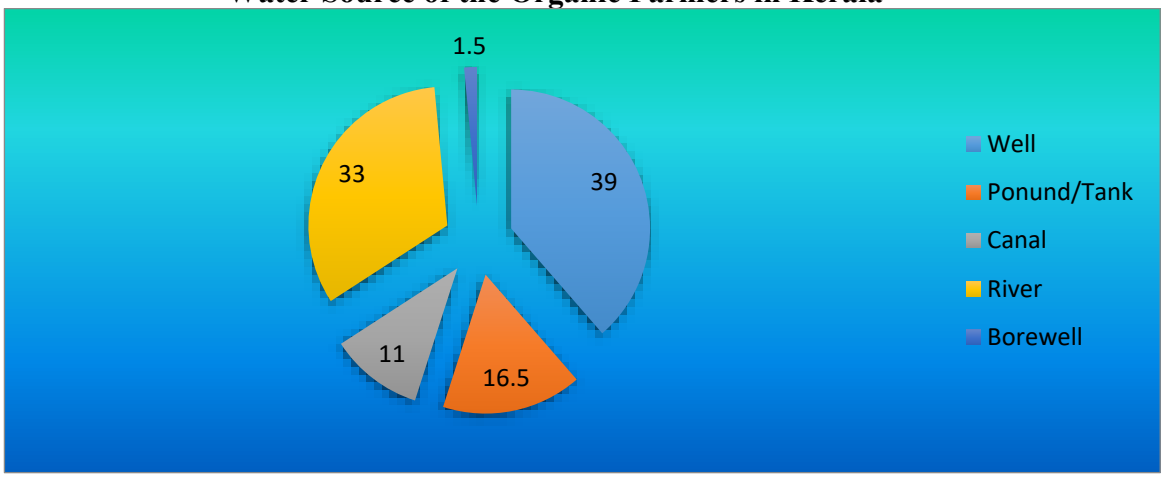
It is an important measure to access the socio economic sitauation of the farmers, other allied agricutral activities directly or indirectly effect the farming,by providing mannures and its also improve the financial possition of the farmers.The main agricultural allied activities are performed by the sample farmers are cattle, poultry, piggery, bee, fish, duck, goat, rabit, others etc. The table 6.9 shows the various agricultural related activities engaged by the organic farmers. Out of sample farmers, 72 (36%) of the organic farmers are engaged in cattle rearing. Most of the farmers who have cattle also keep poultry and goat for alternative Inccome. Only seven farmers are not entered in other agricutural activities.

6.9. Water Source of Organic Farming

Water is the essential thing for farming, as like air for living things availabilty of water and method of irrigation adopted by the farmers are the prime determinnent of agrictural outcome. Excess availabilty and shortage of water isadversly effect the farm practices. Flood and drought are the two phenomenon inversly effect the farming.

Figure 6.8

Water Source of the Organic Farmers in Kerala



Source: Primary Survey

Organic farmers depends mainly on the seasonal rains as their primary water source for the farmland. In addition the farmers depends on well in water scared areas. The 39% of the sample repondents are used well as other source of water. Farmers used other natural resources for water like well, pond, canal, river etc. In addition borewell are also used by the farmers. The source of water is an important

determinanat of organic farming in Kerala. It is evident that the well is th emajor source water to the organic farmers in Kerala. Further, river is the second major source of water to the cultivation in Kerala.

6.10. Farmers Perception towards Farming Methods

Perception refers to the attitude of the organic farmers about the farming method he/ she has adopted in his/her farm. The perception of the organic farmers towards farming method is presented in table 6.10. Out of the 200 hundred organic farmers, (66%) of the respondents are fully encouraged with organic farming. The perception towards the other form of farming is traditional 41 farmers (20%), and partially organic 16 farmers (8%). The farmers do not encourage partially organic methods because partially organic methods may not fulfil ethics of farming.

Table 6.10
Perception towards Farming Methods of the Organic Farmers in Kerala

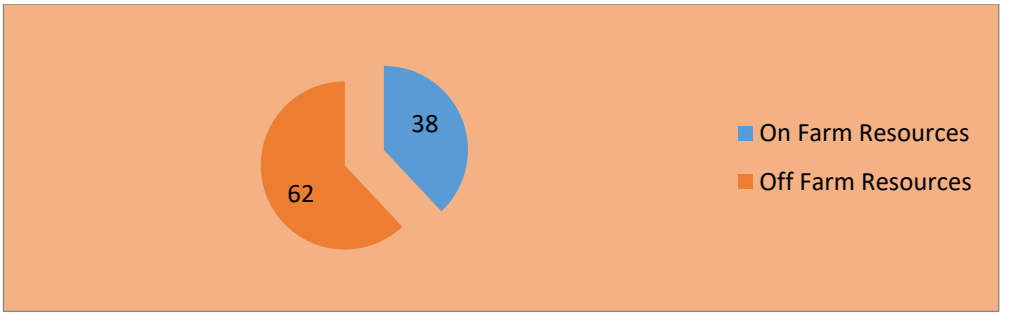
Category	No of farmers	Rank
Traditional	41	2
Modern	11	3
Partially Organic	16	4
Fully Organic	132	1

Primary Survey

6.11. Resources for Organic Farming

This refers to the source of various inputs that have been used for organic cultivation

Figure 6.9
Resources used by the Organic Farmers in Kerala



Source: Primary Survey

The figure 6.8 shows that 38% of the organic farmers use their own farm resources as various inputs for farming and 62 % of the organic farmers dependon the resources outside the farm as farm resources.

6.12. Farming Group Membership

Farming Group Membership refers to the involvement of the respondent in any farmer group either as a member or involvement of the respondent in any organization other than the farmer group.

Table 6.11
Socio-Economic Status of the Organic Farmers in Kerala

Sl.No	Variables	Mean	SD
1	Age	46.03	10.82
2	Education	4.46	1.5
3	Employment	1.61	0.49
4	Family type	1.06	0.24
5	land size	1.48	0.15
6	Area under organic farming	2.86	0.2
7	Year of Experience	18.42	11.74
8	experience in Organic farming	12.74	8.84
9	Crops grown	5.43	3.74
10	Type of farming	3.92	1.48

Source: Computed from primary Data

If the respondent is a member of any farming group the group will direct all agricultural activities by time. It will ensure the minimum productivity of the organic output. The intervention of any group or organisation helps the organic farmers to make awareness about various plans and subsidies provided by the government. All the respondents are the members of the various groups and organizations.

6.13. Technological Innovations in Organic Farming

Among the various organic farming practices being followed by organic farmer respondents of the study, only six major organic farming technologies were considered in this study for assessing their adoption.

(i) Bio-pesticides

(ii) Bio-fertilizers and manures

(iii) Use of traditional seeds,

(iv) Selective weeding

(v) Intercropping and crop rotation

(vi) Minimum tillage and mulching

Table 6.12
Adoption of Technologies by the Organic Farmers in Kerala

Sl.No	Organic Farming Technologies	Mean Rank
1	Bio-Pesticides	408.10
2	Bio-Fertlisers and Mannures	376.90
3	Use of Traditional seeds	228.28
4	Selective Weeding	225.84
5	Inter Cropping and Crop Rotation	122.85
6	Minimum Tillage and Mulching	245.50

Source: Computed from primary Data

To identify the environment friendly farming methods were categorised as six groups of technologies. The details of these groups of farmers and the details of preparations of bio pesticides are given in Appendix IV and V. The obtained data are analysed using statistical tools like percentage analysis, correlation and Kruskal -Wallis (KW) test (Table 6.12).

Table 6.13
Correlation between Adoption of Technologies and Socio-Economic Variables

Sl.No	Socio-Economic Variables	Correlation Co-efficient
1	Age	.380**
2	Total land Size	0.725**
3	land under organic Farming	0.721**
4	Farming Experiance	0.825**
5	Experience in Organic Farming	0.865*

Level of Significance 0.001
Source: Computed from primary data

The table 6.12 shows that there is a statistically significant difference in the extent of adoption among different organic farming technologies and difference in the mean rank for the selected technologies. The bio-pesticides with the mean rank of 408.10 was identified as the most significant technology adopted by the organic farmers and followed by bio fertilisers and manures (mean rank 376.90) the intercropping and crop rotation advised as important practices for organic farming but that was least preferred in the adoption level with mean rank 122.85. The relationship exists between the extent of adoption of various organic farming technologies and different socio-economic variables. The spearman rank correlation non-parametric static method is used. The table 6.13 shows the direction of association as well as the strength of correlation of different socio-economic variables with the adoption of technologies. Out of five socio economic variables four variables shows the positive correlation between with the extent of adoption of technologies.

6.14. Factors behind to Shift to Organic Farming

Agriculture scenario across the country was rapidly changing from bad to worse. There has been a deceleration in agricultural growth leading to stagnation in productivity, declining factor productivity and distress among the farming community in the recent periods. Kerala state too witnessed similar changes in its agriculture sector. As these developments are gradually led the state to a stagnant situation in the production of most of the agricultural commodities. The percentage share of agriculture in economy and the percentage of farmers among the population have started to decrease in the state. This phenomenon has become most evident in the case of major food crops of the state. The area and production of rice, the part and parcel of the culture of the state is also in the declining stage and in this way Kerala has reached a stage of shortage of all agricultural produce (John, 2007). Organic farming is a holistic production management system for promoting and enhancing health of agro-ecosystem, has gained wide recognition as a valid alternative to conventional food production system to ensure safe food for human consumption

There is no question about the increasing demand for chemical free food, but seems to be confined among the population of the industrialized world. So, as third world countries enter into the world organic market, production may be mostly for the export and thus contributing very little to the food security of the poor nation (Altieri and Nicholls, 2004). However, the promise of a better and improved health conditions of the farm family ingrained in the concept of organic farming can act as an added incentive for practicing farmers to continue with it as well as for motivating more farmers to adopt organic farming.

A number of factors are associated with the adoption of organic farming among the farming community. The willingness to change and operate in diverse ways, the ability to face challenges, love of land and region, and the ability to overcome obstacles related to markets and to search for traditions and new information, etc., all these attributes make organic farmers different from others (Duram, 1999). Organic farmers had better environmental orientation than inorganic farmers. The organic farmers were treating their farms as a living organism and they were mostly using locally available inputs in their farming which did not harm the environment (Jaganathan, 2009). In a state like Kerala where cash crops are being

exported to other states and abroad and food crops are being imported, there 'organic by default' is a big market for organic food. The homestead farming model which popularly known as in the state has the potential to emerge out as the main source of organic food to a certain extent if farmers can take the advantage of the existing homestead models (John, 2007).

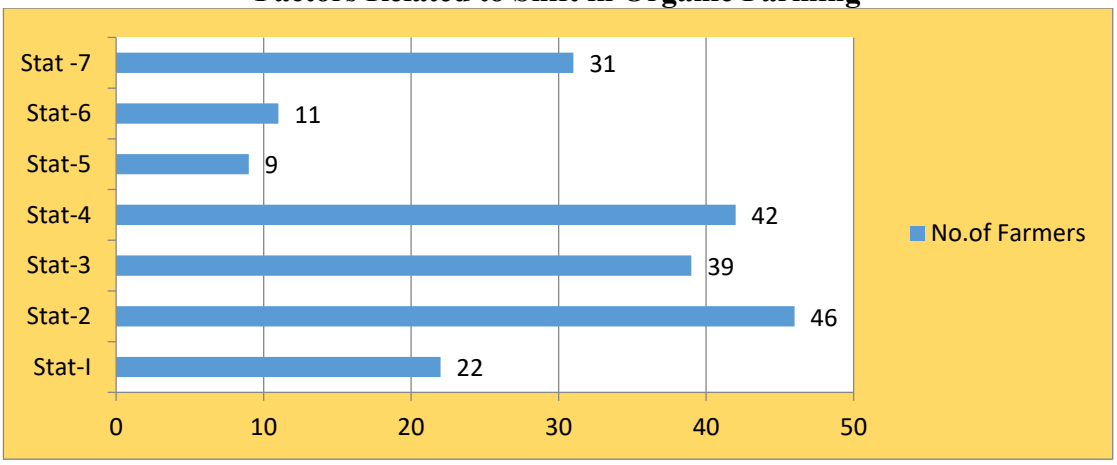
Knowing the importance of these issues, the Government of Kerala has started to work on an organic farming policy with the aim of localization of chemical free food to the whole population of the state as well as to create a chemical free environment for the future generations. Many ecologically sensitive farmers have come forward forgoing organic, with considerable success. Considering all these facts, this study was planned to analyse the factors behind the need for a shift from conventional farming to complete organic farming in Kerala. The figure 6.9 shows the various factor behind to shift to organic farming by sample respondents. There are so many factors to shift to organic agriculture i.e.as detailed below.

1. Environment sustainability through producing chemical food.
2. High price of Organic products
3. Organic farming reduces the environment pollution
4. Domestic market for organic products
5. Export Demand for organic products
6. Financial support from the government
7. Group farming.

The figure 6.10 clearly explains that 46 (23%) of the sample respondnts are shifted to organic farming due to high price of the organic produts in the domestic and foriegn market. It is found that 39 organic farmersare converted to organic farming because of these farming pratcice will reduce the environmental pollution. The 21% of the organic farmersare shifted to organic farming due to the demand for organic products in domestic market. It is revealed that there is only 9% of the organic farmersare moved to organic farming through the export promotion of organic farming.At present,many of the people are the victims of serious dieseseases like cancer are because of change in food habits and chemical composition of the food

items either cooked or food ingriedients may results high medical dilema.There has been an increasing concern for the conservation of the ecosystem for the future generation, restoration of pesticide-polluted water bodies, reclaiming soil health and soil fertility through organic manures. Ecological and environmentally-friendly solutions were sought for practicing farming. Hence organic farming is preferred and practiced by most of these respondent farmers. However, the increasing awareness about the chemical free and safe food for a better living, and the willingness of consumers to spend more for the organic food has raised the demand of organic food even in the domestic markets and lured farmers to shift to organic farmers as the organic produce was fetching high price in the market.

Figure 6 .10
Factors Related to Shift in Organic Farming



Source: Primary Survey

In addition, high demand for organic produce in international market was also another major factor that lured them to shift to organic farming through group efforts of farming and marketing and exporting abroad. Kerala, being the major organic exporter of the nation, had enjoyed an assured high price for organic produce in the export market. This was another major factor for the present organic movement of the state. The group farming method adopted by different small farmers' groups and promoted by non-government organizations of the state could also spread the concept of organic farming rapidly. The group marketing of the produce through these groups promoted a number of farmers to join hands in the organic movement of the state. The lack of awareness about the financial support from government for organic farming might be the reason behind the poor preference of the factor by the respondents.

6.15. Productivity and Profitability of Organic Farming Units

In spreading the concept of organic farming NGOs had made a visible impact as compared to government agencies as they were more close to the rural farming community. The approach, of working at the grassroots level, had enhanced their accessibility to the farmers. Influenced by the worst agricultural situation of the state especially in the food crops, all most all NGOs started working in the farm sector too, along with the livelihood enhancement and natural resource management projects. 'One Life One Earth', an NGO was identified as the pioneer in this farm sector and registered in 1988, which initiated projects to protect nature and natural resources and promote adoption of nature-friendly agricultural practices among farmers for ensuring the development of a safe environment (see tables, 6.14, 6.15, 6.16and 6.17).

Table 6.14
Crop Diversity of Selected Organic Farm in Thiruvananthapuram District

Major Crops	Medium	Minor Crops	Others
Paddy	Papaya	Vegetables	Chilli
Rubber	Jack		Star Apple
coconut	Teak		Passion fruit
Pepper	Arana		Mango
Medium Plants	Nutmeg		Wild Jack
	Jamba		
	Guava		

Source: Primary Data

The one and only organic farmers' association, the Kerala 'JaivaKarshakaSamithi' with organic farmers from the whole state as its members, was managed by this NGO.

Table 6.15
Crop Diversity of Selected Organic Farm in Alappuzha District

Major Crops	Medium	Minor Crops	Others
Paddy	Ginger	Vegetables	Chilli
Areanut	Jack		Wild Jack
Coconut	Turmeric		Passion fruit
Pepper	Elephant Yarm		Mango
Medium Plants	Nutmeg		
	Jamba		
	Guava		

Source: Primary Data

The major NGOs working for the promotion of organic farming in different parts of the state were Thanal (Thiruvananthapuram), Kuttanad Vikasana Samity (Alappuzha), AVARD (Thrissur), Vanamoolika and Wayanad Social Service Society (Wayanad), Most of these NGOs were found to be working under the Association of Kerala Catholic Churches and getting sufficient funds from respective Dioceses, and working

through some externally funded projects to promote awareness on ecological restoration and organic farming. They were concentrating on agriculture and its development mainly to raise the standard of rural living and ensure food security.

Some NGOs were focusing on the preservation of scarce natural resources along with the localization of healthy food. One organic farming unit is selected from each district as directed by the NGOs.A detailed list of planted species crops and otherwise, was collected. There are bound to be some omissions; plants could have been naturally generated. However, it serves to show the biodiversity of organic farms. It is an idealistic organic farmer while for the latter; it is a matter of convenience.

Table 6.16
Crop Diversity of Selected Organic Farm in Thrissur District

Major Crops	Medium	Minor Crops	Others
Paddy	Pepper	Papaya	Elephant arm
Nutmeg	Areanut	Jack	Ginger
Coconut	Cashew nut	Mango	Passion fruit
	Nutmeg	Muringa	Turmeric
	Jamba		Chillies
			Vegetables

Source: Primary Data

Conventional homestead plots might not have the same feature, principally because home-stead farms are, by and large, few in the conventional system. The diversity of crops in these farms shows a direct relation to the agro-climatic zones in which they are situated. Farm1(South Zone) homestead has several species; however, we have not taken the homestead plot for study, since, due to family and peer pressure, the homestead plot has not been brought under organic methods.

Table 6.17
Crop Diversity of Selected Organic Farm in Wayanad District

Crop diversity of selected organic farm in Wayanad District			
Major Crops	Medium	Minor Crops	Others
Coconut	Plantain	Cardamam	Vegetables
Pepper	Areanut		Ginger
Coffee	Vanilla		Papaya
	Elephant Yarm		Malabar Turmeric
			Jack

Source: Primary Data

Moreover, due to the ecological uniqueness of these two areas, they cannot be considered along with the others. It is evident that the farm 4 (northern zone), which has a less fertile soil; differ in terms of number of crops (18 varieties). Most of the

farmers produce their own vegetables. Majority of the seed variety is indigenous. The cropping pattern differs from area to area. Those who have cattle, grow fodder grass.

6.16. Measurement of Productivity

The Table 6.18 shows the total factor productivity of selected farm in Thiruvananthapuram district, the farm output was increasing trend up to 2016-2017, but in the period of 2017-18 a rapid decline in the output, due to change in the climatic situation the productivity of the farm declined to 0.78.

Table 6.18
Total Factor Output comparison in Thiruvanathapuram District

Period	Total Output (Rs.)"O"	Total input (Rs)"I"	TFP=O/I
2015-16	124238	98125	1.27
2016-17	146389	101236	1.45
2017-18	187675	146982	1.28
2018-19	76432	98324	0.78
2019-20	121325	90821	1.34

Source: Primary Source (Note 'O" stands for output, "I" Stands for input)

The firm experience loss in agricultural production of Rs.21892/-, but the farmer expressed that the level of profitability of organic farming is increasing in diminishing rate in the beginning stage then it shows a steady growth in outputs from the period 2014-2019. The ago climatic condition of the south zone reflect the steady output of this region.

The farm 2 belongs to the Alapuzha district Which Covers 3 hectare, the major crops cultivated in the farm are Arecanut, Coconut, paddy and pepper measuring the productivity of the farm is in Adverse profit because the farmer is experiencing normal profit. Total input cost includes cost of own labour and own rent soothe farmers only obtaining the normal profit from the organic farming (see tables, 6.18, 6.19, 6.20, 6.21, 6.22, 6.23 and 6.24).

Table 6.19
Total Factor Output Comparison of Selected Farm in Alaphuzha District

Period	Total Output (Rs.)"O"	Total input (Rs)"I"	TFP=O/I
2015-16	98865	92121	1.07
2016-17	124345	86432	1.44
2017-18	165433	112728	1.47
2018-19	101384	79434	1.28
2019-20	145949	98124	1.49

Source: primary Survey (Note 'O" stands for output, "I" Stands for input)

The Total factor productivity of the farm from the period 2014 to 2019 shows the positive trends. The socio- economic political and environmental conditions for organic farming is only improved through the proper intervention of the government. The influence of the organic farming organisations may improve the productivity of the farm.

The Table 6.20 shows the productivity analysis of farm No.3 in Thrissur district the Adatt farmers' co-operative society, the society is a leading organic society in Thrissur district. The main crops under the cultivation are rice, coconut, banana and vegetables.

Table 6.20

Total Factor Output Comparison of Selected Farm in Thissur District

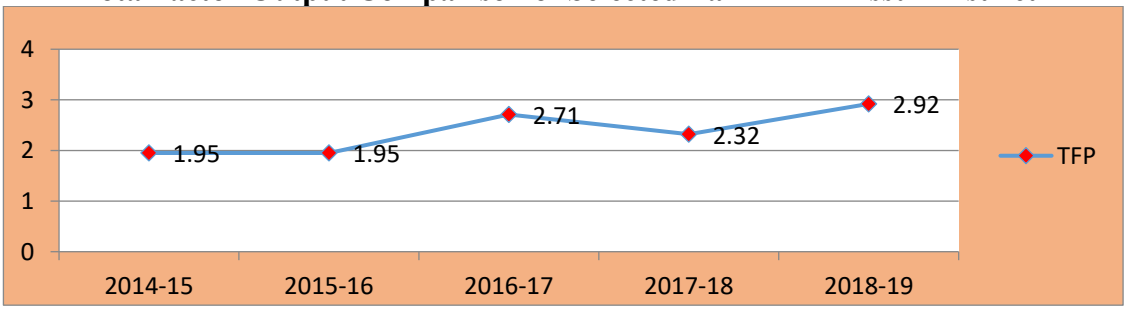
Period	Total Output (Rs.)"O"	Total input (Rs)"I"	TFP=O/I
2015-16	184432	94586	1.95
2016-17	199675	102343	1.95
2017-18	212345	78342	2.71
2018-19	234875	101345	2.32
2019-20	286439	98174	2.92

Source: primary Survey (Note 'O" stands for output, "I" Stands for input)

200 farmers are engaged in the organic farming in Adatt gramapanchayath with the aim of promoting organic agriculture and environment sustainability. The annual factor productivity of the farm shows a study growth in 2016-17, 2017-18 and 2018-19 the farm experiencing profit recognition through the support from government agencies. Overall the firm is experiencing profit but the flood affected the crops in the 2018 and 2019 and decline the price of paddy is an adverse effect experienced by the farm.

Figure 6.11

Total factor Output Comparison of Selected Farm in Thrissur District



Source: Primary Data

Wayanad organic farming development society is a charitable society working with the motto of chemical free food for the society. The area under the cultivation was 6 hectare, the main crop under the cultivation is coconut, pepper, coffee etc. and the medium crops are cardamom, vegetables, Malabar tamarind etc. The total factor productivity of the farm shows overall normal profit from the year 2015-16 to 2018-2019.

It clearly exhibits the total factor output productivity of the selected farm in Wayanad District. But in the 2018-2019 the farm earns profit, the cost of input is comparatively low to compare with other districts, because the agro climatic zone is most favourable for organic farming.Minimum external labour is used and use own labour to agricultural activities. Efficient soil management, minimum labour input and no extra effort to enhance the yield these are the indicating factor of the selected farm in Wayanad district.

Table 6.21

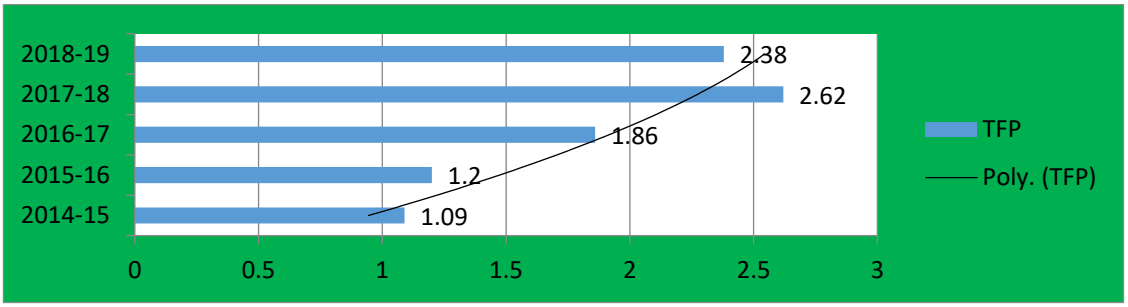
Total factor Output Comparison of Selected Farm in Wayanad District

Period	Total Output(Rs.)"O"	Total input(Rs)"I"	TFP=O/I
2015-16	98122	89735	1.09
2016-17	98643	82134	1.20
2017-18	184900	99635	1.86
2018-19	236489	90328	2.62
2019-20	272434	114675	2.38

Source: primary Survey (Note 'O" stands for output, "I" Stands for input)

But in the 2018-2019 the farm earns profit, the cost of input is comparatively low to compare with other districts, because the agro climatic zone is most favourable for organic farming.Minimum external labour is used and use own labour to agricultural activities. Efficient soil management, minimum labour input and no extra effort to enhance the yield these are the indicating factor of the selected farm in Wayanad district.

Figure 6.12
Total Factor Output Comparison of Selected Farm in Wayanad District



Source: Primary survey

This method could also be effective for a comparative sustainability study of organic plots. One of the major drawbacks of the TFP method is the diverse components whose relative value may be hard to assess. The value of the land has not been taken as an input since the study is restricted to cultivation costs and returns. External factors such as resource degradation, declining product prices (eg. the case of rubber), non-availability of separate market for organic produce, etc. influences the TFP. Moreover TFP focuses on individual farms and cannot be applied on regional level. Considering the complexity of the organic farms, the absence of account keeping among the farmers, lack of deliberate farming plan, inability to assess value of many capital investments and reluctance of the farmers in revealing their financial status are the major factors in Kerala. If the study is made for a longer duration of 5 years, the trend in TFP of every farm could be established.

Table 6.22
Total factor Output comparison of selected farms in Kerala

Period	Farm-1	Farm-2	Farm-3	Farm-4
2014-15	1.27	1.07	1.95	1.09
2015-16	1.45	1.44	1.95	1.2
2016-17	1.28	1.47	2.71	1.86
2017-18	0.78	1.28	2.32	2.62
2018-19	1.34	1.49	2.92	2.38

Source: Primary Survey

The general indifference to evaluating goods in terms of money, time constraint and financial limitations of the study-all put together, severely limited the scope for an exhaustive pool of quantitative data.

Table 6.23
Cost of Organic Manures used by Selected Farms in Kerala

Manures used	Farm 1	Farm 2	Farm 3	Farm 4
Cowdung	4325	3456	5430	7200
Bonemeal	3300	5450	4835	3850
Neemcake	5765	4875	3800	4100
Oil cake	1850	4300	3850	2350
Vermicompost	1350	2920	4320	2800
Total	16590	21001	22235	20300

Source: Primary survey

Yet the trends established by the analysis are indicative. The table 6.23 shows that various organic manures used by the organic farmers in the selected farm. As per the discussion with farmers it is understood that the organic manures and bio pesticides were given in the split doses at different stages of cultivation in the selected area. Farmyard manures are used more often monthly or bi-monthly. The various manures are used in the sample farms are Cowdung, Bonemeal, and Neemcake, Oil cake, Vermi-compost, and homemade slurry. The table 6.25 shows the input wise details of the selected crops of the selected farms in the sample districts. Only five crops selected for input output analysis pepper, Rice, Banana, Coconut and vegetables are the common crops cultivated in these farms commonly. The input cost of the farm for the period of one year taken for the consideration to calculate input cost. As compare with the conventional farming the cost of input material are low, for the calculation of input cost manure cost and labour cost taken for consideration. The total cost of these four farms is ranged from Rs.65000 to Rs.75000 annually. Labour cost plays major share to the total cost

Table 6.24
Input wise cost of Selected Farms in Kerala

Crops	Items	Farm 1	Farm 2	Farm 3	Farm 4
Pepper	Organic manure	4325	3456	5430	7200
	Labour	7000	5500	7000	13000
	Total	11325	8956	12430	20200
Rice	Organic manure	3300	5450	4835	3850
	Labour	18000	23000	29000	24000
	Total	21300	28450	33835	27850
Banana	Organic manure	5765	4875	3800	4100
	Labour	16000	19000	11500	9300
	Total	21765	23875	15300	13400
Coconut	Organic manure	1850	4300	3850	2350
	Labour	4500	7865	7500	4600
	Total	6350	12165	11350	6950
Vegetables	Organic manure	1350	2920	4320	2800
	Labour	3300	5400	11250	4300
	Total	4650	8320	15570	7100
	G.Total	65390	81766	88485	75500
	Total labour cost	48800	60765	66250	55200
	Total manure Cost	16590	21001	22235	20300

Source: Primary Survey

Descriptive Statistics of Output and Inputs

A multi linear regression model is done in order to understand the determinants of output .The regression equation is

Output= $\alpha+\beta 1X1+\beta 2X2+\beta 3X3+\beta$

Where X1, X2, X3 are denoted as vermi-compost, green manure and labour respectively.

The results of the regression are given in the table 6.26. The mean value of output earned by the sample farmers is rs.14963.33.Out of the major inputs labour cost is dominant with average amount of Rs. 4465 for the sample farmers followed by the vermin-compost is with an average cost of Rs.968.33 and green manure with an average cost of Rs.711.66. The regression result shows that green manure and labour inputs are the major determinants of output (t value is less than level of significance at .05).

When one rupee is spent on green manure, the value of output is increased by 7.566 rupees, and one rupee spent on labour the output is increased by 0.82 units. Vermicompost is positively related output but is not significant. The major determinants of the output in the sample regions are green manure and labour. Organic farming and adoption of technologies were focused on technological intervention in organic farming without compromising the in the sustainable resources in the eco system.

Table 6.25
Input-wise Cost of Selected Farms Quantitative Analysis

Valid	Sample size	Minimum value	maximum value	mean	SD
Output	200	5000	80400	14963.3	9626.12
Vermicompost	200	500	7600	968.33	934.44
Green manure	200	400	2600	711.66	482.572
labour	200	600	38000	4465	4125.7

*shows significant at the 5% level
Source: computed from primary Data

The organic farmers could take the advantages of these technologies by adopting relevant technology in farming. The scientist and policy makers should vigilant while advising the technology to the poor farmers, the organic farming practices need to

ensure the farm productivity and guarantee a minimum level of profitability to stick on organic farming

Table 6.26

Input-wise Cost of Selected Farms- Regression Analysis

Valid	Unstandardized Coefficient		Standardized Coefficient	t value	Significance level
Output	3506.41	2302.07	0.361	1.523	0.14
Vermicompost	2.241	1.461	0.218	1.534	0.137
Green manure	7.566*	3.099	0.379	2.441	0.022
labour	0.825*	0.355	0.353	2.321	0.028

*shows significant at the 5% level
Source: computed from primary Data

Chapter 7
Concept and Constraints of Organic Farmers of Selected Districts in Kerala

7.1. Introduction

Farming policies in Kerala have traditionally not favored organic agriculture in the strong has strong potential for organic farming. The problem is that Kerala is not working with appropriate organic standards and policies like many other countries. However, the policy makers are increasingly realizing that fact and are introducing many fiscal and risk reduction strategies to promote organic farming in the country.

Organic farmers are still facing some concerns, for instance, most of the organic products market oriented programs are an arrangement between trading companies are clearly dominant which put farmers at a disadvantage. In the process, they receive only a small part of the benefits of organic production. On the quality of certification programme, in Kerala has uneven systems. Moreover domestic verification and certification systems are time consuming and expensive. To grow organic farming in good way, policy makers should provide farmer-friendly data bases that deliver market knowledge could prove very cost effective. On the other hand the country should do away with fertilizer subsidies which are acting as hindrance and limiting the scope of adoption of organic agriculture in a big way (Government of Kerala Action Plan, 2020).

In fact organic farming in India is experiencing a real boom and the country has tremendous potential to grow crops organically and emerge as a chief provides of organic products in the international market is properly planned and executed in Kerala, organic farming has a market that is demand oriented. If organic farming is properly planned and executed, it will become important foreign exchange earner and money-spinner for farmers in Kerala. Organic farming in Kerala needs minute attention to market intelligence regarding which crops to grow, where to sell, distribution channels competition market access. There is also a need to identify and assign ample number of committed service providers who will act as transfer of technology to identified farmers and connect the certification agencies with the farmers in Kerala.

It is quite natural that a change in the system of agriculture in a country of more than a billion people are faces many problems and constraints in their farming

process. The most important constraints faced in the progress of organic farming level to take a firm decision to promote organic agriculture. Unless such a clear and unambiguous direction is available in terms of both financial and technical supports from the 'centre' to the 'panchayath' levels.

Table 7.1

Problems Faced by the Organic Farmers in Kerala

Sl. No	Problems faced by the Organic Farmers
1	Lack of Awareness
2	Output marketing Problems
3	Shortage of Bio-Mass
4	High input cost
5	Marketing problems of organic inputs
6	Absence of appropriate Agricultural Policy
7	Lack of Financial support
8	Low yields
9	Inability to meet the export demand
10	Vested interests
11	Lack of quality standards for Bio-Manures
12	Improper Accounting methods
13	Political and social factors

Source: Government of Kerala Action Plan, 2020

The problems of organic farmers in Kerala are exhibited in Table 7.1. From the table 7.1., it is clear that there are specific problems as well as universal and a mixture of both among the most of the farmers. Major problems faced by the organic farmers. In the past 10-15 years, many farmers in Kerala other than those who continued the traditional methods have taken up organic farming quite earnestly. Those who reverted from modern intensive agriculture to organic farming had to face many immediate problems. Sudden withdrawal of the external inputs led to steep fall in yield. The high yielding varieties of seeds had to be replaced by indigenous ones. The gap of 30-40 years created vacuum in the knowledge of traditional agricultural practices. The prevalence of modern agriculture in the majority of the cultivable areas makes it difficult to maintain organic purity in the soil and atmosphere.

Moreover, the organic farmers are scattered all over the state with a few pursuing it seriously. While it has been proven beyond doubt that the organically grown food is much better in quality, it remains to be established that, in terms of total productivity and economic viability, organic farming can compare with modern intensive agriculture. In the India, the arable land availability will be reduced to 0.087 hectare per-capita if the population is stabilized by 2050. The biggest challenge will, therefore, be to produce more food with less land (Jose, 2006). So when farmers are trying to produce more out of this limited resource that eventually leading to the creation of an imbalanced agro-ecosystem. In order to ensure a sustainable resource use for long run, these resources need to be protected by a number of alternative farming methods which are coming up and organic farming is one among them.

Organic farming is gaining gradual momentum across the world along with the growing awareness of health and environmental consensus that has demanded production of organic food. While trends of rising consumer demand for organic foods are becoming evident, sustainability in agricultural production has become the prime concern in agriculture development (Bhattacharyya and Chakraborthy, 2005). However, the greatest impact of organic agriculture is on the mindset of people (Ramesh et al., 2005). Through the adoption of organic agriculture, farmers are challenged to take on new knowledge and perspectives, and to innovate. This leads to an increased engagement in farming which can trigger greater opportunities for rural employment and economic up-liftment and finally to the empowerment of farmers and local communities.

The organic farming concept was rooted strongly among the farmers of Kerala a few years ago after witnessing a number of negative impacts of industrialized agriculture from different parts of the state. In order to make a change in the prevailing situation most of them were looking back to the sustainable traditional models that were organic by default and trying to adopt it. Since many of these efforts tasted success through the group efforts and it is necessary to know about these movements rather individual efforts. Thus, the primary study was conducted to understand and analyze the role of group movements in Kerala in spreading the organic farming throughout the state. The primary survey was conducted in Thiruvananthapuram. Thrissur, Palakkad and Wayanad districts of Kerala state with

an objective of understand more about the Economic impact of organic farming. The case study approach was followed to get an in-depth understanding about the issues related to the objective of the study (see chapter 3 for detailed data and methodology).

7.2. Concept of Organic Farming in Kerala

The present study surveyed farmers and NGOs to understand and analyses the concept of organic farming in Kerala. Followings subsections mainly focus on the Concept of organic farming in Kerala. Subsequent sections analyses the constraints of organic farming for optimum cultivation in Kerala

7.2.1. 'Thanal Organic Farming Society': Urban Vegetable Growers

The people was utterly shocked while reading the news of human tragedy that had happened in the villages of Kasargod due to the indiscriminate aerial spraying of 'Endosulfan', in a government owned cashew plantation extended over an area of 4.700 acres, to wipe out the attack of tea mosquito bug. She had been totally disturbed after seeing the photographs of the victims from the regional newspapers. The pesticide tragedy was the main news in all dailies for nearly a month and continued even after. More than 500 deaths (official record) and several cases of physical deformities, mental disorders: nervous problems and pregnancy related complications were reported from 1995.

Even though helicopter spraying of the pesticide in cashew plantation was started in the late 1970s. Pronounced effects in humans were visible only from 1995 onwards. Besides these effects, water resources in the area were also seriously contaminated. 'Usha' was intensely reading all the related news since she was the director of an NGO called *Thanal*, a group of like-minded people working for the betterment of human as well as environmental health. The issue was close to the hearts of 'Usha' and her colleagues.

The evolution of the NGO called 'Thanal' is as follows. Usha was an agricultural graduate from Kerala Agricultural University and her keen interest to work for the society beyond the knots of government and politics had led her to the formation of Thanal, in 1986 with the support of her husband. Jayakumar in Thiruvananthapuram district of the state. *Thanal* in Malayalam means a *'shaded*

place' that offers resting place to travellers on a hot sunny day and the organization was also working with the concept of providing a *"Gathering place for all living beings".*

This group of individuals under 'Thanal' had filed a case of public interest litigation against The Plantation Corporation of Kerala Ltd. in the High Court in the late 90s. Along with Thanal several other groups of people came to the forefront and after a long battle, 'Endosulfan' was banned in the state from the year 2001. In order to get a clear picture on pesticide use in the state. Thanal had done two projects under Centre for Developmental Studies (CDS), Thiruvananthapuram on Intensity of pesticide usage in Kerala in Rice, Bitter gourd and Cardamom. The results were annoying and they had found that the intensity of pesticide usage among the farmers was high compared to the statistics published by the state government. This was only. The first step of Thanal to the world of chemicals destroying our health and environment.

Thanal had resolved to take some concrete steps to ameliorate the situation. Their first attempt was the localization of chemical free food in the nearby areas of the organization. For this,Thanal had targeted a few interested housewives and retired people of the nearby place Azhukulam and they were promoted to grow chemical free vegetables in their homesteads for their family. These farmers were trained to prepare different organic inputs like compost. Panchagavya. Jeevamrita, five-leaf extract etc. in their homes as well as to identify and manage different kinds of pests and diseases.

There were people who did not have enough area for farming and they were trained to raise vegetables on terraces in pots and sacks. Thanal started to provide these landless farmers with different organic inputs on subsidized prices, Composting was another initiative of Thanal as a part of their *'Zero Waste campaign'*, wherein they were using biodegradable wastes from the hotels and industries of Kovalam beach area for composting and supplying to these new organic farmers.

Over a period of time, many people of the neighbourhood also came forward to enjoy the benefits of growing and consuming pesticide/chemical free organic vegetables. As their interest grew, the production of organic vegetables also increased and resulted in surplus in each home that could be marketed to others. While looking

for a better option to market this surplus with each farmer. Thanal had ended up with a new project idea of Organic Bazar in 2003 so that they could sell these organic vegetables to the urban citizens of the district who did not have time for farming but wanted to enjoy a good healthy and safe diet.

There was no third party certification for the produce because all were producing primarily for their own requirements; both producers and consumers were living together in the same locale and sharing a mutual concern for chemical-free safe food. However, there was an internal control system through which field officers of 'Thanal'were inspecting the farmersin fields twice a week to monitor all activities as well as to provide further guidelines. The Organic Bazar was operating twice a week Wednesday and Friday in the evening time where rice and different vegetables were selling to the consumers. Through this farmers were getting more prices to their produce without any bargaining since the consumers were the demanders of quality.

The Organic Bazar with organic rice and vegetables had become a grand success among the community members since they had started the organic bazar with a small group of 20 farmers and that much of consumers and eventually that reached to a group of 300 farmers and nearly 500 consumers. This had led them to open one more monthly bazar on every second Saturday and with this, the organic bazar started to earn nearly Rs. 1,00,000 per month. The news about organic bazar was spreading to the other places of the district too through consumers and mass media channels and that was adding more and more producers as well as consumers to this chain.

The organic bazar caught the fascination of everyone in the neighbourhood and elsewhere. The Parents and Teachers Association (PTA) of the nearby Vellanad. School took the novel step of growing vegetables in pots by using organic inputs, where one pot was given to each student. There were nearly 3000 students studying in the school and they were promoted to spend their leisure time to look after their potted plants. They were cultivating almost all vegetables including carrots which were being cultivated only along the hill tracts. Gradually the students had started enjoying the bliss of growing vegetables under the supervision of their teachers.

When the news reached the office of Minister of Agriculture, with whom Thanal had a working relationship while preparing the organic farming policy of the

government: the Minister proposed Thanal to take up organic vegetable cultivation inside the Poojapura Central Jail premises. Since growing organic vegetables in the vacant lands of jail premises provides for useful employment to the jail inmates and also chemical free vegetables in their daily diet, the jail warden was also enthusiastic with this concept. Within a few years, the earnings from this venture reached up to Rs. 5, 00,000 per annum.

After seeing the result, the Minister of Agriculture had planned to expand this new idea to 500 more schools in the district and released a fund of Rs.5000 for each school for organic vegetables cultivation. On knowing the case of organic vegetables cultivation in central jail premises, officers from the DPI (Department of Public Instruction), the office next to the central jail approached Thanal officials to help them to start organic banana cultivation in an area of 4 acres near their office. The number of schools promoting vegetable cultivation using organic inputs had increased in the district.

Through this organic movement, Thanal was also planning to bring back the traditional concept of at least one cattle in every homestead, the tradition that the state had lost somewhere in the past due to the pressures of modernization. Thus, the small effort channeled by the voluntary group of Thanal slowly became a big movement and that was spreading steadily to build a healthier future generation.

1. It is really a fascinating story about the focused hard work of a group of like-minded people who had made an impact through their innovative steps to turn around the culture of a society within a short span of time. Through the promotion of organic agriculture the NGO had shown the house wives and retired employees a new way of spending leisure time effectively to learn and earning something from their own homesteads and open terraces.

2. It had been observed that even though the target group was not farmers by profession, the NGO could transform their mind set to follow a new tradition that they had been lost somewhere in the past. Eventually, the people who were part of this organic movement could develop an enthusiasm in doing something good for the society and that promoted others to join the movement and take it forward.

3. The role of Thanal was not merely that of a change agent who had introduced some changes in a small group of people, but the actual promoters of this new innovation of growing organic vegetables. In this way they had roped in the emerging generation of young students of the schools of the district.

4. Thanal group had also worked on the developing required organic inputs like compost, manures and bio-pesticides in order to help promote organic growing. of vegetables. They had also quickly responded by creating market network for selling surplus vegetables to other fellow citizens of the locale. In this way, all forward and backward linkages in growing and selling organic vegetables were appropriately taken care of at appropriate time.

7.2.2. 'Adat Organic Farmer's Welfare Society' and 'Adat Model'

The 'Kole wetlands' were believed to be formerly lagoons formed due to the recession of the sea and very productive for rice cultivation. The saucer shaped wetland area was surrounded by elevated fringes of land. These fringes were more or less dry and terraced for coconut plantation. Thrissur district was famous for the 'kole land' rice cultivation since 1916 and Adat village occupies a major fraction of the 'kole land' area of the district. Even from the earlier period, the kole land rice. Cultivation in 'Adat Model' was famous not only for its high productivity without the application of fertilizers and plant protection chemicals but also for the adoption of group farming method.

The farmers of the region were grouped themselves under one 'padashekharam (a contiguous set of wetlands bound by waterways or other natural features)'. All the farming practices from land preparation till harvesting were doing together in the 'padasekharam'. Being a continuous of land only through group activity rice cultivation was possible in 'kole land'. The first step was dewatering the field after the cessation of heavy monsoon with Petty and Para or by using a centrifugal pump and temporary earthen bunds were made to prevent further water intrusion into the field.

In the beginning two rice crops were raised in Kole wetlands, a summer crop punja in December/January-March/April and an additional crop kadumkrishi

(August/September-December/January) and farmers could enjoy a good profit from these two crops. However, due to inadequate management practices the fertility of the land had started to deteriorate after a period of time. In order to regain the high productivity of the kole land, farmers started to depend more on chemical fertilizers and as incidence of pest and diseases increased in the two cropping seasons of the year, they had started using chemical pesticides too. The management of this stress situations with more and more application of chemical pesticides over a period of time created pest resurgence as well as the outbreak of new pests in the area. To control new pests' newer chemicals were also applied as per the recommendation of the pesticide dealers. Eventually, the kole land rice cultivation once famed for its high productivity with minimum inputs became infamous for its overuse of pesticides.

As a result of the increased amount of input use, the cost of cultivation had also escalated and the farmers decided to take one crop cultivation in a year instead of two crop cultivation in a year. Through the years of experience they had identified that taking one crop in a particular time was giving best yield compared to taking two crops per year. Thus, the kole lands became single cropped area where a winter crop 'mundakan' (September/October - January/February) was raised after the heavy rainy season.

The situation created adverse impact on the sustainability of the kole land ecosystem too. The kole land ecosystem once known as a habitat for several identified and unidentified species of plants and animals, breeding sites for several commercial important aquatic species were disturbed and eventually destroyed because of the huge dumping of pesticides. During the period 2003, Mr. Bbaskaran Nair the president of 'Adar-Padasekhara Committee' had decided to take an initiative to make some changes to this distressing situation. He discussed his thoughts with other members of the committee and after a series of debates about the pros and cons of the problem; finally, they had decided to call for a meeting of all member farmers. Since dumping of fertilizers and pesticides was a common phenomenon in the kole-lands to maintain the high productivity they realized that the complete transformation of farming practices in a single step was not a feasible option. Thus, they had planned for a multistep approach of step by step removal of chemicals from the farmland.

The first target of the committee was removal of plant protection chemicals slowly from the kole-land rice cultivation. Though he could convince almost all the committee members about the alteration of their ecosystem due to the dumping of chemicals it was a tedious process to get support from all the farmers as high incidence of pest and diseases became an unmanageable phenomenon. Nearly 50 per cent of the farmers were against the committee's decision to do away with the pesticides because they were afraid of the huge loss due to high pest and disease problems.

However, the committee had decided to move forward with the group of supportive farmers. 'Jyothy', a short duration variety, developed for broadcasting as well as transplanting in problem areas like Kole lands was chosen by the committee as per the advice of agricultural officer of the panchayath Krishibhavan. Farmers broadcasted the sprouted seeds after seed treatment with bio-fertilizers as per the instruction of the Padasekhara Committee. Instead of the basal dose of chemical fertilizers they had incorporated neem cake, vermicompost, bone meal etc.

To manage the two important pests, the rice stem borer and leaf roller farmers were asked to use the Tricho cards. Different kinds of cards were used for controlling the two pests. Tricho cards for the whole area were purchased by the committee members from the State Bio-control Lab in Mannuthy, Thrissur of District. Then, the Tricho card pieces were stapled on leaves of rice plant under the supervision of the committee members and the agricultural officer in each and every farmer's fields. Whereas, the farmers who were against stopping use of pesticides decided to continue with the old procedure of pesticide sprays. As these two practices may nullify the effects of their efforts, the committee members started monitoring all the farmers' fields for the entire season to forcefully prevent the farmers from spraying any pesticides.

They used Icc (20.000 eggs) Tricho cards of two kinds for 1 acre land to control the two pests. The cost was only Rs.20 for Icc card and they repeated the procedure 6 or 7 times in a crop season. In this way, farmers could save a reasonable amount since the cost of Tricho cards for one season was just Rs.250/acre instead of Rs.750/acre for one spray previously. Further, the rest of the farmers were also convinced by the good results in controlling the pests and agreed not to spray any

pesticide in the following seasons. As a result of the continued effort for a gradual shift to organic they could completely eradicate the pesticide use and by the year 2009, they had reduced the use of fertilizers to 20 per cent.

In the marketing process too, the Padasekhara Committee acted as a middleman to ensure reasonable good price for their produce. The harvested rice from cach farmer's field had been given to the Padasekhara Committee for group marketing and the committee fixed the price with the buyer. Usually, the whole produce was purchased by the Civil Supplies Corporation. In that case, the list of farmers along with the weight of the produce from his field as well as the bank account number was given to the Civil Supplies Corporation so that farmers get money deposited in their bank savings account directly from the buyer. This kind of group marketing had helped farmers to get a better price to their produce. In this process the Padasekhara Committee was also getting fixed margin money from the buyer as their commission and that has been used as a common fund for the activities of the committee.

In the year 2009, there was an effort to market the whole produce as "sorted rice under the brand name 'AdatRice' by the Padasekhara Committee and that had produced a good result all the way. The Committee transported all paddy grains to a modern rice mill in Emakulam district for milling, processing and packing. But the milling costs had increased due to high transport costs. Farmers got the best price for their produce compared to previous years but could not continue due to the non-availability of a good rice mill in Thrissur itself. This constraint kept them away from continuing with these kinds of intelligent marketing techniques in the following years. However, the entire sustainable model of farming was appreciated by different scientists, researchers and officials of the agricultural department and is popularly known as Adat Model farming.

1. The case of kole land rice farming in Adat village is a really fascinating chapter while looking at the time-line of organic farming development of the state. In this case study, the key actor was Mr.Bhaskaran Nair, the farmer who loved the nature-friendly farming. Even though there were obstacles initially. his effort could really turn around the distress situation prevailed in the kole lands of Adat and transformed it from a pesticide dumping point to a pesticide

free point with the help of participating farmers of the Padasekhara Committee.

2. It had been observed that in this case study, the farmers had started to feel the need for a change to transform their surroundings to its old pride and took the innovative step. Being the determined that they were. They had searched for the right information with the help of agricultural officer and succeeded in utilizing all the reliable input sources for ameliorating their Kole land ecosystem.

3. There were obvious signs of more coordination and concerted collaborative group actions among the farmers when they started to taste the success for their group efforts to save the nature through the adoption of good agricultural practices. This led them to follow collective bargaining for their produce to get a more remunerative price and they made a pioneering effort to market the produce in a new brand name of Adat Rice. Though some obstructions restricted them to continue with that kind of innovative marketing they can take the advantage of that in future with the development of sufficient inputs.

7.2.3. The Sustainable Development Model of Tribal Farmers

The ‘Muduva’ tribe of Kuttanad colony emigrated from Travancore and Idukki areas during the 1950's and 60's. Their main occupations were agriculture and collection of minor forest produce. Expertise in the field of agriculture was their main strength. They were practicing shifting cultivation earlier (shifting in every two years) and considering the destruction caused to the forest through shifting cultivation. Kerala Forest Department earmarked an area of 29 hectre land for settlement and for agriculture purposes. The average land holdings of farmers range from 50 cents to 5 acre (500 cents) are categorized as small and marginal category. There were 48 families with 167 members settled in the colony and are engaged in agriculture in the area provided by the forest department.

The farmers were practicing an intelligent crop rotation system with Finger millet-Red gram-Maize-Paddy and also cultivates the vegetables like tapioca, and banana. They resort to the collection of wild cardamom and also cultivate cardamom

to some extent, which contributes a rich share of their income. They were following traditional farming and not applying any inputs except wood ash, dried and green leaves available in the farm itself. Since the forest department did not allow keeping cattle the manures from animals were not available in this area. Though the land was very fertile with high organic matter content and giving a good average yield for all crops lack of scientific cultivation practices had resulted in high rate of soil erosion and loss of highly fertile top soil. The source of water to this tribal area was small streams inside the forest and they had built check dams to store the water. From the check dams water was rechanneled to the low lying areas through pipes. They were depending on the same source for irrigation to the annual crops especially vegetables grown for the household purpose. Since, the agro-ecosystem inside forest was sustainable in nature, pest and disease attack of was below economic threshold level and required no application of pesticides or insecticides.

To explore the possibilities to market organic certified produce of tribes with an additional margin an Organic Certification Project was initiated in the year 2009 that included the whole settlement area of 29 ha. The organic project was started by the initiative of Chief Executive Officer, FDA, Parambikulam-Mr. Sanjayan Kumar IFS and his subordinate Range officers Mr. Santhoshkumar.V and Mr. Harikrishnan. The project was running with an Internal Control System (ICS) managed by EDC with a joint participation of members from forest department and tribes. The ICS system was operated under the direct control of the Chief Executive Officer. FDA Parambikulam. Karimala Forest Range Officer and Pooppara EDC secretary was responsible to supervise the whole organic project implementation. The internal organic standard of the ICS will be based on India's NPOP standards and USDA NOP standards of production. To ensure soil nutrient improvement farmers were motivated to strictly adopt measures like crop biodiversity, crop rotation etc as well as measures to control soil erosion and water conservation.

To market the agricultural produce through ecoshops the prime requirement was the organic certification of the area and the certifying agency was Lacon Quality Certification (India) Pvt. Ltd. Under the project major crops were pepper, coffee, ginger, turmeric, kasthurimanjal (Curcuma aromatica) and usual conversion requirement as per standard was 3 years from the last date of chemical application.

But, as the project area was located in the middle of dense forests and there was no chemical application history among the tribal farmers the chance of any outside contamination was zero. So after 1st year conversion period the ICS had submitted the request for reduction in conversion period.

Though all the factors to certify the area as organic were up to date and the final list of farmers along with the relevant details were sent to LACON the difficulty in the accessibility was keeping the area to be certified officially. To supervise the area of one farmer at least one whole day was not enough due to the hilly nature of the area with slippy rocks in between. However, being in the initial stage of certification. Theorganic farmers were allowed to sell their produce in the local market at their convenience. As and when the member farmers attain organic status, marketing facility for organic products will be arranged under the supervision of EDC. Based on requirement of the buyer the produce might be processed, packed and labeled.

1. The most significant factor in the case of this sustainable tribal agriculture was the location of the tribal settlement. As the area was isolated inside the forest there was less chances for the farmers to be a part of the development of chemical agriculture. Thus, the agriculture there moved to the category of organic by default.

2. Being inside the forest the farmers were far away from all the information sources and that had its own advantages as well as disadvantages. Because of the undulating terrain of the area the agricultural practices led to severe soil erosion and they were not aware of the protection measures. Through the organic farming project implemented by EDC they were motivated to take care of these problems.

3. The major constraint to the agriculture inside the forest was marketing. Since these tribal farmers did not have that much bargaining power middle men from outside took the advantage of that and that prevented these poor farmers from getting a better price for their produce. The intervention made by EDC was a good work to be appreciated as they can act as the middle man to get a reasonable profit to the farmers and thus they can improve their standard of living too.

7.2.4. Wayanad Organic Farming Society: Wayanad Tribal People

Wayanad, the district of Kerala state is famous for its tropical climate, lush green hills, valleys and forests and indigenous/tribal population. Historically, these indigenous communities had maintained their time-tested patterns of self-governance social institutions, agriculture and cultural heritage living in symbiotic relationship with the nature and forest. However, the district was rated as the most backward in overall development among the fourteen districts of the Kerala state.

The post independent governments of the district followed a development model of extraction of forest resources followed by intensive cultivation and plantation that soon led to depletion of natural resources and resulted in low productivity of their lands. The traditional sustainable subsistence agriculture became a matter of the past relegated to memory. The erratic trends in the global market led to wide fluctuation in the price as well as demand for cash crops. Vast forests were clear felled and food crops gave way for cash crops. Wayanad or 'vayalnadu'(in Malayalam) literally mean the home of paddy fields, transformed itself into a place rich in cash crops.

The cropping system of the homesteads also got shifted towards more towards the vegetables like Coffee, Pepper, Vanilla, Cardamom, Ginger, Turmeric and Cocoa. At present, coffee based cropping system is a notable feature of Wayanadmodel of cultivation. Pepper was grown mostly along with coffee in eastern parts of the district especially in Pulpally and Mullankolly areas. However, this intensively cultivated land could not sustain the production after a period of time and crisis in the agricultural sector began to take its toll. The outbreak of Quick wilt in the late 90s completely shattered the pepper cultivation, the major source of income of almost all farmers of the district and also led them to '*heavy indebtedness'*. Most of the farmers either looked up to newer means of economic progress like the tourism sector or began critically reviewing the strategy for achieving land sustainability. However, only the resourceful farmers could survive in this troubled situation and the resource-poor farmers continued to struggle to find a solution to sustain their lives. Some serious failure cases ended up with suicides and eventually farmers' suicides became a routine event in the Wayanad district.

In this context of the deterioration of survival mechanisms of vast majority of the agro-communities including the indigenous communities and the vanishing of the traditional knowledge and value systems of sustainable communities, various Non-Governmental Organizations (NGOs) of the state came forward to revitalize this worst agricultural situation prevailing in the district. Along with offering a number of solutions to protect natural resources, they had introduced the concept of organic farming too. As the district was famous for its overuse of agrochemicals to manage the existing high rate of incidence of pest and diseases, organic farming concept could catch the mind of a small group of farmers of Pulppally village.

The prime effort to make the district organically green was from this small voluntary group of farmers of the district in the beginning of this millennium year. As a result of the conversion to organic practices they could produce only less from their farmland initially: the situation again put these farmers in a dilemma. This was evident especially in black pepper, one of the major cash crops known as "black gold" in those days due to its high price. The average yield had fallen down to I quintal/acre from 10 quintals/acre.

In order to get a better price for their produce, they decided to proceed with organic certification of the farmlands. But, there were no authentic certifying agencies in the state during that period and finally they had put an end to their search with Bangalore based IMO Control Pvt. Ltd. However, the certification cost was high and they had paid nearly Rs.150000/- to the agency to get the land certified. Though the land was certified successfully, marketing of the produce was the next problem before this innovative group of farmers as they were not aware of how to market their produce in export market. The difficulty to find suitable markets for the produce coupled with the low yield after conversion again put them in financial crisis and the neighbouring people started to look scornfully at their failed initiative. This condition had tempted a few member farmers to show reluctance to continue any further with organic practices in their farmlands.

While searching for a better alternative to market their produce as well as to attract more farmers to organic farming they were introduced to the concept of fair trade with the help of Mr. Tomy Mathew, the Managing Director of Elements Homestead Products Pvt. Ltd., one of the major organic exporters from Kozhikode

district of Kerala. With the advice of Tomy Mathew and Fr. Joy Kochupara, a unit of Fair Trade Alliance Kerala (FTK) was started in Pulpally with a group of 60 organic farmers in the year 2006. The Fair Trade Alliance Kerala (FTK), a farmer led movement focusing solely on justice concerns in trade. This new step of the organic movement was a new ray of hope for them to go on with the challenging situation. Through this they could avoid middlemen and thus to ensure good price for their produce in the international market. That was enough to compensate the initial low yield problems in organic farming.

The certification for FTK was done by Fair Trade Labeling Organization (FLO) in 'Bonn' in Germany. Compared to the former initiative the certification cost was less with FIK since the organization bears a hand to lessen the burden on individual small farmers. The premium fund that had been coming back to the Fair Trade Alliance Kerala (FTK) account after each trade was the source for this activity. Fair Trade certification was mainly doing for perennial cash crops such as Cashew, Coffee and Spices. There were two evaluations each year in the farmer's field as a part of Internal Control System (ICS) of Fair Trade Alliance Kerala (FTK). In order to monitor the activities of FTK there was an audit in each year by the FLO officials and so all the activities had been done in a transparent way without any ambiguity.

The Fair Trade Alliance Kerala (FTK) and Elements had trading relationships with partners in Switzerland. Italy, France and the UK and offering a reasonable support price to the farmer for each crop in all crop seasons. Still, the member farmers had the freedom to sell their produce even in the domestic market in situations where the open market price is high compared to the international fair trade price. This flexibility had been attracting more and more farmers to this organic movement and the number of organic farmers under FTK had risen to nearly 600 by the year 2010. In this way the movement was spreading slowly throughout the Wayanad, the home of the different spices and beverage crops.

In addition to FTK, there were nearly sixteen non-governmental organizations of the district who were also promoting organic farming. Wayanad Social Service Society (WSS) Vanamoolika Herbals, Indian Farmers Movement (INFARM). Organic Wayanad etc. were some of the good examples in spreading the concept of organic farming in the district. As a result of the synergistic effect of all these efforts.

Total number of organic farmers in Wayanad had moved to 5762 covering an area of 3982 hectares by the year 2010. It is a persuasive story of a group of farmers who put the comer stone of a big movement that had spread evenly to all the corners of the district. Even though this small group of farmers was not led by any non-governmental organizations they succeed not only in the accomplishment of their goal but also could motivate others too, to join hands with them.

The farmers of 'Pulpally' had decided to adopt organic agriculture in a stage when nature started to fight back with severe outbreak of pest and diseases that had devastated their agriculture and livelihood too. However, they could take the advantage of high demand and high price for organic coffee and other spices in the international market with their own effort. The case study clearly revealed the determination a group of farmers in a struggling situation with continuous failures. Their sheer confidence to move forward, without being disturbed by any mockery till they tasted the success.

7.2.5. Concept of Organic Farming

Even though the four cases from the four districts of the state discussed as above were similar in spreading the 'concept of organic farming' among farmers, there were a number of differences too among them. Yet, each case had its own uniqueness with respect to the background, philosophy, group dynamics and socio-economic condition and context of evolution. However, an attempt is made here to derive a common understanding of generalizations of the cases.

The underlying philosophy of each case was found to be different though that was unintentional. In the first case, influence of 'Fukuoka's philosophy' was dominant and in his words a community that can't manage to produce its own food will not last long (Fukuoka, 1978) whereas in rest three cases along with this profit factor had shared the importance. There were differences in the group formation process too like in the first and third case; farmers were motivated by an external agency though the two situations were different. Whereas the second and fourth cases were farmer-led movements where farmers themselves identified the problem as well as the need for change and they came to the forefront not only to led the group but also to follow the principles first and thus to motivate others too. It was observable from the case studies

that out of the four cases only two were concentrating on food crops like rice and vegetables whereas the rest two were concentrated on economic oriented crops mainly spices and beverage crops that can earn high price in export market. While adopting organic farming, it is important to understand along with the elite group who can import even their food items our country includes a number of hungry people too.

Hungry people cannot eat that which is produced for export as the category includes spices, beverages and other non-food items that meant for earning a few more dollars. In nutshell, for a better organic development we need to go beyond farming systems as well as cash crops and start to think about localization of food systems so that the whole system can be supported. To achieve this, rural communities should be motivated to organize themselves in groups to produce for their own needs.Most of the effective organic farming innovations were generated locally through local communities. Many communities were struggling in India to find an ideal farming system that is meaningful to them. Some of them had identified that by organizing themselves: they could enhance their bargaining power and earn enough to raise their standards of living. In the spread of organic farming throughout the country the same principle had the edge and most of the efforts to shift our agriculture to organic were from the small groups of farmers. Over the last couple of decades, numerous groups as well as individual farmers had entered the organic farming sector. Some of them were concerned with ecological health of their surroundings while some were guided by a greater insight into sustainable farming. However, the success of a group could easily motivate others to take challenges organic farming movement in Kerala. The case studies have reinforced the fact that group approach to organic farming would yield encouraging results. The concept of organic farming and constraints are interrelated to some extent. The present study examined and analyses the constraints of organic farming and it is explained in the subsequent section.

7.3. Constraints to the Promotion of Organic Farming in Kerala

Ability of organic farming to restore and maintain the sustainability of the agro-eco-system and its abilities to provide safe food to the society with affordable costs of production is innumerable. The farmers met a lot of skepticism; the Kerala state announced organic farming policy in 2007 for strengthening organic farming in

Kerala. Organic farmers of the state had started experimenting with organic farming for various reasons. The increasing demand for organic products in developed countries and the extensive support for organic farming by the Indian government may be seen as the key factor the development. The new and strategic organic farmers have succeeded in exploiting the advantages of organic farming, yet some others were in the transition process of slow and steady movement.

The major constraints coming in the way of adopting organic farming as the bias towards chemical farming, appropriate use of local varieties, high cost of certification, bias in incentives lack of research and extension support poor marketing ad lack of awareness among farmers and consumers. Organic farming as unorganized markets for organically grown produce, low premium for organic produce lack of knowledge about organic farming innovations no government subsidies for organic farming. The present study gives main focus to identify various constrains faced by the organic farmers.

Table 7.2
Kruskal-Wallis Statistics for Constraints in Organic Framing

Sl. No	Particulars	Values
1	Observed Value (K)	551.542
2	Critical Value(K)	31.482
3	DF	6
4	P-Value (Two-tailed)	<0.00001
5	Alpha	0.05

Source: Computed from Primary data

The major constraints were categorized into seven groups. These constraints are identified through collecting the primary data from 200 sample organic farmers from the selected districts their response was most severe, severe, not severe and the farmers response score were converted into ranks for one way analysis of variance using a non-parametric test, It is used for comparing two or more independent samples of equal or different sample size. Constraints and its relative intensity with respect to statistical analysis are exhibited in table 7.2, 7.3, 7.4 and 7.5. The table 7.2 shows the Kruskal Wallis statistics and its level of significance for constraints in organic farming.

The observed K value of 200 farmers is perceptions towards their constraints that are 551.542. As the computed P value is less than the significant level at one

percent ($P<0.01$) that can be predicted that the influence of the constraints to the promotion of organic farming is according to famers perception. To identifying the major constraints multiple comparison procedure was adopted

Social Constraints

Personal Constraints

Ecological Constraints

Technological Constraints

Economic Constraints

Certification Constraints

Marketing Constraints

Based on the available information from primary survey, different constraints are coming in the way of promoting organic farming were enlisted from the selected organic farmers, agricultural officers and agricultural scientists. Twenty-eight constraints are identified and categorised into seven groups. 'Social Constraints' are those constraints which are related to society and organic farming. 'Social constraints' sub-divided into lack of group initiatives in field of organic farming, poor quality produce due to hesitation of neighbours to adopt organic farming, ongoing debate about the relevance and need of organic farming, in ability to produce organic food for all. 'Personal-constraints' are those constraints which are personally affected by the organic farmers. More specifically, it includes lack of interest to gain more information, lack of concern, fear of profit loss, declining interest due to lack of owned resources. 'Technological-constraints' are related to adoption of agriculture technology in the field of organic farming. The main 'technological-constraints' are shortage of disease free planting materials, lack of timely information, Non-availability of enough organic inputs, lack of unique packages of practices.

'Ecological-constraints' are those constraints which are related to environment sustainability and organic farming. Loss of eco system for viability to produce good crops, destroyed link of ecosystem functions, high Pest and disease problems. 'Ecological and economic constraints' and certification constraints are related to the ecological balance, economic soundness of organic farmers and constraints related to various certification problems are identified in the primary survey of the selected

districts in Kerala. The table 7.3 shows the comparison of different constraints faced by y the organic farmers in promotion of organic farming in Kerala. It can be seen from the table 7.3, the mean Rank corresponding to the marketing constraints is more and hence it was the major constraint to the promotion of organic farming. Certification constraints and Economic constraints are also the main constraints with Mean ranks (915.407 and 883.86) so it can be concluded that marketing certification and economic constraints are the most severe constraints faced by the organic farmers. Technological and ecological constraints were severe constraints to compare rest of the constraints. The organic farmers in rural area belong to the less education group and their financial position is comparatively low these are the main reason to certification and economic constraints. It is indicated that social constraints are different from each other. The pair-wise comparison of the social constraints with mean of ranks is exhibited

Table 7.3
Comparison of Constraints in the Promotion of Organic Farming Based on Mean

Sl.No	Constraints	Frequency	Mean of Ranks
1	Social Constraints	200	247.702
2	Personal Constraints	200	452.473
3	Ecological Constraints	200	647.845
4	Technological constraints	200	788.452
5	Economic Constraints	200	883.868
6	Certification Constraints	200	915.407
7	Marketing Constraints	200	978.015

Source: Computed from Primary data

Among the social constraints four specific social constraints were considered that is lack of group initiative in organic farming, poor quality produces due to negative externalities, Debate about the relevance and need of organic farming, inability to produce organic food for all. The *p*-value is less than 0.01. The inability to produce enough organic food was the most severe constraint faced by the sample organic farmers among the four social constraints. Lack of interest to gain more information, lack of concern about organic farming, fear of profit and loss, personal interest of the organic farmers are considered as the personal constraints faced by the organic farmers, Kruskal-Wallis statistic for personal constraints P- value is less than 0.01, it shows the significant difference among the personal constraints. Out of four sub-constraints declining the personal interest due to inability to make sufficient farm

resources was the most severe personal constraint, fear of loss in farming due to low output was the another major constraint.

Table 7.4
Computed value of Kruskal-Wallis Test

Sl .No	Constraints	Observed Value (K)	Critical Value(K)	DF	P-Value	Alpha
1	Social Constraints	477.895	7.815	3	<0.0001	0.05
2	Personal Constraints	19.947	7.815	3	<0.0001	0.05
3	Ecological Constraints	110.517	7.815	3	<0.0001	0.05
4	Technological Constraints	61.538	7.815	3	<0.0001	0.05
5	Economic Constraints	298.179	7.815	3	<0.0001	0.05
6	Certification Constraints	89.648	7.815	3	<0.0001	0.05
7	Marketing Constraints	39.767	7.815	3	<0.0001	0.05

Source: Computed from Primary data

Technological constraints are sub divided in to four categories, shortage of quality planting material (disease free), Lack of information, Non availability of organic inputs, Lack of unique package practices. Organic farming materials re locale-specific and mainly use the locally available materials.

Table 7.5
Comparison of Different Economic Constraints with Mean Ranks

Economic Constraints	Mean rank
Initial low price for products	276.345
High input cost	350.224
Lack of Government support	358.437
Initial yield losses	620.000

Source: Computed from Primary data

It is difficult to follow a unique method of organic production for all crops because agro climatic zone and fertility of the soil is different from one farm to another, the Technological intervention in the field of organic farming may improve the status of organic farming in Kerala. Technological backup is the real impediment in the progress of organic farming movement. Loss of eco system, inability to reconstruct link of eco system, High pests and disease problems, Time lag to obtain positive response. The main ecological constraints faced by the organic farmers are requirement of long period to get positive response from the agro system was the most severe ecological constraint. The main economic constraints are initial low price for the produce, high input cost, lack of government financial support and initial yield of losses. It can concluded that the single most economic constraint faced by the organic

farmers to promote organic farming was initial yield losses in the first few years from the period of conversion to conventional farmland to organic farm land. The table 7.6 shows that in the analysis of different factors related to certification constraints was associated with higher cost of organic certification process with mean rank (479.187) and the duration for certification process with men rank (457.625) these two constraints are the major certification constraints faced by the sample farmers.

Table 7.6

Comparison of Different Certification Constraints with Mean Ranks

Certification Constraints	Mean rank
Standards for the certification process	304.437
Lack of certifying agencies in near places	363.75
Long Period certification process	457.625
Higher cost of organic Certification	479.187

Source: Computed from Primary data

The dimension of grading and certification constraints is on par with that of lack of awareness about the grades for the agricultural products and inaccessibility to reliable distribution channels market information. So here it can be concluded that in general the small organic farmers were observed to be ignorant on the market and consumer preferences and quality standards and so usually fail to produce high quality produce required for the market.

Table 7.7

Comparison of Different Grading and Marketing Constraints

Certification Constraints	Mean rank
Selection &development of target markets	326.485
Lack of market information	315.735
Lack of awareness about grading	424.595
Inability produce high grade products with limited resources	448.187

Source: Computed from Primary data

The result of analysis for different constraints coming in the way of organic movement it was understood that all the enlisted constraints were important in promotion of organic farming. However, those related to the economic and marketing aspects plays a major role in creating obstacles to promotion of organic farming. The consumption of organic goods is a costly option for ordinary people, a huge population Kerala belongs to this group. They are forced to consume similar goods

produced through the conventional methods. It has a direct impact on the development of sufficient organic markets for organic produce. In the present context of lack of adequate domestic markets organic farmers are forced to produce for international organic markets. In international market demand for organic products and price were high but the standard are also high to compare domestic markets. For competing international markets grading of the organic products are the prime factors.

The organic farmers are still facing a dilemma because of the inability to meet a high quantity of organic manures to match the nutritional requirements of crops to produce in global markets. The economic constraints are mainly focused to the small and marginal organic farmers. The proper intervention of the government and providing subsides to the farms and farmers to encourage organic farming. New organic farmers show a good and positive attitude towards the organic farming, organic farmers express their genuine interest for environment sustainability, but initial yield loss was the dampener for their attitude. At the outset the initial yield loss along with the lack of grading and marketing opportunities and certification procedure was the major constraint faced by the sample organic farmers.

Chapter 8
Findings and Policy Recommendations

8.1 Introduction

The unsustainability of modern agricultural practices have led farming communities the world over to look for alternatives. The majority of these alternatives indicate a return to traditional, eco-friendly practices; organic farming is one among them. Organic farming over the last few decades has proved to be successful; but the differences in culture, ecology and geographical factors necessitate adoption of situation-specific principles and techniques. The farmers of Kerala, as elsewhere are experimenting on this. Some have succeeded, others are in the process of evolution and yet others have failed but new options are being tested out. Organic farming is an alternative agricultural method that relies on ecosystem's management and emphasizes soil health as the foundation of successful crop production. As organic farming helps to avoid the dumping of agro-chemicals and gives us residue free food, safe environment, importance of organic farming is increasing day by day. The demand for organic food is also growing fast in India and so most of the states in India are trying to convert a remarkable portion of their cultivated areas into organic farming. In order to make the state organically green the government of Kerala state also came forward with a new policy on organic farming in 2008 with the help of the Kerala State Biodiversity Board, with a mission of converting Kerala's agriculture into "Completely Organic" within next five years.

Reacting to this innovative policy and action plan of the state government to revitalize the state agriculture, several concerns were aired, like food security, food safety, and the right of the state government to formulate a policy on a state subject and its relevance, etc. Several government and non-government agencies, farmers, agricultural scientists, ecologists, naturalists, politicians, and other stakeholders started debating on the topic and made the situation more ambiguous by presenting evidences in *support of* or *against* organic farming. The state government's approach and undue haste was also criticized. In this context, the present study was formulated specific objectives are detailed below.

1. To examine trend and pattern of organic farming in Kerala
2. To analyze the Government initiatives to organic farming in Kerala
3. To analyze the productivity and profitability of organic farms in Kerala

4. To analyze the constraints faced by the organic farmers in selected districts in Kerala

The methodology adopted survey research design was adopted for the study. Thiruvananthapuram, Thrissur, Alapuzha, and Wayanad districts of Kerala state were taken purposively as the study area after analyzing the reports of successful organic farming efforts in these districts. A survey approach was followed for data collection. A sample of 200 organic farmers was randomly selected from the four districts. In addition, five organic farming units were analyzed from these districts to study in productivity and profitability of organic farming. A discussion with agricultural experts officials associated with promotion of organic farming was also interviewed to understand the existing status and the various strategies for promotion of organic farming in Kerala. The data collected were analyzed with the help of statistical tools.

8.2. Trend and Pattern of Organic Farming in Kerala

The production of food grains has increased four folds from 50.82 mt in 1950-51 to 212.05 mt on 2003-2004. Organic farming appears to be one of the options for sustainability. Organic agriculture in India starts in 1900 onwards. The year 2000 is very important year for India on the field of organic farming. There are four major events during the year 2000. The planning commission constituted (2000) a steering group on agriculture which identified organic farming as a national challenge and suggested it should be taken in the form of a project as major thrust area of 10th plan. The group recommended organic farming in rain fed areas and in the areas where the consumption of agro chemicals is low or negligible.

The National Agriculture policy (2000) recommended promotion of traditional knowledge of agriculture relating to organic farming and it's scientific up gradation. The Department of Agriculture and co-operation (DAC) and Ministry of agriculture constituted (2000) a task force in organic farming. The ministry of commerce launched the National Organic Programme in April 2000 and Agricultural and Processed Food Products Export Development Authority (APEDA) is implementing the National Programme for Organic Production (NPOP).

India exported 135 organic products under 18 categories. The total volume was 44,476 tons realizing over US Dollar 125 million. The overall growth of organic food exports was 50.5% over the previous year. Around 60% of the country's organic products were exported to the Economic Union, 8% to Japan and the rest to Canada, Australia and East Asian countries, India ranked 33rd in terms of total land under organic cultivation, and 88th in terms of ratio of agriculture land under organic crops to total farming areas. The market potential for organic product in the metros is Rs. 1462 crores, out of this 562 is available from modern retail. Market potential for India is estimated at Rs. 2300 crores. Delhi and Bangalore are top two cities in terms of market potential.

The consumers express very high demand for organic products. It is found that consumer is ready to pay only 57% more for items at a regular consumption, while organic products are available at a premium of 15 to 20%. The market for organic products can be developed at 2 levels. The first one is Niche market which can be developed by creating awareness about certified organic branding and selling through special stores. The second level is mass market. The gain in promoting organic food in mass market is enormous. The agriculture and allied sectors in India provide employment to 65% of the workers and accounts for 30% of the national income and India have concerned much more than any other nations of the world as agriculture is the source of livelihood of our people and it is the foundation of the economic development of the country. The area under cultivation cannot be increased and the present 140 million hectares will have to meet the future increases in such demands. There is a strong reason for decline in cultivated area because of urbanization and industrialization, which in turn will export much pressure on the existing cropped area.

The organic products are available in the domestic market are rice, tea coffee pulses and vegetables. Wholesalers, traders, super markets and own shops are the major channels in the domestic markets which are mainly in the metropolitan cities, and accounts for only 75% of total organic production. The policy of ministry of Agriculture seeks to promote technically sound economically viable, environmentally Non-degrading and socially acceptance use of natural resources in favor of organic agriculture. The policy seeks to promote organic farming for strengthening rural

economy, promoting value addition accelerating growth of Agro business and securing fair standard of living for the farmers and agricultural workers and their families.

During the 10th plan the Department of Agriculture and Co-operation (DAC) Ministry of Agriculture has launched a new central sector scheme. The 10th five year plan emphasizes encouragement to organic farming with the use of organic waste integrated pest management and integrated Nutrient management. Even 9th five year plan had emphasized the promotion of organic products with the use of organic and bio inputs for the promotion of sustainable agriculture. High price expectations, delayed delivery quality restrictions, lack of production, high cost of inputs, lack of certification, huge expense on certification marketing networks are some of the constraints in market6ing organic products internationally and domestic market, government does not provide any incentive to organic production. Most of the organic market oriented programs are an arrangement between trading companies and farmers in which the companies are clearly dominant which puts farmers at a disadvantage. Experts say that providing opportunities for the strengthening of farmers associations and NGO could help for the promotion of organic agriculture. Besides, the most efficient way to do this is by inviting the private sector to provide marketing services and even required investment for organic farming.

As per consolidated organic statistics for the year 2020-21 provided by the national programme for organic production (NPOP), Kerala belongs to 11th position to compare with other state in India. Madhya Pradesh belongs to the first position with 1637730 Ha areas under organic cultivation. Kerala has organic cultivation 48364.18 ha; it is comparatively low with comparing other states like Maharashtra (371722.62 ha;), Rajasthan (298686.29 ha;).The area under cultivation of organic farming in Kerala, it shows decreasing and increasing trends in area under cultivation, in 2015-16the total area under cultivation was 44788.50 ha; and it is decreased in 2016-17 and 2017-18 area under which 43701.88 ha; and 34160.14 ha; respectively. Kerala belong to the 14th position in the case of area under cultivation. The total area under the organic cultivation was 48364 ha; out of that 45070 ha is farm area and the remaining is organic area under wild cultivation i.e (3293 ha).

The total farm production is 27850 million tones. Export is the one of the best indicator to access the economic performance of organic farming Kerala attained 4th position in state wise organic exports with export of 8610.66 million tons in 2020.Under group marketing, 10-15 Self Help Groups (SHGs), numbering about 250-300 farmers, come together under the banner of Swasarya Karshaka Samithi (SKS) and trade their produce collectively. This helps the farmers to have a good volume thereby being in a better position to negotiate with the wholesalers in order to 'optimise their returns'.

8.3. Government Intervention and Organic Farming in Kerala

In fact, the different government institutions have a good access the each corner of the social system. A proper institutional mechanism is an important component of any development process or program. Different institutions of the network have its own role in the mobilization various resources, proper implementation of the program, monitoring and evaluation of the program etc. The six major institutions that had been identified though the study like government, NGOs, certifying/exporting agencies, farmers' groups, educational institutions and family found to be having its own relevance in the recent organic agricultural development of the state. Family & homesteads and farmers groups acted as pivotal institutions in exerting a major influence on adoption and spread of organic farming. Educational institutions like school had played their role in generating interest on organic agriculture in the young minds.

8.4. Production and Productivity of Organic Farmers in Kerala

Seven general indicators are used to analyze the socio-economic status of the sample respondents are age, annual income, sex, size of family, economic status, education, employment. Out of 200 sample farmers, 10.5 % of the sample respondents are belong to the age group varies 20-35. It is a clear indication for educated youth are not self-encouraging in organic farming.36% percentage of the sample respondents are belong to the age group of 35-50 i.e. productive age group, under this age group farmers are experienced and they are more capable organic farmers. Out of the respondents, 38 % of the sample respondents are belongs to the age group of 50-65 they are very prominent supporters to organic farming,15.5 % of the sample

respondents are belong to the age group of above 65 years, they are the nominal farmers because their unhealthy situations may not be contribute to organic farming in Kerala.

Income of the individual and family are the prime indicator of the socio-economic status of the individuals, Out of 200 sample organic farmers 24% of the sample respondents are belongs to the lower income group. 25.5 % of the sample respondents are belongs to the average income group and 8.5% of the sample respondents are belonging to the higher income group. Male female proportion among the sample respondents are another factor to access the socio economic status of the sample respondents, a proportionate proportion of the male female participation means that the women has a equality in employment. 74% of the sample respondents are male farmers and only 26% percentage of the sample respondents are females. It clearly indicates that participation of females in the organic farming is low among the selected sample districts.

Size of the family is an another important factor to access the socio-economic status of the resppondents, on the basis of the number of family members family is divided in to three i.e. Nuclear family,small familyand large family. 77 (38.5%) of sample repondents having nuclear fmily , it understood that earnersof the family is either one or two.majority of the family having single earner.42% of the responents having small family the number of dependence in the samll family is comaparitively low to comapare with nuclear and large family. 20% of the sample respondents having large family consists of more than 8 members.It is clearly understood that family income of the large families is comapritively high in large families.

Economic status of the sample respondent is an another factor to access the socio economic status of the sample respondents. The term economic status means that better linig condition without burden. out of 200 sample repondents 112 (56%)respondnts are belong to Above Poverty Line (APL) and 88 (44%) of sample respondents arebelogs to below poverty line on the basis of their actual status of their ration card. One serious issue identfied by the researcher during the survey process, that is real position regarding their economic status was entirely differnet from the actual position. The criteria behind that the amniities enjoyed by the sample respondents .Out of two hundred sample responndents 131 (65.5%) of the sample

respondents are belongs to the lower income group an only 69 (34.5%) of the sample respondents are belongs to the higher income group. Education is an another important criteria for evaluating the socio economic status of the sample respondents. Out of 200 samples 22% of the sample respondents are illetrates and 27.5% of the sample respondents are completed primary education. The number of people havingeducation at matriculation and Pre-degree level is 13% and 6% respectively.2.5% of the sample repondents havingthe education level above the graduation among the sample respondnts. Educational wise classifation of the sample respondents are explaine with the help of trend lines .

The indicators used to access the socio economic background of the people are engaged in agricultural related activities that is status of farm land, area under cultivation, allied agricultural activities of the farmers, water source, method of irrigation, use of agricultural machinery. Out of 200 sample respondent's 144 (72%) farmers having Own land and 5% of the organic farmers are farming at lease land.6.5% of the sample respondents are use land for partially lease. 12.5% of the sample respondents are farming under small holder organizations.

According to the size of the farm land area under cultivatio divided into three category farmers with cultivating area one hectare, in between one hectare to two hectare and finally above three hectare. 55.5% of the sample are cultivating below one hectare. In distirict wise analysis it is clear that in Thiruvananthapuram district out of 50 farmers 27 farmers (54%) are cultivating below one hectare.Significantly the number of farmers cultivating below one hectare in three sample districts are higher than 50% expet wayanad district. 31.5% of the sample respondents are cutivating the area in between one hectare to two hectare. only 13% of the sample respondents are cultivating the farm land above two hectares.In wayanad district nearly 26% of the sample respondents are cultivating more than two hectares. Out of two hundred sample farmers 72 (36%) of the sample farmers are engaged in cattle rearing.Most of the farmers who have cattle also keep poultry and goat for alternative Inccome.Only Seven organic farmers are not entered in other agricutural activities. All the farmers depends mainly on the seasonal rains as their primary water source for the farmland. In addition the farmers depends on well in water scared areas. 39% of the sample repondents are used well as other source of water. Farmers used other natural

resources for water like well, pond, canal, River etc.In addition borewell are also used bythe farmers.Out of the 200 hundred sample respondents 132 (66%) of the respondents are fully encouraged with organic farming. The perception towards the other form of farming is traditional 41 farmers (20%), and partially organic 16 farmers (8%).The farmers do not encourage partially organic methods because partially organic methods may not fulfil ethics of farming.

The 38% of the sample respondents use their own farm resources as various inputs for farming and 62 % of the sample respondents depends resources outside the farm as farm resources. The 46 (23%) of the sample respondnts are shifted to organic farming due to high price of the organic produts in the domestic and foriegn market. 39 (19.5%) of the sample respondents are converted to organic farming because of these farming pratcice will reduce the environmental pollution. 21% of the sample respondents are shifted to organic farming due to the demand for organic products in domestic market. One of the highlight is only 9% of the sample respondents are moved to organic farming through the export promotion of organic farming.

8.5. Productivity and Profitability of Organic Farming

The farm 1 experience loss in agricultural production of Rs.21892/-, but the farmer expressed that the level of profitability of organic farming is increasing in diminishing manner in the beginning stage then it shows a steady growth in outputs from the period 2014-2019. The ago climatic condition of the south zone reflect the steady output of this region. The farm 2 belongs to the Alapuzha district Which Covers 3hectare, the major crops cultivated in the farm are Arecanut, Coconut, paddy and pepper measuring the productivity of the farm is in Adverse profit because the farmer is experiencing normal profit. Total input cost includes cost of own labour and own rent the farmers only obtaining the normal profit from the organic farming.

The Total factor productivity of the farm 3 from the period 2014 to 2019 shows the positive trends. The annual factor productivity of the farm shows a study growth from 2014-15 (1.95) and 2015-16. 2016-17, 2017-18 and 2018-19 and the total factor productivity of the farm was 2.71, 2.32 and 2.92. It is a clear indication of the farm is experiencing in profit recognition. The total factor productivity of the farm shows overall normal profit from the year 2014-15 to 2018-2019. The total factor

productivity of the firm is (1.09) in 2014-15, 2015-16 (1.2), 2016-17 (1.86) the farm experiences the steady productivity rate and 2017-18 and 2018-2019 where farm earns profit.

8.6. Constraints Faced by the Organic Farmers in Kerala

Statistical results from primary data show that the observed K value of 200 organic farmers' perceptions towards their constraints that are 551.542 is high. As the computed P value is less than the significant level at one percent P<0.01) that can be predicted that the influence of the constraints to the promotion of organic farming is according to famers perception. Certification constraints and Economic constraints are also the main constraints with Mean ranks (915.407 and 883.86) so it can be concluded that marketing certification and economic constraints are the most severe constraints faced by the organic farmers. Technological and ecological constraints were severe constraints to compare rest of the constraints. Among the social constraints lack of group initiative in organic farming, poor quality produces due to negative externalities, Debate about the relevance and need of organic farming, liability to produce organic food for all. The *p*-value is less than 0.01 it is indicated that social constraints are different from each other. The pair wise comparison of the social constraints with mean of ranks. It is understood that inability to produce enough organic food was the most severe constraint faced by the sample organic farmers

Lack of interest to gain more information, lack of concern about organic farming, fear of profit and loss, personal interest of the organic farmers are considered as the personal constraints faced by the organic farmers, Kruskal -Wallis statistic for personal constraints P- value is less than 0.01, it shows the significant difference among the personal constraints. Out of four sub constraints declining the personal interest due to inability to make sufficient farm resources was the most severe personal constraint with Mean rank (672.378), fear of loss in farming due to low output was the another major constraint in farming.

Technological constraints are sub divided in to four categories, shortage of quality planting material (Disease free), Lack of information, Non availability of organic inputs, Lack of unique package practices. Organic farming materials re locale-specific and mainly use the locally available materials .The Technological

intervention in the field of organic farming may improve the status of organic farming in Kerala. Technological backup is the real impediment in the progress of organic farming movement.

The main ecological constraints faced by the organic farmers are requirement of long period to get positive response from the agro system was the most severe ecological constraint. The main economic constraints are initial low price for the produce (Mean rank (276.345), high input cost (Mean rank 350.22) lack of government financial support (Mean rank 358.47) and initial yield of losses (620.00). It is concluded that the single most economic constraint faced by the organic farmers to promote organic farming was initial yield losses in the first few years from the period of conversion to conventional farmland to organic farm land.

It is inferred that in the analysis of different factors related to certification constraints was associated with higher cost of organic certification process with mean rank (479.187) and the duration for certification process with men rank (457.625) these two constraints are the major certification constraints faced by the sample farmers. Climatic changes, erratic rains, unavailability of labour& exorbitant wage rate, especially for paddy cultivation. Being part of a collective farm restricts innovations and adaptation of different techniques. Conversion of paddy fields to other crops such leads to fragmentation of paddy fields and break in nutrient flow. Silt blockage due to construction of roads and dams. Industrial pollution affects river water and thus paddy-prawn cultivation. Lack of market/consumer awareness regarding organic produce is the various constraints faced by the organic farmers in Kerala.

8.7. Summary of Findings

The results of study of different aspects of extent of adoption exhibits the most of the organic farmers were no so innovative in complete adoption in relevant technologies. In correlation analysis a strong positive correlation between the experience in organic farming and extent of adoption of organic farming technologies (r=0.869). It is reflected that experience in organic farming is more there will be an increased chance in the adoption of different innovative technologies. Local communities are the most effective innovators in organic farming, group approach in

organic farming would encourage the quantum of output. It was understood that the institutional network that could make positive impact on organic farming. The constraints are the real paradigms of the organic farming development in Kerala. Economic and marketing constraints had a crucial role in creating obstacles to promotion of organic farming. Lack of domestic organic market was the serious concern and the organic farmers are forced to produce for international markets. The economic constraints are the most severe factors hindering to the small and marginal organic farmers. The productivity of the selected farms shows a nominal profit trends, during the flood season the productivity of the farm declined, Majority of the farmers are in conversion period. During the conversion period Technical efficiency of the selected farm shows a decline trend.

8.8. Policy Implications and Recommendations

The government has a crucial role to strengthening and promoting Organic agriculture in Kerala. They are many policies formulated by the central and state government to encourage organic farmers in Kerala. These policies and programmes are only achieved through the proper implementations at grass root level

(1). Government should take initiatives to arrange various awareness programmes for both for the producer and consumer of organic goods in Kerala. It helps to improve the position of organic farming in Kerala. The proper awareness of organic goods leads to adequate markets to organic products.

(2). Government agricultural institutions should encourage development of model organic plots with institutional support from the bottom level to provide adequate support to organic farmers in Kerala.

(3). Government should Provide healthy and sound financial support to organic farmers during transition period to sustain in Organic agriculture. Assuring availability of quality organic manure at reasonable prices is necessary. Development and maintenance of organic manure sources within the farm. Proper institutional mechanism is an important component of any development process and programme. So the government provides subsidies and interest free loans to organic farmers to

support them. Rural credit helps to farmers to sustain in organic farming. It should be promoted.

(4). Guilds of skilled and experienced organic farming experts to guide new entrance to organic farming in Kerala. Therefore Institutional arrangement is necessary from the part of local self-governments of Kerala.

(5). Establishing local markets for organic products without intervention of the middle man will enhance the marketability of organic products in Kerala. Farmer societies can provide these facilities to organic farmers in Kerala. Financing of organic products through micro financing it will enhance their accessibility to finance.

(6). Processing of organic produce as a key area of development where government can intervene and establish processing centers.

(7). Grading and marketing of organic products are the major constraints faced by the organic farmers in Kerala.

(8). Establishment of public warehouses for storage of organic produce using organic methods will enhance the profitability of organic farming in Kerala.

(9). Price of the organic products to the producers are low to compare the product price in the market so the government Assurance of better prices for organic products to farmers for promoting organic farmers in Kerala.

(10). Restrain trends of large-scale commercialization of organic produce may resolve through the establishment of marketing societies in Kerala through the support of local self-governments.

(11). Creation of networks of organic farmers to facilitate exchange of ideas, technology, inputs and experience. Creating adequate infrastructure for establishing organic input making bio-fertilizer units will be fruitful. Food quality testing labs, grading and packaging facilities and creating marketing channels for promoting organic farming in Kerala are essential.

(12). Education and training programs need to be organized for farmers will enhance the knowledge level of organic cultivators in Kerala. Therefore, awareness programmes will improve their knowledge on agriculture.

(13). Organizing workshops and seminars to achieve consensus among different stakeholders will improve the awareness of organic farming in Kerala

(14). Educating and training organic farmers will increase the profitability of organic farming in Kerala

(15). Creating infrastructure for establishing organic input production centers. Grading and packaging food parks for export quality. Cold chains and supply chains for assured marketing of organic produce. The government and all the stakeholders have a key role to play in promoting organic farming in Kerala. Concerted group farming actions need to be taking up in area which less organic farming. Organic farming needs to be taken forward as it has a great promise for the future generations.

8.9. Areas of Further Research

Organic farming is an alternative agricultural method that relies on the environment sustainability and ensuring the quality of food. In the present study is a micro level to measuring the economic impact of organic farming in Kerala. The study reveals the major constraints and problems faced by the organic farmers. The economic impact of productivity and profitability of selected farm is also measured. Organic agriculture is a multifaceted concept. There may be variations in spending of the governments and farmers due to difference in productivity and profitability. The variation of Productivity and profitability with comparison of conventional agriculture is a further research area.

SELECT BIBLIOGRAPHY

BOOKS

Altieri, Miguel A (1995):*Agroecology: The science of sustainable agriculture*. Colorado

Blake, Francis(1987). *Organic farming and growing* . UK: The Crowood Press

Bogetoft, P., & Otto, L. (2011).*Benchmarking with DEA, SFA, and R.In Customer Introduction to efficiency and productivity analysis.* New York :Springer.

Coelli, Timothy J., Rao, D. S. P., O'Donnell, C. J., &Battese, G. E. (2005). *Anintroduction to organic farming, Sage Publishers, New Delhi*

Dwivedi O. P(1997).*India's Environmental Policies, Programmes and Stewardship*. UK: Macmillan Press.

Devu (1990).*Return to the Good Earth: damaging effects of modern agricultureand the case for ecological farming*. Penang : Third World Network

Hague T. (1996).*Sustainability of Small Holder Agriculture in India*. New Delhi: Concept Publishing Co.

Koopmans, T. (1951).*Activity Analysis of Production and Allocation*.Wiley, New*Issues & Problems*. New Delhi : Sage Publications.

Martin Upton (1996). *The Economics of Tropical Farming Systems*.UK : Cambridge University Press.

Mirchandani, T.J. (1971) .*Investigations into methods and practices of farming in new forms of agriculture, Oxford University Press*

O'Donnell, C. J. (2018). *Productivity and Efficiency Analysis*. New York : Springer.

Robert. C (1978).*Organic agriculture*. USA: Allanheld, Osmun&Co. Publishers

Palaniappan SP &Annadurai K(1999). *Organic Farming: Theory & Practice*. Jodhpur : Scientific Publishers

Poate, C.D. and Daplyn, P.F(1993). *Data for Agrarian Development*.UK : Cambridge University Press

Porus (2020)Satisfaction Evaluation: Methods for Measuring and Implementing ServiceQuality. New York : Springer

Thomas P M.(1999).*Agricultural Performance in Kerala in Kerala's economic development: various states*. New Delhi : . ICAR, Westview Press.

Dahama, A.K (1999).*Organic Farming for Sustainable Agriculture*.India : Agrabios.

Fukuoka, Masanobu (1985). *The Natural Way of Farming.*Madras :Bookventure.

_____(1984).*One Straw Revolution*.Rasulia: Friends Rural Centre.

Kiley-worthington Martha (1993). Eco-agriculture: Food First Farming. Bengaluru :Souvenir Pvt. Ltd.

Lampkin, Nicholas (1990) Organic Farming in U K. London : Farming Press

Leopold, Aldo (1994). *ASandcounty Almanac and Sketches from Here and There* . London: Oxford University Press.

Pereira, Winin (1993).*Asking the Earth*.Bombay :Earthcare Books.

Pretty J.N.(1995)*Regenerating Agriculture*. London : Earthscan Publications Ltd

Sujit Kumar, C K. (1999).*Krishimalayalam.* Kannur , Kerala : Samskrti Publications.

Swaminathan M.S(1996)*Sustainable Agriculture: Towards Food Security*. New Delhi :Konark Publishers Pvt. Ltd.

Yadava, A. K., &Neog, Y. (2019).Public Sector Performance and EfficiencyAssessment of Indian States.*GlobalBureaue Review*.https://doi.org/10.1177/0972150919862664

Torfolk, Sweden. In *The World of Organic Agriculture- Statistics & Future Prospects.IFOAM, Germany.*2002.

Werf, E.van der and A.de jager (1992).*Ecological agriculture inSouth India: an Agro-economic Comparison and Study of Transition.* Netherlands:ETC-Foundation/AgriculturalEconomics Research Institute (LEI_DLO).

Yussefi, Minon& Mike Mitscke.Introduction.In *The World of Organic Agriculture-Statistics & Future Prospects. IFOAM, Germany.* 2003.

JOURNALS

Aigner, D. J., & Chu, S. F. (2008). On Estimating the Industry Production Function. *The American Economic Review*, *58*(4) : 826–839.

Abrol I P. (Eds.) Stressed Ecosystems and Sustainable Agriculture. Oxford & IBH, NewDelhi. 1994.

Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics*, *6* : 21–37.

Arzubi, A., &Berbel, V. (2002).Determinación de índices deeficienciamediante DEA enexplotacioneslecheras de Buenos Aires. *InvestigaciónAgraria.: Prod.Sanid. Anim.*, *17*(1–2) : 103–124.

Ball, V. E., Bureau, J., Nehring, R., &Somwaru, A. (1997). Agricultural Productivity Revisited. *American Journal of Agricultural Economics*, *79*(4): 1045–1063.

Battese, G. E., &Coelli, T. J. (1992). Frontier production functions, technical efficiency and panel data: With application to paddy farmers in India. *Journal of Analysis*, *3*(1–2) : 153–169

Charnes, A., Cooper, W. W., & Rhodes, E. (1978).Measuring the efficiency of decisionmaking units.*European Journal of Operational Research*, *2* : 429–444.

Coelli, Tim J. (1995). Recent Developments in Frontier Modeling and Efficiency Measurement.*Australian Journal of Agricultural Economics*, *39*(3) : 219–245.

Margasagayam N and Norman, T SelvinJebraj(1997). A study on the impact of organic farminginPudukkottai District in Tamil Nadu.*J.Hum*.Ecol, 8 (3): 171-173

Cardino (2017) agriculture development as a key role in food security and economic development in most the world's population in rural area.

Debreu, G. (1951). The Coefficient of Resource Utilization.*Econometrica*, *19*(3) : 273–292.

Greene, W. H. (1990). A Gamma-distributed stochastic frontier model.*Journal of Econometrics*, *46* : 141–163.

Harendar Raj, M.L.Bhardwaj and N.K.Sharma(1996). Need for Eco-friendly Farming. *Employment News Weekly* 16(2).

Huguenin, J.-M. (2013) Data Envelopment Analysis.and Non-discretionary Inputs: How to Select the Most Suitable Model Using Multi-criteria Decision Analysis. *Expert System with Applications,* 42(5):2570–2581

Land, K. C., Love, C. A. K., &Thore, S. (1993). Chance-constrained Data Envelopment Analysis.*Managerial and Decision Economics*, *14* : 541–554.

Mahapatra, Richard. 'Suicide by Pesticide' Article in 'Down to Earth'Vol. 116. No.17.,1998.

Mollison, Bill. *Permaculture*- A designer's Manual. Deccan Development Society. 1990.

Meeusen, W., &Broeck, J. van Den. (1977).Efficiency Estimation from Cobb-DouglasProduction Functions with Composed Error.*International Economic Review*, *18*(2): 435–444.

Nwachukwaul (2008) planning nad evaluation of agricultural and rural development project . Lambhouse publisher's pp1-6

Srivastava S P, and Dhar N R(1980). Organically produced crops better than inorganically producedcrops.*Proc.Natn.Acad.Sci.India* , 50(1) :17-24. 1982.

Olesen, O. B., & Petersen, N. C. (1995).Chance Constrained Efficiency Evaluation. *Management Science*, *41*(3): 442–457

Omorogbe O, Jelena Z, Fathima A (2014) The role of agricultural development on economic growth of Nigeria , European scientific journal 10(4) pp 25-37

Pathak, H., Aggarwal, P. K., Roetter, R., Kalra, N., Bandyopadhaya, S. K., Prasad, S., &VanKeulen, H. (2003).Modelling the quantitative evaluation of soil nutrient supply, nutrient use efficiency, and fertilizer requirements of wheat in India.*Nutrient Cycling in Agro ecosystems*, *65*(2) : 105–113.

Reinhard, S., Knox Lovell, C. A., &Thijssen, G. J. (2000). Environmental efficiency with multiple environmentally detrimental variables; estimated with SFA andDEA. *European Journal of Operational Research*, 121(2): 287–30

Ruttan V W (1977) induced innovation and agricultural development ,food policy 2(3):196-202.

Robert M., S. (1957). Technical Change and the Aggregate Production Function.*The Review of Economics and Statistics*, 39(3): 312–320.

Sajeesh P. V and Sabu P. J. Problems and prospects in organic farming in Kerala: An empirical investigation: NIU national journal for Human Rights,2020

_____Trend of organic farming in India: Dynamics and Relevance: ANVESAK, 2020

_____Structure of agriculture and sustainability of Organic farming in Kerala: Journal of education Rabindran Bharathi University ,2020

Sharma, K. R., Leung, P., &Zaleski, H. M. (1999). Technical, allocative and economicefficiencies in swine production in Hawaii: a comparison of parametric and nonparametric approaches. *Agricultural Economics*, *20*(1) : 23–35.

Simar, L., & Wilson, P. W. (1998). Sensitivity analysis of efficiency scores: How toBoot strap in nonparametric frontier models. *Management Science*, *44*(1) : 49-61,https://doi.org/10.1287/mnsc.44.1.49

_____(2000). A general methodology for bootstrapping in non-parametric frontier models.*Journal of Applied Statistics*, *27*(6) : 779–802.

_____ (2007).Estimation and inference in two-stage, semi parametric models of production processes.*Journal of Econometrics*, *136*(1) : 31–64.

Sreedharan, E.V. *NelvayalukalNilavilikkunnu*. Article in Kalakaumudi Weekly No.1145

Stevenson, R. E. (1980). Likelihood functions for generalized stochastic frontier estimation. *Journal of Econometrics*, *13*(1): 57–66.

Suryavanshi.S.D, Lohar N.S and Killedar N.S. '*An Economic appraisal of Vermiculture Farming in Western Maharashtra.- Agricultural Situation in India'* Feb1997. Vol. III, No.11

Sreenath N and Joseph Antony.*KuttnadinteKanneer*. Article in Kalakaumudi Weekly

Swaminathan M.S. Presidential Address. In: Proceedings of the Fifty fifth Indian Science, Congress. Part II. Varanasi. India. 1968.

Tone.K. (2001).A slacks-based measure of efficiency in data envelopment analysis. *European Journal of Operational Research*, 130 :498–509.

Turvey, C. G., &Godah, A. (1990).Decomposition Measures of Technical Efficiency for Ontario Dairy Farms.*Canadian Journal of Agricultural Economics/Revue Canadienned'agroeconomie*,*38*(4) :1023–29.1023.

Verghese, Wilson K. (1995).NelkrishiyudeAnthyashwasam*Mathrbhumi Weekly* , 14-20

Yadava, A. K., &Komaraiah, J. B. (2020). Benchmarking the performance of organic farming in India. *Journal of Public Affairs*, 21(4)

EDITED BOOKS

Alvarez, Claude et al, (ed.) (1999) *The Organic Farming Reader*. Goa, India : OIP

Alvarez, Claude. (Ed.) (1996).*The Organic Farming Source Book*., Goa:The Other India Press.

Edwards, Clive. A et al, (Ed.) (1988).*Sustainable Agricultural Systems*. United States : CRC Press.

Goldsmith E and Hildeyard E. (Eds.) *The Earth Report 2*. UK : Mitchell Beazley.

Gupta NC and Gujrar R.K (Ed.) (1993).*Sustainable agricultural development: a comparison between commercial and traditional agricultural systems. in Sustainable Development*., New Delhi :Vikas Publications.

Harold O. Fried, C. A. Knox Lovell, and Shelton S. Schmidt (Eds.) **(**1993).*Production Frontiers and Productive Efficiency in theMeasurement of Productive Efficiency: Techniques and Applications*. England:Oxford University Press.

Hiemstra, Wim, et al. (Ed.) (1992)*Let Farmers Judge*. London : ILEIA-Intermediate Technology Publications.

Kotschi J, Bayer W, Becker T &Schrimpf B (eds.)(2003). *AlterOrganic: local agenda for organicagriculture in rural development: Proceedings of an International Workshop at Bonn-Konigswinter, 21-24 October 2002*. Germany : Volker & Ritter Druck *Natural Farming*.Rajastan : RAU.

Reijntjes, C. et al. (ed. (1992). *Farming for the future*.London : The Macmillan Press Ltd.

Scialabba, N. & C. Hattam, Eds. (2002). *Organic agriculture, environment and food security.Environment and Natural Resources Series*.Rome : Food and Agriculture Organization of the United Nations (FAO).

Gupta A.K, Patel N T, and Shah R N(1989). Review of post-graduate research in agriculture(1973-1984): are we building appropriate skills for tomorrow?.*Working Paper series* (Working Paper 1990/840*)*.Ahmedabad : Centre for Management inAgriculture, IIM.

REPORTS

FAO.(2018). *Guidelines for the measurement of productivity and efficiency inagriculture*. United Nations. Food and Agriculture Organization of the United Nations.

Mechri, A., Lys, P., &Cachia, F. (2017).*Productivity and Efficiency Measurement in Agriculture: Literature Review and Gaps Analysis*. United Nations.Food and Agriculture Organization of the United Nations.

Balachandran.V. (1998).*A Preliminary Survey on the Status of Organic Farming in Kerala*,Alappuzha, Keral.Swadeshi Science Congress

Balachandran.V (2002).*Organic Farming in Kerala*. Workshop on Agriculture. KRPLLD,CDS, Trivandrum, Retrieved from http://www.cds.ac.in/krpcds/publication/downloads/82.pdf

Govt. of Kerala..Kerala Land Use Board, Govt.of Kerala. Kerala State resource based Perspective Plan 2020

Janardhanan Nair, M.(1981)*Report of the One Man Commission on the problems of Paddy cultivators in Kerala*.

Pillai. Kerala's economy: *Institute of Planning and Applied Economics Research*, John Mathai Foundation, Thrissur: 1994.

Rajendra Prasad. *Cropping systems and sustainability of agriculture*.Indian Farming. November 1996.

Singh G B and Dwivedi BS.*Integrated nutrient management for sustainability*. Indian, Farming. November 1996.

Appendices

Appendix 1

Table 1

GDP Growth Rate across Sectors (% per annum)

Period	Agriculture	Agri & Allied Sectors	Industry-Sector	Service Sector
1960-61 to 1968-69	0.7	1.04	5.05	5.03
1968-69 to 1975-76	2.19	2.24	3.92	3.37
1975-76 to 1988-89	2.74	2.47	5.53	5.4
1988 -89 to 1995-96	2.69	2.76	5.9	6.15
1995-96 to 2004-05	2.23	2.28	4.87	7.86
2004-05 to 2016-17	3.4	3.43	7.51	8.69

Source: MAFW, Various Years

Appendix 2

INTERVIEW SCHEDULE

1. Name of the farmer:
2. Age (in years):
3. Village:
4. District:
5. Educational Status:

SI. No	Category	Score
1.	Literate	
2	Functionally literate	
3	Primary school	
4	UP school	
5	High school	
6	College & above	

6. Occupational Status:

SI. No	Category	Score
1.	Fulltime Farmer	
2.	Farming and other occupation	
3.	Any other	

7. Family Type:

SI. No	Category	Score
1.	Nuclear Family	
2.	Joint Family	

8. Family Size:
9. Type of House:

SI. No	Category	Score
1.	Thatched	
2.	Tiled	
3	Concrete	

10. Total Land Size:
11. Area under Organic Cultivation:
12. Year of Organic Certification:
13. Experience in i) Farming:
    ii) Organic Farming:
14. Crops Grown in the Farm:
15. Type of Farming:

SI. No	Category	Score
1.	Monoculture	
2.	Crop Rotation	
3	Dry land Farming	
4	Mixed and Multistoried	
5	Mixed Farming	

16. Allied Agricultural Activities:

SI. No	Category	Score
1.	Cattle/ Goat/ Piggery/ Rabbit	
2.	Poultry/ Duck	
3	Bee Keeping	
4	Fish	
5	Others	

17. Share of Agriculture in Total Household Income:

SI. No	Category	Score
1.	From farming alone	
2.	Partially from farming	
3	Not at all from farming	

18. Irrigation Potential:

SI. No	Category	Score
1.	Throughout the year	
2.	Seasonal	
3	Not assured	

19. Water Source:

SI. No	Category	Score
1.	Well	
2.	Pond/Tank	
3	Canal	
4	River	
5	Bore well	

20. Farmer's Perception of his Farming Methods:

SI. No	Category	Score
1.	Traditional	
2.	Modern	
3	Partly Organic	
4	Fully Organic	

21. Resources for Organic Farming:

SI. No	Category	Score
1.	On-farm resources	
2.	Off-farm resources	

22. Methods of control for pest and diseases:

23. Farming group membership: Yes/No

24. Other organizational membership: Yes/No

25. Farm Yield Data for last 5 years:

Sl. No.	Crops Grown	2016	2017	2018	2019	2020
1						
2						
3						
4						
5						

Sl.No	Organic Farming Technologies	Extent of Adoption		
		Fully Adopted	Partially Adopted	Not at all Adopted
1	Bio-Pesticides			
2	Bio-Fertilizers & Manures			
3	Use of Traditional Seeds			
4	Selective Weeding			
5	Inter Cropping & Crop Rotation			
6	Minimum Tillage & Mulching			

26. Extent of adoption of major technological innovations in organic farming

27. Sustainability of Organic Farming Technologies to Agro ecosystems

Organic Farming		Rating			
		AlwaysTrue	Mostly true	Rarely True	Not True
Ecological Sustainability	1. Protects and recharges the farm resources				
	2. Increases the system biodiversity				
	3. Low negative impact on environment				
	4. Chemical free environment				
	5. Reduces soil erosion and Improves soil fertility				
Economic Sustainability	6. Improve net income from the farm				
	7. Enable to accumulate working capital				
	8. Availability of high quality food at reasonable price				
	9. Low dependence on external inputs reduces cost of cultivation				
	10. Help farmers to become self-sufficient with minimal risk in long run				
Social Sustainability	11. Rural poor involved in the approach				
	12. Indigenous knowledge recognized within the approach				
	13. Produces foodstuffs of high nutritional quality and sufficient quantity				
	14. Equitable access to assets				
	15. Technology safer to hiimari and animals				

28. Major constraints to the promotion of organic farming

Particulars		Rating		
		Most Severe	Severe	Not True
Technologic Constraints	**1.** Lack of timely information related to organic fanning technologies			
	2. Non availability of enough organic inputs			
	3. Lack of a reliable package of practices for organic farming			
	4. Shortage of disease free seeds and planting materials			
Economic Constraints	**5.** Initial Yield Loss			
	6. Inadequate financial support to the new organic farmers from govt.			
	7. Higher Cost for the Establishment of Manure Source			
	8. Initial Lox\ Price for the Produce			
Social Constraints	**9.** Inability to produce chemical free food for all in the society			
	10. Hesitation4from neighboring farmers to follow organic practices making the produce of relatively less quality			
	11. The debate still going in the society about the need for the promotion of organic farming			
	12. Lack of proper community movement for the promotion of organic farming			
Personal Constraints	**13.** Lack of interest to know more about organic farming			
	14. Declining interest due to shortage of owned resources			
	15. Fear of profit loss due to low yield in the initial period			
	16. The belief that °It is better to follow conventional farming today and let tomorrow take care of it			
Certifying Constraints	**17.** Higher cost involved in the certification process			
	18. The need of a long period for the certification process			
	19. Lack of proper certifying agencies in the nearby place			
	20. The stringent standards and rules of the			
Grading & Marketing Constraints	**21.** Inability to produce high grade produce with limited resources			
	22. Lack of reliable market information & distribution channels			
	23. Lack awareness about grading & different grade			
	24. Difficulty in selection and development of target markets Ecological Constraints			
Difficulty in selection and development of target markets Ecological Constraints	**25.** Higher Pest and disease problems			
	26. Requirement of long period to get positive responses from the ecosystem			
	27. Loss of ecosystem viability to maintain a good crop			
	28. Inability to reconstruct the destroyed links of various ecosystem functions			

29. Factors behind the shift to organic agriculture in Kerala

Sl.No.	Particulars	Rank
1.	High price of organic produce	
2.	Organic farming produces chemical free food	
3.	Organic farming reduces the environmental pollution	
4.	Organic farming lowers the cost of cultivation	
5.	Increasing domestic market for organic produce	
6.	High demand of organic produce in the export market	
7.	Financial support from government through the Kerala state organic farming policy	
8.	Organic farming enables group farming and marketing	

Appendix 3

CASE STUDY SCHEDULE

Name of Group: Village:
Address: District:

1. When did this group movement of organic farming started?
2. Give a brief background about the agricultural trend before the group movement?
3. Why did you shifted to organic practices?
4. What is the motive behind the shift to organic? Economic or Ecological? Explain
5. Why did you opt for a group movement rather than individual adoption?
6. Do you think that group farming is effective in the spread of organic farming in Kerala?
7. Give a brief background that led you to depend on group farming?
8. From which agency you got certification?
9. What are the activities you did to get it certified?
10. Where do you market"your produce?
11. Give a brief outline about the Grading and marketing process
12. Do you think that organic farming is economically viable over inorganic farming? Why?
13. What do you feel about the present condition of farming?

Appendix 4

SCHEDULE FOR INSTITUTIONS

1. Give a brief background information about the formation and mission of the organization/institution/agency
2. What is the mode of extension work of the organization and its effectiveness in the transfer of technology
3. Give a brief account of the different funds and projects for the promotion of organic farming in the state
4. Give a brief outline of the certification and marketing facility given to the organic farmers.
5. Is there any specification in growing crops for the export market? If yes give an outline about the process.
6. What is the major impact observed among the farming community after the entrance of institution/agency into the society?

Appendix 5

SIX GROUPS OF ORGANIC FARMING PRACTICES

1. **Bio-fertilizers and Manures**: The use of the bio-fertilizers and organic manures are important while practicing organic farming. Some of the commonly used bio fertilizers for enhancing nitrogen fixation in the soil are: Rhizobium (Bradyrhizobium and Azorhizobium) induces better root stems nodulation of pulses, oil seeds and legume green manures. Azotobacter suitable only for upland crops like vegetables, tapioca, and plantation and orchard crops, Azospirillum - suitable for both upland and wetland conditions. Blue green afgae-recommended for wetland rice cultivation. Azolla- suitable for wetland rice cultivation. The major bio-fertilizers that improve the uptake of available phosphorus include Phosphate solubilising bacteria and fungi-recommended for upland crops raised in neutral and slightly alkaline soils, and Vesicular/Arbuscular Mycorrhiza - recommended for upland and transplanted crops.
2. **Bio-Pesticides and Cultural Control**: In organic farming, recommendations for controlling pests and diseases are use of mechanical/cultural controlling techniques like light traps. pheromone traps. yellow sticky traps, and use of products from local plants and of biological origin prepared at the farm like Neem seed kernel extract. Tobacco decoction. Neem oil garlic 2% emulsion, and Cashew nut shell liquid emulsion.
3. **Use of Traditional Seeds**: Instead of genetically engineered crops use of those locally available traditional varieties that can well adapted to the environment without the addition of chemical fertilizers is one of the important aspects of organic farming. Here the seeds preserve mostly by sun drying after mixing with cow dung slurry so that seeds can be store better without much pest or disease problems.
4. **Selective Weeding:** Selective weeding is one of the recommendations in organic farming not only to preserve natural diversity but also to protect the crop plants. Most of the weeds can be act as alternate host of several pests and some weeds have allelopathic effect to controlling the problem/noxious weeds, and the root exudates of some weeds can repel nematodes also.

Appendix 6

PREPARATION OF SOME OF THE BIO- PESTICIDES ANDORGANIC NUTRIENT SUPLIMENTS

1. **Leaf / Plant (5%) Extract):** Macerate 50g of leaf/ plant in a mixer grinder. Soak the macerated product in 1 litre of water for 24-48 hours. Strain the solution and spray.

2. **Neem Seed Kernel (5%) Extract**: Grind Neem kernel to coarse powder. Take 50 g of the powder in a cloth bag and dip it in ½ litre of water for 24 hours. Squeeze the cloth bag repeatedly till the out flow turns light brown. Dissolve 5 g of ordinary bar soap in 0.5 litre of water. Add the soap solution to the kernel extract, stir well and spray.

3. **Tobacco Decoction:** Steep 500g of tobacco waste in 4.5 litre of water for 24 hours. Dissolve 120g of ordinary bar soap separately in 0.5 litre of water. Add the soap solution to the tobacco extract and stir vigorously. Add 5 litres of water to this stock solution and spray.

4. **Neem oil + Garlic 2% Emulsion:** To prepare 10 litres, 200ml Neem oil. 200g garlic and 50g ordinary bar soap are required. Slice the bar soap and dissolve in 500ml luke warm water. Grind the garlic pearls, mix it with 300 ml water and strain to prepare garlic extract. Pour the 500ml soap solution into 200ml neem oil slowly and stir vigorously to get a good emulsion. Mix the garlic extract in the neem oil + soap emulsion. Dilute this 1 litre stock solution by adding 9 litres of water to get 10 litres of 2% Neem oil + garlic emulsion.

5. **Cashew Nut Shell Liquid (CNSL) 5% Emulsion:** To prepare 10 litres of 5% CNSL emulsion, 500ml of CNSL and 50g bar soap are required. Slice the bar soap and dissolve in 500 ml of water. Pour 500 ml of CNSL slowly and stir vigorously to get a good emulsion. Dilute this one litre solution by adding 9 litres of water to get 10 litres of 5% CNSL emulsion

6. **Inter Cropping and Crop Rotation:** Intercropping is recommended as a part of organic farming to ensure crop diversity and intercropping/crop rotation with

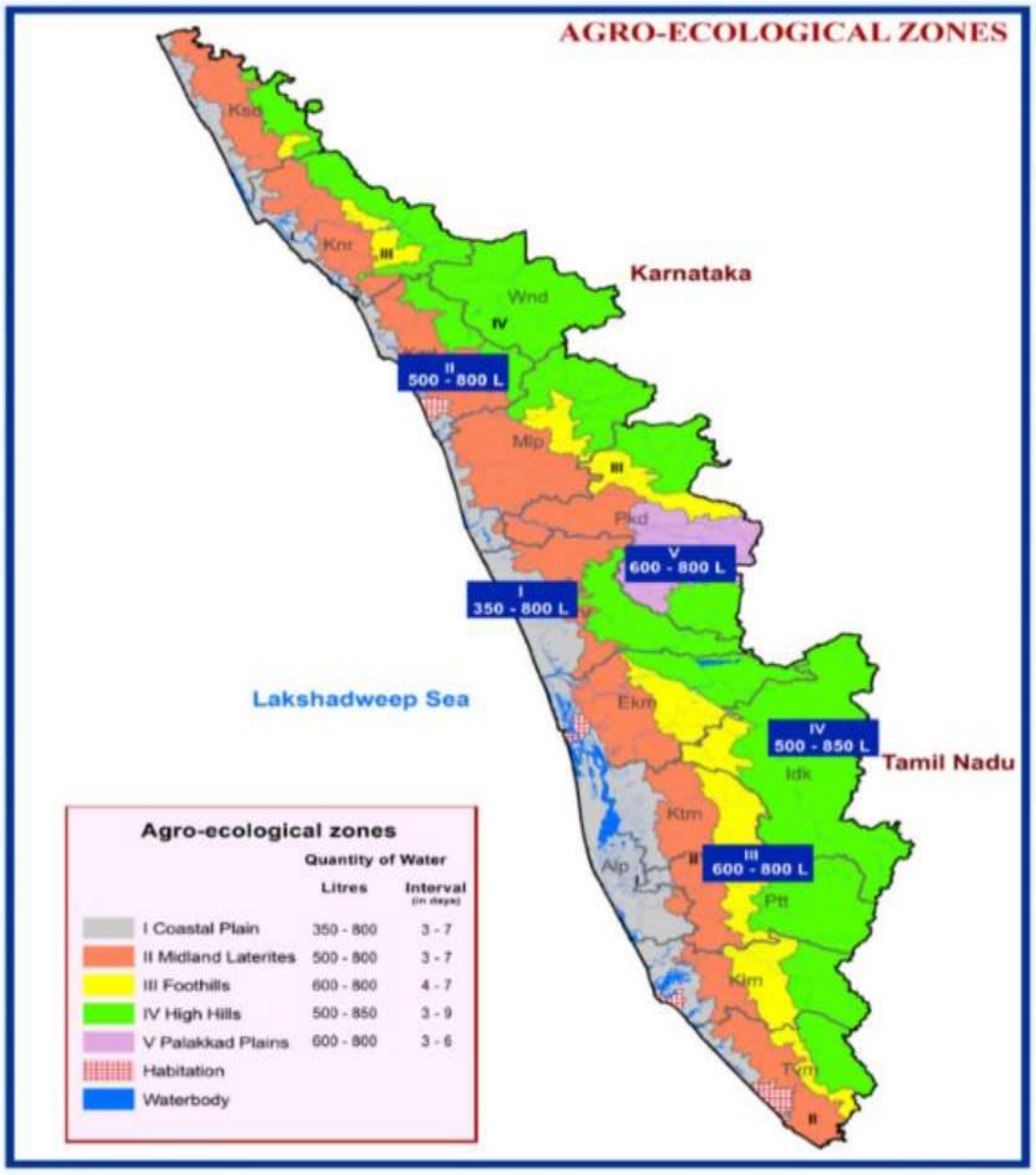
pulses and leguminous crops to enhance nitrogen fixation. Intercropping with various crops like pineapple, turmeric, ginger, roots and tuberous crops with perennial crops help to enhance nutrient extraction from different soil layers so that there will not be any fast depletion in nutrient level in soil.

7. **Minimum Tillage and Mulching**: Minimum tillage or zero tillage of the field and mulching is recommended for organic farming as a part of soil and water conservation measures as this prevent erosion of top soil so that soil fertility can be improved, and improves water holding capacity of the soil thus enhance the recharge of water resources in the farm. Here, clearing of land through burning organic matter recommended to be the minimum and clearing of primary forest is prohibited.

Appendix 7

Figure 1

Map showing Agro-Climatic Zone of Kerala



Source: Economic Review 2020

Figure 2
Harvesting of Organic Vegetables Thiruvanthapuram 2020

Source: Primary Survey

Figure 3
Intercropping by the Organic Farmers at Wayanad 2020

Source: Primary Survey

Figure 4
Paddy seedlings by the Organic Farmers at Alapuzha 2020

Source: Primary Survey

Figure 5
Water channeling by the Organic Farmers in Thrissur 2020

Source: Primary Survey

Figure 6
Applying of pests in organic farms Farmers at Thrissur 2020

Source: Primary Survey

Figure 7
Paddy seedlings organic farms Farmers at Thrissur 2020

Source: Primary Survey