केरल में जैविक खेती – ग्रहण, स्थिरता व बाधाओं का मूल्यांकन

ORGANIC FARMING IN KERALA: AN ASSESSMENT OF ADOPTION, SUSTAINABILITY AND CONSTRAINTS

SHINOGI K. C.

DIVISION OF AGRICULTURAL EXTENSION
INDIAN AGRICULTURAL RESEARCH INSTITUTE
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ORGANIC FARMING IN KERALA: AN ASSESSMENT OF ADOPTION, SUSTAINABILITY AND CONSTRAINTS

by

SHINOGI K. C.

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Approved by:

Chairman: _____
(Dr. D.U.M. Rao)

Co-chairman: _____
(Dr. Ram Bahal)

Member: _____
(Dr. D.K. Sharma)

Member: _____
(Dr. Seema Jaggi)

DIVISION OF AGRICULTURAL EXTENSION
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI – 110012, INDIA

CERTIFICATE

This is to certify that the thesis entitled "Organic Farming in Kerala: An Assessment of Adoption, Sustainability and Constraints", submitted to the Faculty of Post Graduate School, Indian Agricultural Research Institute, New Delhi, in partial fulfillment of the requirements for the award of the degree of **Doctor of Philosophy in Agricultural Extension,** embodies the results of *bona fide* research work carried out by **Ms. Shinogi, K.C. (Roll No: 9506)** under my supervision and guidance, and that no part of the thesis has been submitted by him for any other degree or diploma. It is further certified that any help or information that has been availed of in this connection is duly acknowledged by her.

Place: New Delhi
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(D. U. M. Rao)
Chairman
Advisory Committee

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CHAPTER - I

INTRODUCTION

The difference between what we do
and what we are capable of doing would suffice
to solve most of the world's problems.

- (Mahatma Gandhi)

Agriculture in India has a long history dating back to nearly ten thousand years. In ancient times, farming means not just for food production or income generation but it was a way of life. However, in the course of development agriculture, the means of livelihood of almost two-thirds of the work force in the country has been revolutionized by the *Green Revolution*. That has also changed India's status from a starving nation to one of the world's leading agricultural nation. Though, the green revolution proved a boon for hungry India, it has created severe consequences on our ecosystem and its sustainability.

Agro-biodiversity, an important aspect of the crop genetic diversity has also been threatened by the industrialization of our agriculture as it has caused three once rare plants (rice, wheat, and maize) to become the dominant plants on earth. Eventually these monocultures have replaced natural ecosystems that once contained hundreds to even thousands of plant species and thousands of insect species. Consequently, agricultural development has made a significant simplification and homogenization of the world's ecosystem.

As modern farming is characterized by high quantity of pesticides and fertilizer application, eventually the ecosystem lost its vitality to produce a good crop without an increased cost of cultivation. According to Conway (1997) the current agricultural practices involve deliberately maintaining ecosystems in a highly simplified, disturbed and nutrient rich state. The quantity as well as frequency of chemical use in farming has been increasing in every cropping season, and yet the soil

has to be replenished by more chemicals, while the total crop output is decreasing. Thus, the statement of Blake (1987) became a reality that *a crop grown year after year on the same piece of ground is likely to run into difficulties very soon*.

The undesirable result of the agricultural situation in the country led most among the farming community to gradually shift away from food crops to cash crops in order to maintain economic viability of agriculture. Yet, the success of industrial agriculture and the green revolution in recent decade has often masked significant externalities, affecting natural resources and human health as well as agriculture itself (Ramesh *et.al.* 2005).

The chemical agriculture and the food distribution systems that has developed and sustained through years have been affecting each of us in many ways. In the middle 90s, we had witnessed the dreadful effects of indiscriminate pesticide (Endosulphan) sprays in the Kasargod district of Kerala state. People in 15 villages in the district were subjected to continuous exposure to endosulfan which was aerially sprayed three times every year for 24 years. Following a public outcry a number of health-based scientific studies conducted and confirmed that the health problems were directly linked to the exposure to endosulfan (Thanal, 2001). A survey of only 123 houses found 49 cancer cases, 43 psychiatric cases, 23 epileptics, 9 with congenital abnormalities and 23 with mental retardation (Joshi, 2001).

The over use of chemical fertilizers and plant protection chemicals led to the buildup of chemical residues in soil and water through leaching and runoff. So, in the name of growing more food to the entire world, we have taken the wrong road of unsustainability (Chandrashekar, 2010). Finally, we have reached in a stage where the whole system of agriculture needs to be revitalized gradually to bring a sustainable outlook to our ecosystem.

Quite a lot of alternate farming systems have been incorporated in between from the stage of hunting and gathering till the current industrial agriculture, to bring the sustainable future to our ecosystem slowly but surely. These alternate farming systems include Eco-agriculture, Organic agriculture, Permaculture, Biodynamic agriculture etc. While analyzing all these developments from different parts of the

world *Organic Agriculture* seems to be emerging as an alternative to wipe out the negative impacts of *Green Revolution* technology in India.

Though India took nearly thirty years for organic agriculture to occupy one per cent of its agricultural land (Rao *et al.*, 2006) the country has attained the drive in spreading the organic farming concept afterward. However, the concept of organic farming is still not clear to most of the people in many concerns and they have mistaken the traditional agriculture, biodynamic agriculture, permaculture etc. as organic farming. Some other category believes that the use of organic manures and natural method of plant protection instead of using synthetic fertilizers/pesticides are distinguishing features of organic farming (Bhattacharyya and Chakraborthy, 2005).

The organic farming concept had been well said by Ghosh (1999) as *organic farming means farming in the spirit of organic relationship. We have to know the relationship between the soil, water and plants; between soil, soil microbes and waste products; between vegetable kingdom and animal kingdom, of which the apex animal is the human being; between agriculture and forestry; between soil, water and atmosphere, etc. it is the totality of these relationships that is the bedrock of organic farming.*

The famous definition of Codex Alimentaris Commission, a joint body of FAO/WHO (2001) reads as *"Organic agriculture as holistic food production management systems, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system".*

Though organic farming is gaining importance, it survived several objections also throughout the organic farming development, like food security issue. The people and organizations who have been raising their voice against the organic agriculture are also trying to project it as an unjustified luxury in a world with too many hungry people. The pros and cons of organic farming are just like the two sides of a coin and this keeps the debate on this topic stronger throughout its development. On one side,

the world needs food for its people, and if organic farming alone could not feed the world, then it is of no interest to discuss the development of organic farming as a solution to the world food shortage. Conversely, it is not only a question of producing enough food for consumption, but, it is important to look at whether our fields can continue to produce food as we exhaust it by growing the same crop year after year without improving the fertility.

Statement of the Problem

Kerala which lies on the south-western tip of India is one of the small states of India. The state came into existence on November 1st 1956, consequent on the reorganization of states on linguistic basis. The agricultural scenario in the state is somewhat unique and distinct from that of many other states in India in terms of land utilization and cropping pattern. The size of operational holdings is extremely small and cropping pattern is predominantly of commercial crops. Since Kerala has three natural divisions: lowland, midland and highland, forming parallel belts across the length of the state and the unique climatic conditions of each division allow the farmers to raise a wide variety of crops throughout the state.

Diverse agricultural systems have evolved in Kerala, as diverse as its landscape. But, in the last few decades, traditional agriculture was rejected in favour of the modern intensive kind of agriculture. This scenario has created a negative impact not only on agriculture but also on economy, environment, culture and social life of people. The transformation from agriculture to agribusiness is most evident in Kerala (Balachandran, 2004).

Responding to this new agrarian crisis and degradation of natural resources, several organizations had shown great concern for promoting eco-friendly farming and conservation of natural resources. In order to make the state organically green, The Kerala State Biodiversity Board had evolved a policy statement on organic farming in 2008 with a strategy to convert Kerala's agriculture into 'Organic' (at the rate of 20 percent every year) in a span of five years.

Immediately, there was uproar among the intelligentsia of Kerala and several issues of food security, food safety, and relevance of going organic for whole of Kerala surfaced. Several government agencies and stakeholders including staff of

Department of Agriculture, teachers and researchers of Kerala Agricultural University and several input agencies vehemently criticized the very policy and appropriateness of Biodiversity Board, while NGOs were making a lot of hue and cry about food safety. Thus many agencies raised apprehensions about the laudable goal set by KSBB for Kerala. Many praised it but many others rejected the idea of converting Kerala into completely organic for the fear of jeopardizing the vulnerable and delicate food insecurity of Kerala.

Indeed, Kerala is a paradox of many propositions, counter-propositions, ambiguities and complexities. The challenges are quite tremendous while the opportunities galore and demands highly forceful. First, there seems wide agreement that the pesticide residue in soil, water and environment needs to be handled cautiously in order that the future generation's food safety is not compromised with or mismanaged at any cost. Second, food safety is equally important to food security for a state like Kerala where food crisis is quite frequent and there seems wide agreement that those innovations in agricultural practices and science have crucial roles to play in boosting agricultural growth, coping with and recovering from current food crisis and environmental pollution.

However, the success stories of *Organic Bazar* (weekly market that bring the small scale organic farmers and consumers together under one roof) in Thiruvananthapuram district and *Eco-shops* (outlets for the purchase of certified organic food produce) in Thrissur and Kozhikode districts of the Kerala state are reaffirming the fact that development of domestic markets for organic produce is not a big issue. Many small groups of farmers in the state are already practicing organic farming and exporting their organic produce to different countries through *Indocert* certification procedures.

Hence, it was felt imperative to analyze the pulls and pushes operating in the organic farming movement in Kerala.

The present study was conducted to investigate some of the above issues from socio-economic and sustainability perspectives with the overall objective of assessing the adoption, sustainability and constraints in organic farming in Kerala. The specific objectives of the study were as following:

Specific Objectives

1. To delineate factors behind the need for a shift to organic agriculture in Kerala.
2. To assess the extent of adoption of major technological innovations in organic farming and their sustainability to agro-ecosystem.
3. To study the impacts of farmer's group efforts in the spread of organic farming.
4. To study the institutional mechanisms for promoting organic farming.
5. To study the major constraints to the promotion of organic farming in Kerala.
6. To map the advocacy strategies for implementing organic farming policy strategy and action plan in Kerala.

Importance and Scope of the Study

The results of the study will give a reasonable understanding about reasons behind the conversion of Kerala's Agriculture into organic and the key issues involved in it. The study will help to address issues of sustainability, economic viability, certification, and marketing of organic produce. This will throw a light to the existing and required institutional frameworks in the promotion of organic farming, and also help researchers and policy makers to think beyond the prevailing situation of agriculture.

Limitations of the Study

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 results to a larger area.

CHAPTER - II

BACKGROUND

The birthright of all living things is health. This law is true for soil, plant, animal and man: the health of these four is one connected chain. Any weakness or defect in the health of any earlier link in the chain is carried on to succeeding links, until it reaches the last. The general failure in the last three links is to be attributed to failure in the first link, the soil: the undernourishment of the soil is at the root of all. The failure to maintain a healthy agriculture has largely cancelled out all the advantages we have gained from improvements in hygiene, in housing, and medical discoveries. To retrace our steps is not really difficult once we set our minds to the problem. If we are willing to conform to natural law, we shall rapidly reap the reward not only in a flourishing agriculture, but in the immense asset of an abounding health in ourselves and in our children's children.

- (Sir Albert Howard)

Food has been a historical constant in all human societies of the world and people everywhere were historically engaged in question of food shortages and food security. While food insecurity i.e., lack of security in food supply was a major concern of the poor nations, questions of qualities of food and food safety loomed large for the affluent people of North and urban centers of the South of the planet.

The raising concern of people around safety of food in the light of Bovine Spongiform Encephalopathy (BSE) and pesticide residues, the environmental sustainability of how it is produced, the ethical treatment of producers, the landscape agriculture creates, and treatment of animals within farming, have fused into one another, bring food into question in a way that is historically and socially novel. For many people, the supply of food remains a central question in their lives; they may be subsistence farmers, or technologically oriented commercial farmers. The system in

which crop is grown, the price they receive for it and the relationship they have with those who purchase their crops is of vital importance.

During the earlier periods of cultivation of crops, fields were cultivated either by digging, or ploughing using cattle as the motive power. However, People had improved plants even in ancient times by simple selection, saving seeds and vegetative parts of the best specimens for planting the next year. Though, primitive people worked by trial and error, without the scientific knowledge of modern plant breeders, with the discovery of principles of heredity and genetics by Gregor Mendel in 1865 the era of scientific plant breeding started to emerge out. Till the sprouting of industrialization in farming, farms were small and diverse with its plants and animals. Nothing remained as waste since plant wastes were fed to farm animals and animal wastes were applied as manures to crops. The incidence of pest and disease was rare because nature took care of the crops with its own biological control.

When farms became bigger and the monocropping with high yielding varieties have replaced the plant diversity, pests and diseases hackled. The uninterrupted spraying of chemical pesticides to manage these situations had weakened the natural control system of the ecosystem and eventually these chemicals entered into the human food chain too. Then, most of the people started to think about the techniques to preserve the nature for their future food when it reached to the brim of death.

There were alarms of caution even before from several people and organizations regarding the ill health of our nature due to the over adoption of modern agriculture. The report of Brundtland (1987) for World Commission on Environment and Development came out with some important recommendations like industrialized countries must swiftly reduce agricultural subsidies to discourage surplus production and overuse of fertilizers and chemicals which damage the environment and cause long term degradation of the soil. Third world countries must be encouraged to develop their agriculture in a way that conserves natural resources. However, things had moved so fast in a direction of artificiality and reached in a stage where we could hardly get any food without the traces of pesticides. Consequently, organic farming came to the forefront along with other alternative farming methods and started to gain importance in the agricultural sector of many countries irrespective of their stage of development.

Organic Farming: The Historical Perspective

Though organic farming has only risen to public prominence in the last twenty years, the roots of organic agriculture are in the early twentieth century when it became increasingly apparent that agriculture as practiced was struggling to feed people adequately and causing considerable damage to the environment (Conford, 2001). It lay dormant for many years, kept alive by a relatively small group of ecologically minded farmers. Further, several agricultural scientists and rural thinkers began to look towards solutions to these problems, and they concentrated in understanding the ecology of farms more adequately and devising ways of keeping agricultural practices in line with these biological limits.

Two schools of thought on organic farming emerged. Rudolf Steiner and his followers understood the ecological and natural processes and methods and were guided by mystical insights. Based on acute observation, rigorous management of the land and a range of special preparations that enhanced land and crops anthropological or biodynamic agriculture gained a small but loyal group of adherents.

Another school of thought on organic farming preferred to gain an understanding of nature and ecosystem from a base in more conventional science. British agricultural scientist Albert Howard's work was more influential. Howard based his work on his experience of working in India, where he was impressed by the efficiency of traditional peasant farming and sought to empower it through the observations of Western Science.

These insights and arguments became distinctly minority views in the immediate years after the Second World War, as agricultural productivity was prioritized and the technological gains of the Green Revolution were systematically introduced across the planet (Perkins, 1997).

Earliest organic farmers emphasized on the concept of organic farm to be viewed as a whole, as a complex ecology of not just plants, microbes and animals but also its footprint on the society in which it is intimately bound.

At a time when modern, chemical-based industrialized agriculture was just beginning to radically alter food production, it advocated natural processes rather than

man-made inputs as the superior approach to farming. However, Walter Ernest Christopher James, a British agriculturalist, was the first known user of the term 'organic farming' in his book *Look to the Land* published in 1940 that had laid the corner stone for many of the recent issues raised by the organic agricultural movement.

The concept of organic farming started to popularize along with Albert Howard in 1940 through his book *An Agricultural Testament*, the results of his experiments with traditional Indian agriculture while he was in India as an Economic Botanist at the Imperial Agricultural Institute, Pusa in the early 90s. With this new concept he had marked the origin of modern organic farming in the West and known as the father of organic farming. The approach is holistic, rather than analytic and he emphasized the concept of mixed farming that includes both crop plants and animals as well as feeding of soil through compost.

The roots of organic farming are also closely related to the natural farming model developed by Masanobu Fukuoka in the late 1940s. When he became a failure in transferring his understandings to others he made a decision to return to his family farm and to create a concrete example of his understandings by applying it to agriculture.

Through his famous book *One-straw Revolution* Fukuoka (1978) contributed four principles of natural farming: 1) No cultivation. 2) No chemical fertilizer or prepared compost. 3) No weeding by tillage. 4) No dependence on chemicals. According to him *"Natural farming is not just for growing crops, it is for the cultivation and perfection of human beings."* In fact, organic farming is not exactly as that of natural farming model in several ways though the basic aim of both farming systems is same.

One of the outstanding efforts to unravel the negative impact of modern day agricultural practices was from Rachel Carson. With *Silent Spring* in 1961, Carson launched the environmental movement and she could explain the impact of human interference in nature in the fifteenth chapter (Nature Fights Back) of her book as *despite our efforts to control insect populations by mass application of new chemicals, the insects keep coming back. Insects are genetically adapting to the*

chemicals we use - they are becoming resistant, but even worse than that, our chemical attacks on insects have weakened entire ecosystems, so that the natural enemies of the targeted insects are destroyed, along with the targets. This creates an ideal environment for the unwanted insects to re-infest an environment where their unfettered reproduction will not be challenged.

Further, as a result of the joined efforts of several farmers' organizations of the west like *Demeter International* of Germany, which encouraged biodynamic farming and began the first certification program, the *Soil Association* of the United Kingdom, and *Rodale Press* in the United States, along with others International Federation of Organic Agriculture Movements (IFOAM) was formed in 1972.

Francis Blakes's *Organic Farming and Growing* published in 1987 was a practical introduction to the practice of organic farming and it contains detailed information about the organic system, the conversion to organic methods, and marketing process. Altieri (1995) reported that several experiments lasting more than 100 years at the Agricultural Experiment Station at Rothamsted, England, and the Morrow plots at the Illinois Agricultural Experiment Station had provided considerable data on the effects of crop rotations. Evidence indicates that crop rotations influence plant production by affecting soil fertility and survival of plant pathogens, physical properties of soils, soil erosion, soil microbiology, and prevalence of nematodes, insects, mites, weeds, earthworms, and phytotoxins. Rotations are the primary means of maintaining soil fertility and achieving weed, pest, and disease control in organic farming systems.

To revitalize agriculture in a sustainable manner there were some recent global efforts as that of IAASTD (The International Assessment of Agricultural Science and Technology for Development). This was an international effort initiated by the World Bank, a three-year collaborative effort (2005-2007) of nearly sixty countries that assessed Agricultural Knowledge, Science, and Technology (AKST) in relation to meeting development and sustainability goals of: Reducing hunger and poverty, Improving nutrition, health and rural livelihoods and facilitating social and environmental sustainability.

The suggestions for the sustainable development was emphasizing on multifunctional role of agriculture, agro-ecosystem functions, small scale agriculture and Research and Development as *Future research for development efforts must recognize the multifunctional role of agriculture including ecosystem functions that mitigate environmental impacts while maintaining and increasing productivity. Formal, traditional and community based agriculture knowledge need to be tapped by the science and technology system to respond to worsening quality of water, degraded soils and landscape, loss of biodiversity and ecosystem functions while addressing agricultural strategies.*

In short, from the beginning of the Green Revolution, a small minority of thinkers and practitioners doubted its veracity. These minorities were often clustered around the early organic farming movement; they questioned the reliance on chemical technologies, the seeming simplification of the ecosystem around farmland and the sidelining of the health giving benefits of food. As this critique became louder, the problem more pressing and the opportunities for an alternative more apparent, the organic movement came into prominence Reed and Holt (2006).

Indian Scenario of Organic Farming

India is an exporting country and producing only primary organic products but, not importing any organic products. There were certain isolated efforts towards organic agriculture from different parts of the country. The seeds of commercial Indian "Organic cotton" cultivation were sown for the first time in Maharashtra in the early 1990s. Some progressive farmers, distressed by the negative effects of pesticides for insect suppression in cotton crop, reduced the chemical inputs and increased the use of organic manure, developed their own techniques to optimize resources in order to develop sustainable farm.

The pioneers, in this field were from the Yavatmal district of Maharashtra. A team of CICR (Central Institute of Cotton Research) scientists visited the Yavatmal farms in 1992 crop season to analyze their package of practices. Similar efforts of promotion of organic farming have been made in many states. Efforts have been made by the NGOs to study organic farming in Gujarat, Madhya Pradesh, Kerala, Karnataka, and Tamil Nadu.

To study the techno-economic feasibility of organic farming, Department of Agriculture and Cooperation of Ministry of Agriculture, Government of India constituted a Technical Team. After visiting various places and interacting with farmers and scientists, the members of the team made observations as the country at present is not in a position to completely eliminate the use of chemicals especially fertilizers, the production of agricultural commodity is not only to maintain but also to increase it substantially to match with the demand of increasing population. However, it would not be difficult and unrealistic to phase out the use of these chemicals systematically. For this, on one hand the doses of fertilizers need to be gradually reduced and be balanced by increasing the use of optimum quantity of organic manure and bio-fertilizers (Modi, 1997).

The individual organic movements got a serious imagery with the launch of National Program for Organic Production (NPOP) by the Ministry of Commerce in March 2000. The prime aim of the program was to promote organic farming for export purpose and that have established national standards for organic products, which could then be sold under the logo '*India Organic'*. To ensure the implementation of NPOP, the National Accreditation Policy and Program (NAPP) was formulated, with accreditation regulations announced in May 2001. National Accreditation Body (NAB) is the sole accreditation body with Agricultural Processed Foods Export Development Authority (APEDA) as its secretariat.

India's first ever local Organic Certification Body, INDOCERT (Indian Organic Certification Agency), was established in March, 2002 with an objective to offer a reliable and affordable organic inspection and certification services to farmers, processors, input suppliers and traders. INDOCERT has strong technical collaborations with two well reputed Swiss Organic Agriculture Institutions: FiBL (Research Institute of Organic Agriculture) and bio.inspecta (Swiss certification agency). FiBL advices INDOCERT in setting up of an efficient management and administration and ensure that the certification is established at par with National and International Accreditation Criteria. INDOCERT is the cooperation partner of bio.inspecta and its official national office in India. INDOCERT was nationally accredited for organic certification as per Indian National Programme for Organic Production (NPOP) in October 2002.

Under National Project on Organic Farming (NPOF) Department of Agriculture and Cooperation, Government of India, had initiated systematic promotion of organic farming in the country in a project mode in specified areas during the 10th plan period. In order to reduce the cost of certification for individual farmer Grower Group Certification (GGC) was introduced under NPOP. According to Government of India reports the costs which were ranging from Rs. 1, 50,000 to Rs. 2, 00,000 per individual project had came down to Rs. 45,000 to Rs. 75,000. Then, the government have taken initiatives to promote State Government bodies as certification agencies and this reduced the costs again. The Uttarakand State Organic Certification agency is offering certification at a price of Rs. 10,000 to Rs. 15,000 per project.

Anyhow, thousands of farmers who realized the unsustainable nature of Green Revolution type agriculture are taking recourse to organic agriculture. They believe that organic farming is the only solution that can take them out of this growing crisis by way of improving soil fertility and overall health of the agro-ecosystem, thereby making their farming sustainable over long run. The promise of a better environment and improved health conditions ingrained in the concept of organic agriculture has also acted as an added incentive for these farmers (Das, 2004). However, Ghosh and Varadachari (2006) reported that the existing state of art on organic farming is inadequate to compete with modern methods in terms of yields and economic returns. This is because of inadequate soil and crop management. Intensive research needs to be done to develop technology packages that are crop and region specific. These packages should incorporate managements for all nutrients, pests and diseases. Quality and quantity of inputs are also to be specified and only thereafter can large scale extension work be undertaken.

In India, about 528,171 hectare area is under organic farming (this includes certified and area under organic conversion) with 44,926 number of certified organic farms. This accounts for about 0.3% of total agricultural land (Ramesh *et.al*, 2010).

Organic Farming: Tool to Preserve Sustainability of Agro-ecosystem

Sustainability of an agro-ecosystem is the ability of an agro-ecosystem to maintain productivity when subject to a major disturbing force (Conway, 1997).

Developments of these agro-ecosystems that meets the needs of the present without compromising the ability of future generations to meet their own needs, known as sustainable development (Bruntland, 1987).

Agriculture has been at the centre of the sustainability issue for two main reasons: Firstly, agricultural systems occupy large areas of land - far more land than any other industry with the possible exception of forestry. Therefore, what occurs within agriculture can often have major environmental effects. Secondly, the product of agriculture is often food, and we all eat. Agriculture is therefore one of the foundations of human society (Balachandran, 2004).

The capability of an agro-ecosystem to produce a good crop mostly depends on the soil quality. In fact, various physical, chemical and biological properties of soils interact in complex ways to determine the potential fitness for sustainable production of healthy nutritious crops (Soil Science Society of America, 1984).

For instance, describe sustainable agriculture as a philosophy, based on human goals and knowledge of impacts, which leads to "integrated, resource conserving, equitable farming systems which reduce environmental degradation, maintain agricultural productivity, promote economic viability in both the short and long term, and maintain stable rural communities and quality of life (Francis and Youngberg, 1990). Sustainable agriculture is a broad concept that covers a number of different approaches. All try in one way or other to achieve environmentally sound, economically profitable, ethically acceptable and socially responsible form of land husbandry. They have much in common with each other, and different people and organizations define them differently, so overlap is not unusual (Sustainet, 2006).

In fact, the secrets to feeding the world can be found only in the healthy soil. As our health is directly connected to the health of the food we eat and ultimately to the health of the soil (Lockie, *et. al*, 2006), it is important to take care of it to ensure the uninterrupted availability of good food. In a healthy soil, the biotic and abiotic components exist in a state of dynamic equilibrium. This state of soil life and the associated organic transformations enhance the vegetative capacity of the soil and make it resilient to absorb the effect of climatic vicissitudes and occasional failures in agronomic management.

To improve and maintain soil quality, the best means are alternative agricultural practices such as crop rotation, recycling crop residues and animal manures, reduced input of chemical fertilizers and pesticides, and increased use of cover crops and green manure crops, including nitrogen fixing legumes. All of these help to maintain a high level of soil organic matter that enhances soil tilth, fertility and productivity while protecting the soil from erosion and nutrient runoff (Papendick and Parr, 1989, Parr *et al*., 1983, 1989). However, only though the development of sustainable agricultural practices we can bring back the health of the soil. Organic farming is just one of the approaches of sustainable agriculture.

Organic farming promotes the increase in organic matter content in the soil. Organic matter has a profound impact on the quality of the soil as it encourages mineral particles to clump together to form granules, improving the structure of the soil. This increases the amount of water in the soil, the soil will hold and supply more nutrients, and the organisms in the soil are more active. All in all, organic material makes the soil more fertile and productive (Reganold, 1989).

While taking the soil health as a measure of sustainable practices we should be aware of the visible indicators of soil health. Generally earthworms can be called as biological indicators of soil health, for soils with earthworms definitely support healthy populations of bacteria, fungi, actinomycetes, protozoans, insects, spiders, millipedes, and a host of other organisms that are essential for sustaining a healthy soil (Ismail, 1997).

Earthworm casts get converted into stable soil aggregates by the action of gums that result from microbial digestion of their organic compounds (Waksman and Martin, 1939), or by the binding effect of fungal hyphae (Parle, 1963 a, b). There are also reports that certain metabolites produced by earthworms may be responsible to stimulate plant growth (Gavrilov, 1962; Neilson, 1965).

In Europe, researchers have found diversity and abundance of soil and surface living arthropods such as spiders, beetles, parasite flies and wasps as well as non pest butterflies and many other invertebrates species in organic farming systems compared to conventional farming systems (Tybirk *et. al*. 2004).

The main principles of organic farming as given by Claude (1999) were i) Nature is the best role model for farming since she does not use either chemicals or demands vast quantities of water, ii) The soil is to be considered as a living system, not as an inert bowl for unloading chemicals, iii) The soil's living population of microbes and other organisms is a significant contributor to its fertility on a sustained basis and must be protected, iv) The total environment of the soil, from soil structure to soil cover is more important for a healthy agriculture than any nutrients we may wish to pump into it.

The principles that distinguished organic farming from conventional farming methods are, in organic agriculture, soluble inputs are prohibited and synthetic pesticides are rejected in favour of natural pesticides. They use only natural manures and non chemical agents like insect predators, mating disruption, and traps are also used to protect crops from pest and diseases. On the other hand, conventional farmers apply chemical fertilizers in addition to organic manures to maintain soil fertility, and use plant protection chemicals to protect crops from pests, diseases, and weeds (Trewavas, 2001).

In terms of environmental sustainability many studies have been completed taking into consideration a large variety of agro-environmental indicators, such as soil organic matter, soil moisture, soil nutrients and biodiversity. Most indicators suggest that organic farming is less environmentally damaging than conventional farming and improve agro-environmental conditions (Lotter, 2003).

The findings of several studies indicate that excessive use of chemical fertilizers results in degradation of soil, water and environmental resources (Ghosh 2003, Pachauri and Sridharan 1998, Singh *et al.* 1987). On the other hand, the organic farming had beneficial effects on human health, sustainability of soil, water, and environmental resources and crop yields in the long run (Blaise 2006, Gareau 2004, Rahudkar and Phate 1992, Rajendran *et al.* 2000, Singh and Swarup 2000, Thakur and Sharma 2005).

Rembialkowska (2004) reviewed certain studies, which state that organic produces differ from conventional crops in respect of micro and macro elements content. However, the direction of these differences is not always the same and the

results are mixed. For instance, organic products contain more phosphorous, potassium, magnesium often also iron, copper and zinc where as levels of protein and calcium do not differ or else are higher in conventional crops.

According to Rai (2005) Organic farming systems can deliver agronomic and environmental benefits both through structural changes and tactical management of farming systems. The benefits of organic farming are relevant both to developed nations (environmental protection, biodiversity enhancement, reduced energy use and CO2 emission) and to developing countries like India (sustainable resource use, increased crop yields without over-reliance on costly external inputs, environment and biodiversity protection, etc.).

Long term experiments were conducted by Ghosh and Varadachari (2005), initially with soils, then pot trials and finally field experiments. They had observed that organic inputs improve soil pH, salinity, organic matter, total nitrogen, available phosphorus and potassium, and water holding capacity. Pot experiments substantiated better germination, plant height and weight, and increased total nitrogen. Field experiments had showed higher seed weight and nitrogen content, increased soil moisture and total nitrogen, and most importantly productivity. On critical analysis, it was concluded that yields as high as 'inorganic' agriculture can be achieved.

Babalad (2007) reported the multidimensional role of organic farming as organic agriculture protects water supply, enriches the soil, encourages bio-diversity, reduce the toxic bodies, employs sound cultural production practices, replaces synthetic fertilizers, chemicals and pesticides, enhances the inherent fertility and biological life to built soil, improves water quality, provide attentive care for farm animals, handle the agricultural products without the use of extraneous synthetic additives or processing in accordance with the act and the regulations, creates a safe environment for people and wild life, produces nutritious food of high quality, generates more income and employment opportunities for rural people.

However, while switching over to organic from conventional farming; the farm should go through a transition period to get it certified as organic. This is the time required for the chemical residues left in the soil until then due to conventional agricultural technique, to be neutralized.

Generally this time span is known as ‘conversion period’, the time from the start of the organic management till the certification of crops or animal husbandry as organic. Farmers cannot sell their produce as organic during the conversion period. Though the minimum period is fixed as three years by all most all certifying agencies, sometimes it may take a long period to restore the ecosystem potential where organic production is becomes economically viable.

However, it is also a fact that in areas with intensive high input agriculture, conversion to organic farming may often lead to a reduction in crop yields. Thus, a sudden transition from conventional to organic farming is not the right way to maintain sustainability but, integrating slowly all those agro ecological and other components to improve the overall biological efficiency and agro-eco system productivity (Halberg *et al.*, 2006). Over time, organic farming practices promote the formation of soil humus and accumulation of nutrient reserves in the bodies of soil organisms and in the readily decomposable form of soil organic matter (Wander *et al*., 1994).

Trials conducted in organic cotton at Nagpur indicated that after the third year, the organic plot, which did not receive fertilizers and insecticides, produced as much cotton as that cultivated with them (Rajendran *et.al*., 2000). Likewise, studies conducted in Punjab also revealed that organic farming gave higher or equal yields of different cropping systems compared to chemical farming after an initial period of three years (Kler *et.al.* 2002).

As the time required to restore the ecosystem potential largely depends on the pre-existing condition of the soil, which is in turn determined by the land use, the conversion period may not always same for different situation. Thus, in general crop yields in organic agriculture are on an average between 10 and 30 per cent lower than in conventional system [BMELF (1990), Rude (1990), Bockenhoff (1986), Priebe, (1990)].

The yield component in organic farming vary considerably according to the techniques used, varieties chosen, region, and so on just as conventional yields vary (Loganandhan, 2002). In most of the cases though farmers experience some loss in yields after discarding synthetic inputs and converting their operations from the

conventional system to organic production, after the conversion period organic agriculture produces higher yields and requires low external inputs (Partap and Vaidya, 2009).

Ramesh *et.al*, (2010) reported that organic farming, in spite of the reduction in crop productivity by 9.2 per cent, provided higher net profit to farmers by 22 per cent compared to conventional farming. This was mainly due to the availability of premium price (20–40 per cent) for the certified organic produce and reduction in the cost of cultivation by 11.7 per cent. There was an overall improvement in soil quality in terms of various parameters, viz. physical, chemical, biological properties, availability of macro- and micronutrients, indicating an enhanced soil health and sustainability of crop production in organic farming systems.

Development of Organic Farming in Kerala

There are a number of studies on different aspects of organic farming like organic manures, natural pesticides, integrated pest management, integrated nutrient management but organic farming as systems seems to have left out in the state till the late 90s (Balachandran, 2004). He further added that the most revealing statement on the agricultural situation in Kerala was given by the Kerala Land Use Board in 1997 through *Kerala State Resource based Perspective Plan 2020 AD*. The report was one of the most precise indications of the state's sorry state in agricultural affairs and it strongly recommended the adoption of sustainable agricultural practices at the earliest.

In order to protect environment and its scarce resources *One Earth One Life*, a voluntary nonprofit organization was formed in the year 1998 by Dr. John C Jacob, one of the pioneers of the environmental movement in Kerala. The research cell of this organization mainly deals with the different aspects of organic farming and coordinated organic farmers of the state under *Jaiva Karshaka Samithi* the first organic farmers group in Kerala.

Influenced by this a group of small farmers of Pulpally village of Wayanad district in the beginning of this millennium year. The area was certified by the Bangalore based IMO Pvt. Ltd. and this was the first recognized step of the state towards an organic movement. After Wayanad, a small village of Idukki district

Karunapuram have attained the status of cent per cent organic farming village, with all the 4,000 farmers in the village committed to use only organic inputs for their farms.

During the year 2001-2002 the Directorate of Agriculture started a scheme called 'Integrated Nutrient Management System' with an outlay of Rs.50 lakh for promotion of bio-fertilizers, starting of vermin-nursery and strengthening of soil fertilizer/pesticides-testing laboratories. The scheme intended to promote the usage of organic manure, bio-fertilizers etc. so as to maintain and to enhance the fertility levels of the soil. Subsequently, POABS Estates in the Nelliyampathy hills of Palakkad district, one of the largest perennial Multi-crop organic farms in the World (350ha) have attained the status of *POABS Organic Estates* in 2002. The estate was certified as organic by *Skal International* of the Netherlands and *Naturland* of Germany.

Realizing the ground realities, the State Department of Agriculture had started organic farming promotional activities in the financial year 2002-2003. In the following year, the Department had set up a cell for the promotion of sustainable agriculture and organic farming. Further, they have also launched two brands: *Kerala Organic* and *Kerala Natural* to market the organic farm produces.

Indian Organic Farmers Producer Company Limited (IOFPCL), the first Primary Producer's Company of India was established in Kerala in the year 2004 with a vision of empowering farmers, enabling eco-sustainability and ensuring safe food. However, most of the members of IOFPCL interested in organic farming of high value – low volume commercial crops like pepper, cardamom, vanilla, coffee, cocoa, nutmeg etc. as there are assured international markets for these produce.

As per the study report of NRAA (2009) among the member farmers of IOFPCL the reasons for practicing organic farming are

1. Earlier experience when the pepper plantation was almost wiped off due to indiscriminate use of inorganic pesticides and other chemicals.
2. High incidence of cancer cases in the area was attributed to pesticide residue (furadan)
3. Premium price of the organic produce in the domestic and export and export market can offset the low productivity.

While considering the role of Non-Governmental Organizations (NGOs) in the spread of organic farming throughout the state, Wayanad and Idukki stand first two positions. The NGO that playing a major role in Wayanad district is INFAM (Indian Farmers' Movement), an organization backed by the Catholic Church also helping farmers to export organic farm produce. It runs *Organic Wayanad*, a project in Wayanad district whose sole aim is to promote organic farming in the district. The promoter of *Vanamoolika* (one of the NGO promoting organic farming in Wayanad) Mr. Chakkochan says *the status of certified organic farmers in Wayanad have reached 5673 with an area of 3983.28 ha by the middle of 2010*. This comes nearly 18.74 per cent of the geographical area of the district.

In Idukki district, Peermade Development Society (PDS) have the hand and it started to promote organic tea production in the district from the year 1998 for export market. With the help of this NGO the small and marginal tea farmers established a consortium of nearly 1200 members; with a total area of nearly 800 hectares. PDS helped in obtaining a loan from local banks to build the factory (one-third of the cost was covered by the Donors), which is now owned jointly by PDS and the farmer consortium and the factory was opened in November 2003. In order to get access to the international market, PDS arranged for the farmers to be certified by an internationally accredited agency, Skal International and also obtained a Fair Trade certification through the Fair Trade Labeling Organization.

As per different study reports, out of the 14 districts of Kerala state, Wayanad and Idukki have occupied in the first two places while accounting the certified organic agriculture area. The two districts are famous for their export of organic spices and beverages to different European countries and USA. These two districts are located in the Cardamom Hills of Western Ghats, the house of various spices and beverage crops. But, Balachandran (2004) reported that Wayanad and Idukki districts had showed poor representation in the number of organic farmers in the late 90s. However, may be due to the more involvement of different NGOs the two districts have moved to a best position in export of organic produce within a short period.

According to Sebastian (2007), the executive director of Indocert, 5,175 farmers in Kerala have won the certification. While it certified 155 farmers last year, 144 certificates have been issued this year. He also conveyed that it is the premium

price for organic produce that attracts farmers to organic cultivation. To pursue organic farming, farmers are expected to make an integrated approach for all farming activities, from seed to the produce - using only manure from organic sources, bio-fertilizer and bio-pesticides. They should start practicing mixed farming - rearing livestock for organic manure, as procuring farm yard manure from outside won't be cost effective.

As the next step towards a big movement, the State Government itself came forward along with a new policy on organic farming in 2007 and that had been formulated by the State Biodiversity Board. They have put forward the concept of gradual conversion of the state to organic completely with ten years. The policy document entitled *Kerala State Organic Farming Policy, Strategy and Action Plan* have a vision statement to "make Kerala's farming sustainable, rewarding and competitive ensuring poison-free water, soil and food to every citizen". It envisages a 24-point strategy with a clear action plan under each strategy mentioned.

The implementation of the policy has been declared recently in May 2010 after a series of debates with agricultural experts, various NGOs and other farmers' groups who are willing to promote organic agriculture in the state. The mission to convert Kerala into an organic state is planned to achieve in a phased manner, and focusing on potential crops and areas in the initial period. In the first phase, the target is to cover an area of 40,000 hectare i.e., 10 per cent area of the state. The policy document is giving a promise of a comprehensive assessment of the farmers' well being, economy and environment by the end of third year of implementation and rectification of drawbacks if any.

Influenced by different sustainable developmental models of the state the Kerala Ministry of Local Self Government along with Suchitwa Mission, Centre for Development of Imaging Technology (C-DIT), and DD Malayalam (Kerala wing of Doordarshan Kendra) were came up with *Green Kerala Express*, the unique social reality show in the beginning of 2010. The program had focused on sustainable development models developed by the local self-governments. The agricultural and allied sectors have proved its power throughout the show and it could unravel a number of proud green realities of organic farming efforts from different parts of the state.

In short, sustainable agriculture requires a system approach (Feenstra *et al*. 1997) to prove it as a success. For that, farmers, labourers, researchers, extension workers, policymakers, retailers, consumers, and other stakeholders are the participants in this system and it emphasizes an interdisciplinary effort in research and education. Sustainable yield in the agro-ecosystem is the result of a proper balance of crops, soils, nutrients, sunlight moisture and coexisting organisms. The agro-ecosystem is productive when this balance and rich growing condition prevail, and crop plants remain resilient enough to tolerate stress and adversity (TOKAU, 2008).

While considering the role of an extension agent in motivating farmers to the adoption of different organic farming technologies, it is important to give ears to the words of Rosario (1997) that the new role for organic agricultural trainer or extension worker is not so much about teaching special techniques, rather to stimulate new motivation so that organic agriculture is valued more highly. It requires a commitment and this often involves risks where there is not a lot of information.

CHAPTER - III

RESEARCH METHODOLOGY

Research methods and procedures followed in the present study are given in this chapter. The various aspects included in the chapter have been given under the following sub heads:

3.1. Research design

3.2. Locale of the study

3.3. Pilot study

3.4 Sampling procedure

3.5. Variables and their measurement

3.6. Data collection tools and procedure

3.7. Statistical analysis

3.1. Research Design

A research design is the overall plan or program in any research. According to Tripathi (1987) it is the general blueprint for the collection, measurement and analysis of data. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of the data.

An ex-post-facto research design was adopted for the present study. According to Kerlinger (1964) an *ex-post facto* research is a systematic empirical enquiry in which the researcher does not have direct control over the variables because their manifestations have already occurred or because they are inherently not manipulable.

The *ex-post facto* research design was used in the present study, as the manifestations of the variables presumably had already occurred and there was no scope for manipulation of any variable.

3.2. Locale of the Study

The study was conducted in Thiruvananthapuram, Thrissur, Palakkad, and Wayanad districts of Kerala state. Kerala is a small strip of land lying at the south-west corner of India and occupies an area of 38,863 square kilometer (comes to 1.27 per cent of India's land area). The state is divided into 14 districts and surrounded by Karnataka State in the northern part, Tamilnadu State in the Eastern part and Arabian Sea in the South-western part. The temperature in Kerala normally ranges from 28° to 32° C on the plains but drops to about 20° C in the highlands. The average annual rainfall is about 3000mm. The state is blessed with 44 rivers, out of this, 41 rivers flows to the western region and the remaining 3 rivers flow to the east. The longest river is the Bharathapuzha (about 374.40 Km).

Kerala is naturally divided into three geographical regions as highland, lowland and midland throughout the length of the state (See Fig. 3.1 for the three geographical divisions of the state) and each region is unique with its own climatic condition and cropping pattern.

The Highlands slope down from the Western Ghats are important for crops like *tea, coffee, rubber* and various spices like *pepper, cardamom*. The Wayanad and Palakkad districts belong to this zone. The Midlands, lying between the mountains and the lowlands, is made up of undulating hills and valleys accounts for intensive cultivation of *cashew, coconut, arecanut, tapioca, banana* and *vegetables*. Lowlands are made up of numerous shallow lagoons known locally as *kayals*, river deltas, backwaters and shores of the Arabian Sea and are essentially a land of *coconuts and rice*. Thiruvananthapuram and Thrissur districts included both midlands and lowlands.

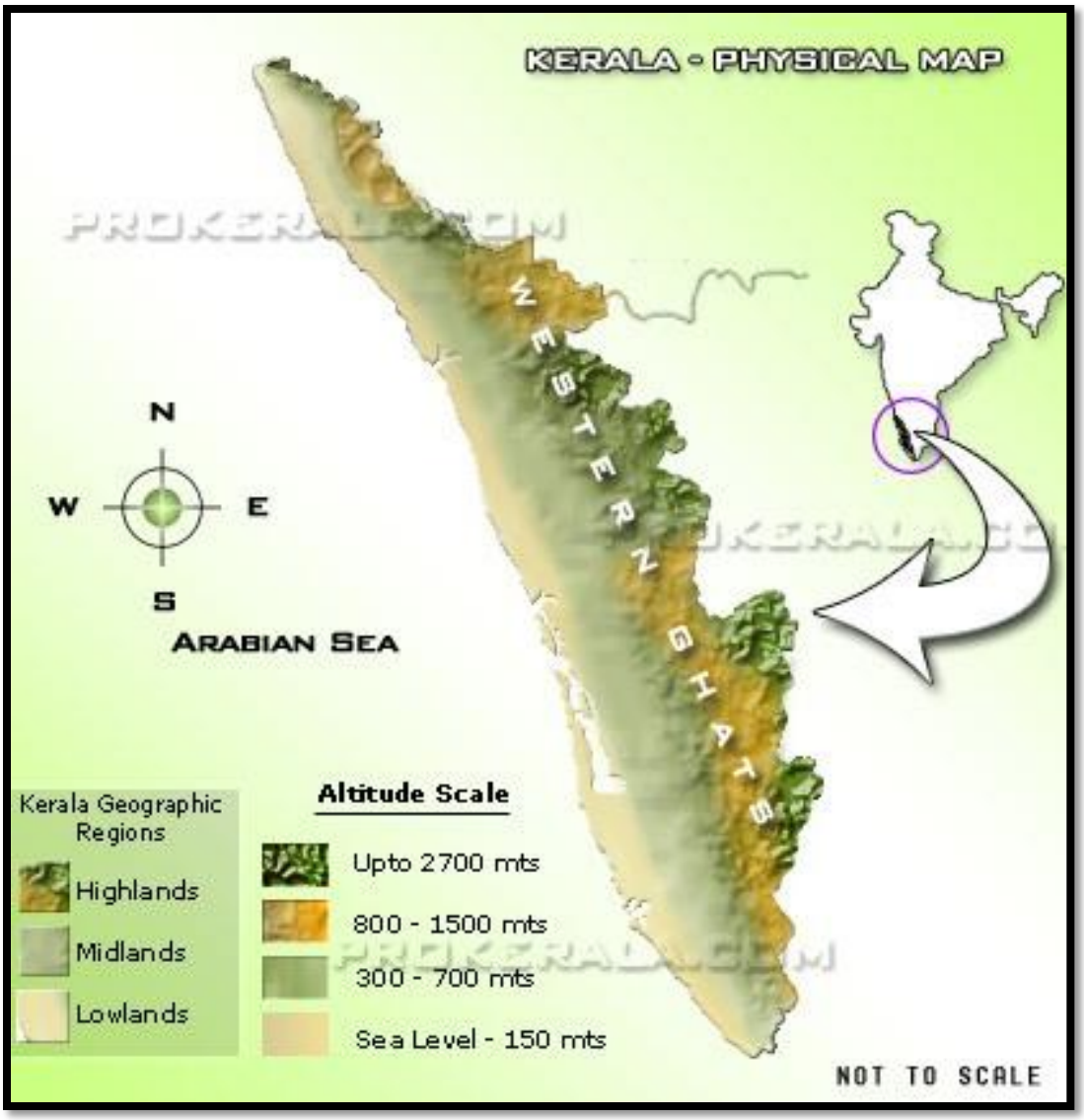


Figure 3.1: Map of Kerala State Showing Three Natural Divisions

Kerala is one of the pioneer states in India that had started efforts towards organic movement at government level. The state Department of Agriculture started promoting organic farming through setting up a separate cell for the promotion of sustainable agriculture and organic farming seven years back in 2002-03. It was also claimed that Kerala has a rich potential for the promotion of organic farming since the inorganic agriculture in the state is not that severe compared to other states in the country.

3.3 Pilot Study

Since there were many varied reports about organic farming from Kerala: an ambitious organic farming policy and strategy initiated by Kerala State Biodiversity Board (KSBB) and its opposition from Teacher's Organization of Kerala Agricultural University (TOKAU), and reports of various NGOs engaged in successful cases organic farming, it was felt that a pilot study would help in identifying the sample of organic farmers for the study. Hence, a pilot study was conducted to identify the villages and districts for the study. The members of advisory board for the formulation of organic farming policy of the state working in Kerala State Biodiversity Board and KAU were also consulted. Then a list of certified organic farmers engaged in organic farming in the state was collected from the INDOCERT office located in Aluva town of Ernakulam district of Kerala.

In addition, information about uncertified organic farmers was obtained from the scientists of Kerala Agricultural University (KAU) at Thrissur. Various NGOs engaged in the fight against the chemical farming and promotion of environmentally friendly sustainable agriculture and organic farming in the state were contacted. One NGO, namely Thanal in Thiruvananthapuram was contacted which gave a list of organic farmers. The results of the pilot study were encouraging as organic farming was being practiced in diverse agro-climatic as well as socio-political situations.

It was found through pilot research that out of the fourteen districts of Kerala, seven districts: Idukki, Wayanad, Thiruvananthapuram, Alappuzha, Palakkad, Thrissur and Kannur were involved in the promotion of organic farming. Further, out of these seven districts, four districts were selected in such a way that they represent all the three geographical regions as well as the diverse cropping patterns of the state.

The suggestions of KAU agronomists were taken in identifying organic farmers of Adat region in Thrissur district. Kerala State Biodiversity Board also suggested Adat model of organic farming of rice. The peri-urban area of Thiruvananthapuram district was selected for identifying organic farmers suggested by the NGO, Thanal. The Kerala Forest Department (KFD) suggested Pooppara village in Parambikulam Wildlife Sanctuary in Palakkad district. INDOCERT and Thanal had suggested in selecting Mullankolli village of Wayanad district.

3.4. Sampling Procedure

Through the pilot study, four districts were finally selected for the study (See Fig 3.2 for the location of the districts in the map of Kerala). From each selected district one village was identified based on the organic farming efforts as well as the number of organic farmers in the village. Thus, Azhakulam village of Thiruvananthapuram district, Adat village of Thrissur district, Pooppara village of Palakkad district, and Mullankolli village of Wayanad were selected for the study as given in Table 3.1 below. Twenty farmers who were actively involved in organic farming and its further promotion were randomly selected from each of these villages. Thus that formed a sample of eighty organic farmers from the Kerala state.

Table 3.1: Selection of Districts and Villages through Pilot Study

District (Geographical divisions)	Village	Suggested by	Special Features	Sample size
Thiruvananthapuram (midlands and lowlands)	Azhakulam	Thanal, NGO	Peri-urban homesteads near the Vizhinjam town of Thiruvananthapuram	20
Thrissur (midlands and lowlands)	Adat	KAU, KSBB	Farmers' Cooperative of organic paddy growers	20
Palakkad (highlands)	Pooppara	KFD	Natural farming methods, organic farming by default	20
Wayanad (highlands)	Mullankolli	Thanal, KAU, INDOCERT Vanamoolika	Certified organic farmers of Wayanad Social Service Society, an NGO	20

These eighty farmers were personally interviewed by the researcher for collecting data on adoption of organic farming practices, their sustainability and

Figure 3.2: Map of Kerala State Showing Selected Districts

constraints. In addition, for the in-depth analysis of the impact of group efforts being taken up various agencies engaged in the spread of organic farming movement of the state, one case study was also done from each of these four selected districts. These cases were further analyzed critically to draw reflections and lessons for promotion of organic farming in Kerala. To analyze the institutional mechanisms for the promoting organic farming a sample of twenty officials from the four districts and other agencies were selected. Suggestions on the advocacy strategies for implementing organic farming policy strategy and action plan were also obtained from all the officials engaged in promotion of organic farming in Kerala.

3.5. Variables and their Measurement

The appropriate variables for the present study were prepared based on the objectives of the study, review of literature, discussion with experts and also the observations made by the researcher.

Measurement of Socio-economic Variables

Age: Age was measured as the number of chronological years completed by the respondent at the time of investigation.

Educational Status: This refers to the years of formal education achieved by the respondent. To measure this variable scoring pattern developed by Trivedi (1963) was adopted with some modifications in the present study.

Category	Code
Illiterate	0
Functionally literate	1
Primary school	2
Upper Primary school	3
High School	4
Collage and above	5

Occupational Status: Occupational status refers to the major activity of the respondent in which he or she was involved for most part of the day, and which

generates the major part of family income. For this, an arbitrary scoring system was developed as follows:

Category	Code
Fulltime Farmer	1
Farming and other occupation	2
Any other	3

Family Type: This refers to the type of the family to which the respondent belongs to. For this, an arbitrary scoring system was developed as follows

Category	Code
Nuclear Family	1
Joint Family	2

Family Size: This refers to the total number of family members of the respondent. For that, an arbitrary scoring system was developed as follows:

Category	Code
1 – 4 members	1
5 – 8 members	2
9 – 12 members	3
> 12 members	4

Type of House: This refers to the kind of house possessed by the respondent. For that, an arbitrary scoring system was developed as given below.

Category	Code
Thatched	1
Tiled	2
Concrete	3
Concrete double story	4

Total Land Size: The extent of land an individual possessed and cultivated was termed as land holding. The size of land that the respondent possessed was taken as his land holding and total land size was measured as the total owned land in acres.

Area under Organic Cultivation: The size of land in which the respondent was practicing organic farming was taken as his area under organic cultivation and that was measured in acres.

Experience in Farming: This refers to the total number of chronological years the respondent has been engaged in farming.

Experience in Organic Farming: This refers to the total number of chronological years the respondent has been engaged in organic farming.

Type of Farming: This refers to the kind of farming methods the respondent was following in his farm. For this, an arbitrary scoring system was developed as follows:

Category	Code
Monoculture	1
Crop Rotation	2
Dry land Farming	3
Mixed and Multistoried	4
Mixed Farming	5

Crops Grown in the Farm: This refers to the total number of different crops including vegetables grown on commercial basis by the respondent. To measure this variable the total number of crops grown on commercial basis itself was taken as the score.

Allied Agricultural Activities: This refers to the different agricultural related activities that the respondent was practicing along with the cultivation of different crops. For this, an arbitrary scoring system was developed as follows:

Category	Code
Cattle/ Goat/ Piggery/ Rabbit	1
Poultry/Duck	2
Bee Keeping	3
Fish	4
Others	5

Share of Agriculture in Total Household Income: This refers to the contribution of agriculture and allied sector of the respondent towards his/her family income. For this, an arbitrary scoring system was developed as follows:

Category	Code
From farming alone	2
Partially from farming	1
Not at all from farming	0

Irrigation Potential: This refers to the availability of water to irrigate the crop in the farm. To measure this variable the scoring pattern used by Bonny (1991) was adopted.

Category	Code
Throughout the year	2
Seasonal	1
Not assured	0

Water Source: This refers to the source of water to which the respondent is depending for meeting the farm and home requirements. For this, an arbitrary scoring system was developed as follows:

Category	Code
Well	1
Pond/Tank	2
Canal	3
River	4
Bore well	5

Farmer's Perception of his Farming Method: This refers to the attitude of the respondent about the farming method he/ she has adopted in his/her farm. For this, an arbitrary scoring system was developed as follows:

Category	Code
Traditional	1
Modern	2
Partly Organic	3
Fully Organic	5

Resources for Organic Farming: This refers to the source of various inputs that have been used for organic cultivation. For that, a simple arbitrary scoring procedure was developed as follows:

Category	Code
On-farm resources	1
Off-farm resources	0

Farming Group Membership: This refers to the involvement of the respondent in any farmer group either as a member or as an office bearer. If the respondent is a member of any farming group a score '1' was given, else a score '0' was given to measure this variable.

Other Organization Membership: This refers to the involvement of the respondent in any organization other than the farmer group. If the respondent is a member of any farming group a score '1' was given, else a score '0' was given to measure this variable.

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 including this study for assessing their adoption. These are: i) Bio-pesticides, ii) Bio-fertilizers and manures, iii) Use of traditional seeds, iv) Selective weeding, v) Intercropping and crop rotation, and vi) Minimum tillage and mulching.

Measurement of Extent of Adoption

The extent adoption of different organic farming technologies were analyzed through an arbitrary scale developed for the purpose that contains major six technological innovations in organic farming and responses were scored as per the scoring system given below. The set of questions used is given in Appendix I.

Category	Code
Fully Adopted	2
Partially Adopted	1
Not at all Adopted	0

Measurement of Sustainability of Organic Farming

The sustainability aspects of various organic farming practices were analyzed through an arbitrary scale developed that contains a set of fifteen questions in three dimensions of sustainability viz., Ecological, Economic and Social.

Responses were scored on a 4-point continuum ranging from 1 = 'Not True' to 4 = 'Always True' for all statements. The statements for the three dimensions of sustainability are given in Appendix I.

Measurement of Constraints of Organic Farming

For the measurement of constraints in the promotion of organic farming eight dimensions of constraints analyzed through an arbitrary scale developed for the purpose, that contains a set of twenty eight questions in seven dimensions viz., i) Technological constraints, ii) Economic constraints, iii) Social constraints, iv) Personal constraints, v) Certification constraints, vi) Grading and Marketing constraints, and vii) Ecological constraints.

Responses were obtained on a 3-point continuum ranging from 1=Not Severe to 3=Most Severe for all statements. The statements under each dimension are given in Appendix I.

3.6. Data Collection Tools and Procedures

The data were collected through personal interview with the respondents and a semi-structured interview schedule was constructed for the purpose. The schedule was prepared in English and respondents were being interviewed mostly in their farm and/or home.

Case studies were done through group interaction of the respondents and responses were gathered with the help of a semi-structured interview schedule with open ended questions developed specially for the purpose. These schedules are given in Appendix I.

3.7 Statistical Analysis

Data analysis and interpretation are the next steps after collecting the adequate data and categorization of data according to the objectives of the study. For the present study, data were collected both in the form of primary data as well as secondary data. Data were subjected to descriptive statistics namely mean, standard deviation, frequency, percentage analysis using SPSS (Statistical Package for Social Sciences).

In addition to this, Kruskal-Wallis (KW) Test, a nonparametric alternative to one way ANOVA was also used to analyze variables measured in 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. In addition to statistical analysis, case stories were written, discussed, critically analyzed and interpreted. Reflections and lessons were drawn from case study analysis.

CHAPTER IV

RESEARCH PAPER-I

Factors behind the Shift to Organic Agriculture in Kerala

Abstract

In the study conducted among eighty organic farmers of four districts in Kerala state to delineate the factors that prompted them to shift from conventional farming to organic farming revealed four major factors behind this shift. The first ranked among them was: 'organic farming reduces environmental pollution' which was the most important ecological factor. The increasing concern about the conservation of their agro- ecosystem pushed farmers to shift to organic farming. The second set of factors related to positive factors that pulled them towards organic farming: 'high price, chemical-free safe food and increasing domestic market for organic produce'. The third set of factors was the lure of exports that prompted them for group farming and marketing of organic produce. The least ranked factor was the 'financial support from government for organic farming'. Ecological concerns weighed heavier than economic support from government, among these organic farmers.

Key Words: Shift to organic farming, agro-ecosystem, organic market

Introduction

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 decades. Kerala state too witnessed similar changes in its agriculture sector. As these developments 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).

The reports from other parts of the country was similar, as the productivity of intensive rice wheat systems of the Punjab has started to show signs of serious decline associated with soil quality (Nambiar, 1994) and also the continuous use of fertilizers

in Gujarat has resulted in loss of soil fertility and decline in farm output to the extent of 60-80 per cent over the past few decades (Kaushik, 1997). If these situations persist for a long the greatest challenge that the nation is going to face in the coming years will be *to provide safe food for its growing population*. In this regard, organic farming which 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 (Bhattacharya and Krishna, 2003).

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 (Das, 2004).

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 is a big market for organic food. The homestead farming model which popularly known as *'organic by default'* 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 for going organic, with considerable success. Considering all these facts, this study was planned to analyze the factors behind the need for a shift from conventional farming to complete organic farming in Kerala.

Methodology

Assessment of the various factors behind the shift from conventional farming to organic farming practices is important to confirm the initial beliefs about the need for that particular farming method to the existing agricultural scenario of the study area. The study was conducted in the four districts: Thiruvananthapuram, Thrissur, Palakkad, and Wayanad of the Kerala state. As there were a number of techno-economic and social psychological factors associated with the adoption of any technology a pilot study was conducted to identify different factors contributing to the shift to organic agriculture of the state from its conventional agriculture. Three steps of activities to identify the factors behind the shift were: developing a sample questionnaire, targeting and interviewing, and discussion with selected agricultural scientists, certification agencies, NGO officials and practicing organic farmers. The identified factors were grouped into eight statements. The eight factors (statements) which were identified as the major causes for the shift from inorganic farming to organic farming are as given in the following Table 4.1.

Table 4.1: Factors behind the Shift to Organic Farming

Items	Factors (Statements) Identified
Stmt 1	High price of organic produce
Stmt 2	Organic farming produces chemical free food
Stmt 3	Organic farming reduces the environmental pollution
Stmt 4	Organic farming lowers the cost of cultivation
Stmt 5	Increasing domestic market for organic produce
Stmt 6	High demand of organic produce in the export market
Stmt 7	Financial support from government
Stmt 8	Organic farming enables group farming and marketing

A survey approach was used for the main study and eighty farmers who were actively involved in organic farming and its further promotion were selected from four districts and that formed a random sample of eighty respondents. A semi-structured schedule that includes the eight major factors was developed for data collection and responses were collected through interview method. The respondents were asked to rank these eight factors based on their view point while adopting the organic farming as well as from their experience after the adoption of organic farming.

For the analysis of data, descriptive statistics like frequency, percentage and mean, and Kruskal-Wallis Test (KW test) were used. Kruskal-Wallis one-way analysis of variance by ranks is an extremely useful technique for deciding whether k samples are from different populations. So, this statistical tool was used to understand whether the eight statements are independent based on the ranks assigned by a sample of eighty farmers on all the eight statements.

Results

It was of interest to see whether these eight factors (statements) are independent or not. Here, Kruskal-Wallis test was performed to test the independence and also to identify the most important factor on the basis of the mean rank. The results obtained for the analysis of the statements related to the eight groups of identified factors are given in the following Table 4.2.

Table 4.2: Computed Value of Kruskal-Wallis Statistic and Significance Level

Category	Values
K (Observed value)	391.768
K (Critical value)	14.067
DF	7
p-value (Two-tailed)	< 0.0001
Alpha	0.05

Here, as the computed *p*-value is less than the significant level at one per cent ($p < 0.01$) it can be inferred that at least one of the factors (statements) is different from others. When the obtained value of Kruskal-Wallis test was significant, it

indicated that at least one of the statements was different from at least one of the others. It does not tell which ones were different, nor does it tell how many of the statements were different from each other. Hence multiple comparisons procedure was adopted to identify the most important reason behind the shift form inorganic farming to organic farming and also to group the statements based on the mean ranks.

The Table 4.3 given below shows the mean of rank corresponding to each of the statements and also the grouping letter which shows the homogeneous statements according to farmers.

Table 4.3: Comparison of the Identified Factors of Shift to Organic Farming

Factors of Shift to Organic Farming	Frequency	Mean of ranks	Groups			
Organic farming reduces the environmental pollution	80	140.5	A			
High price of organic produce	80	220.5		B		
Organic farming produces chemical free food	80	220.5		B		
Increasing domestic market for organic produce	80	240.5		B		
High demand of organic produce in the export market	80	300.5		B	C	
Organic farming enables group farming and marketing	80	360.5			C	
Organic farming lowers the cost of cultivation	80	480.5				D
Financial support from government	80	600.5				E

Mean ranks having same letter are not significantly different

It can be seen from the Table that statement 3 i.e., *Organic farming reduces the environmental pollution*, is most important factor behind the shift and is significantly different from all other factors and followed by *High price of organic produce, Organic farming produces chemical free food, Increasing domestic market for organic produce* and so on. The least influenced factor behind the shift is identified as *financial support from government through the Kerala state organic farming policy*. The statements *High demand of organic produce in the export market*

and *Organic farming enables group farming and marketing* are homogeneous in the sense that the farmers gave almost similar ranking to both the statements.

To explore more, the probability Table (Table 4.4) is also given to identify those statements which are significantly different from each other.

Table 4.4: *p*- Values for the Pair wise Comparisons of Factors behind Shift

	Stmt 1	Stmt 2	Stmt 3	Stmt 4	Stmt 5	Stmt 6	Stmt 7	Stmt 8
Stmt 1	1	1.000	**0.001**	**< 0.0001**	0.853	0.090	**< 0.0001**	**< 0.0001**
Stmt 2	1.000	1	**0.009**	**< 0.0001**	0.861	**0.013**	**< 0.0001**	**< 0.0001**
Stmt 3	**0.001**	**0.009**	1	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
Stmt 4	**< 0.0001**	**< 0.0001**	**< 0.0001**	1	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
Stmt 5	0.853	0.861	**< 0.0001**	**< 0.0001**	1	0.414	**< 0.0001**	**< 0.0001**
Stmt 6	0.090	**0.013**	**< 0.0001**	**< 0.0001**	0.414	1	**< 0.0001**	0.099
Stmt 7	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	1	**< 0.0001**
Stmt 8	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	0.099	**< 0.0001**	1

Here, the probability corresponding to the difference in mean ranks of statement 1 and statement 3 is **0.001** which is less than 0.01 and hence the two statements are significantly different according to the ranks given by the farmers.

To make the results more comprehensible the percentage distribution of the respondents over the eight factors, which were identified through a preliminary investigation as the major reasons behind the shift to organic farming movement in Kerala, is also given in Fig. 4.1.

Discussion

The results of the study clearly highlighted the significance attached to organic farming in reducing environmental pollution. 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.

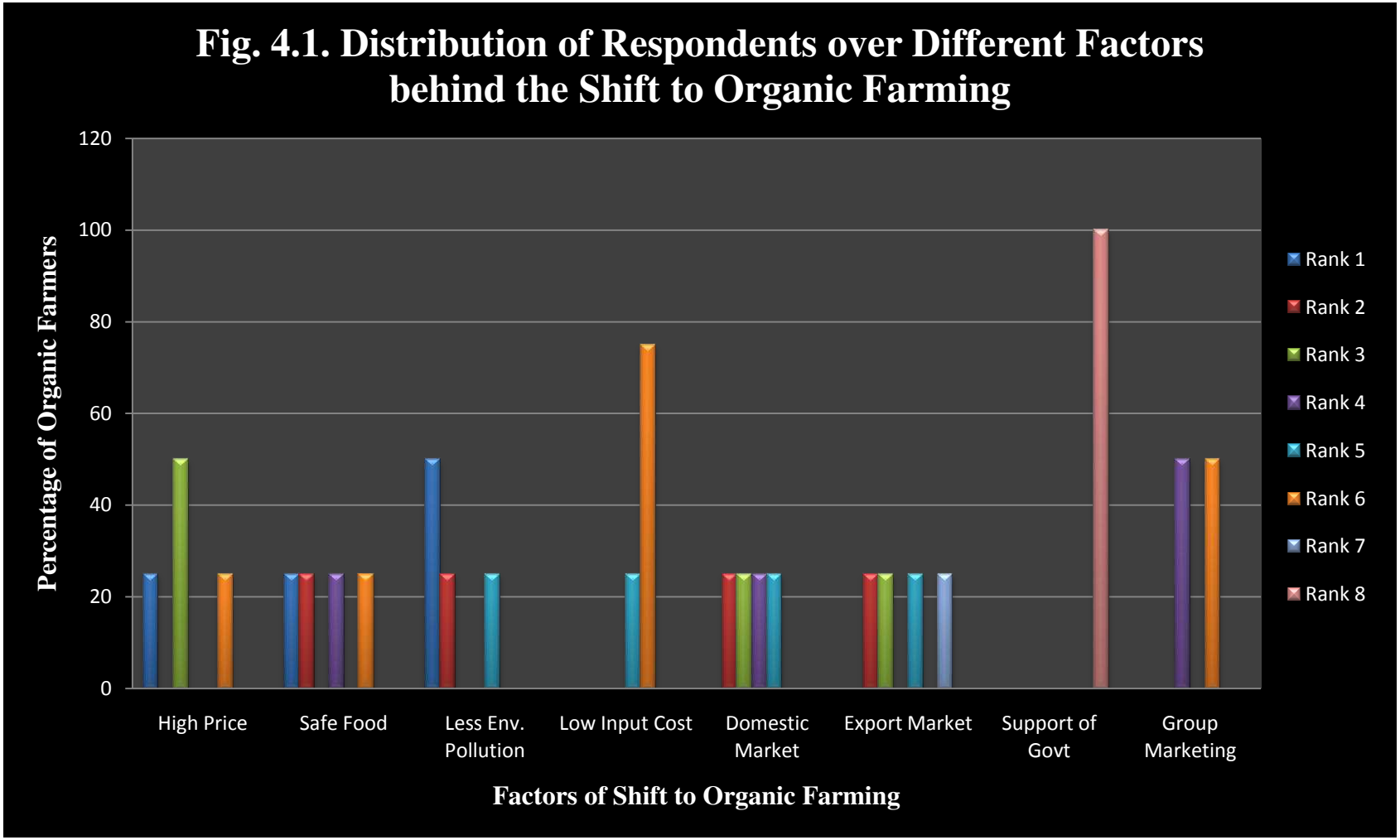


Fig. 4.1. Distribution of Respondents over Different Factors behind the Shift to Organic Farming
Percentage of Organic Farmers
120
100
80
60
40
20
0
High Price
Safe Food
Less Env. Pollution
Low Input Cost
Domestic Market
Export Market
Support of Govt
Group Marketing
Factors of Shift to Organic Farming
Rank 1
Rank 2
Rank 3
Rank 4
Rank 5
Rank 6
Rank 7
Rank 8

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. 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.

Conclusion

The most significant factors behind the shift from inorganic farming to organic farming were the concern of farmers for reducing environmental pollution and restoring the agro-ecosystem (soils, water and the surroundings) from pesticide poison residues. It was an interesting finding that farmers had an awakening for ecological concerns, which was a 'push factor' for this shift to organic farming. Wide publicity of this aspect would bring in more farmers into the fold of organic farming movement. On the other hand, the 'pull' factors like the positive aspects of organic farming that it would produce chemical-free safe food and fetch higher prices in both domestic and international markets were another set of factors that were playing a significant role in pulling farmers towards shifting to organic farming. Both these 'push' and 'pull' factors may be exploited in devising strategies for promoting organic farming in the state. The farmers were seriously looking for alternatives for safer environmentally-friendly agricultural solutions like bio-fertilizers, vermicompost, bio-

pesticides, etc., which need to adequately supported by the agricultural extension professionals, that would help spread organic farming in Kerala.

CHAPTER IV

RESEARCH PAPER - II

Extent of Adoption of Major Technological Innovations in Organic Farming and their Sustainability to Agro-Ecosystem

Abstract

In the study conducted among eighty organic farmers of four distriicts of Kerala with an objective of assessing the extent of adoption of different organic farming technologies and their sustainability aspects, it was revealed that majority of organic farmers were adopting bio-pesticides, followed by bio-fertilizers, minimum tillage andmulching and selective weeding. Intercropping and crop rotation practices were least adopted by them. These organic farming practices were perceived to be ecologically and economically sustainable. Organic farming was benefiting the farm especially in the protection and recharge of on-farm resources.

Key Words: Organic farming, Extent of adoption, Sustainability

Introduction

Agriculture in a broad sense cannot be considered as an enterprise that leaves everything to nature without any intervention, as opined by naturalist school of organic farming. Rather it is a human activity in which the farmer attempts to integrate certain agro-ecological factors and production inputs for optimum crop and livestock production. Yet, the indiscriminate use of chemicals to manage different pests and disease problems over the years had destroyed the sustainability of the nature. Along with the pests many naturally occurring biological control agents also disappeared from the nature due to the over use of chemical pesticides. As reported by Ghosh (1996) in tropical countries, the plants are pollinated more by insects than by wind. So, if the bees and insects die, then the losses to the vegetable world would become so heavy that no amount of fertilizer can compensate.

The human as well as ecological health hazards associated with the intensive agriculture and other related factors gave birth to new sustainable models like organic agriculture. However, the success of organic agriculture depends on the efficiency of agronomic management practices adopted to stimulate and augment the underlying productivity of the soil resource to a great extent. In this context, the concept of agro-

ecosystem becomes relevant. A farming system unit is treated as an agro-ecosystem when it attains the resemblance of a forest ecosystem in species diversity and its multiplicity (Palaniyappan and Annadurai, 2007). Yet, to ensure an optimum productivity of an agro-ecosystem in the long run, it is important to keep its vitality by adopting the sustainable agricultural practices. For that, the adoption of the ideal technologies at right time is important. National Research Council outlined the ultimate goal of sustainable agriculture is to develop farming systems that are productive and profitable, conserve the natural resource base, protect the environment, and enhance health and safety over the long run (NRC, 1989).

The adoption of any technology is always associated with a set of positive as well as negative factors. These factors have different levels of importance in different regions with respect to the culture, local agro-climatic conditions, socio-economic aspects, influence of service provider, and even the mindset of farmers. For instance, the rice seed innovations featured in the Bangladeshi videos are reported to be sustainable in all the aspects since; i) these innovations incorporated local knowledge and skills, scientists were involved only to explain the principles or to improve the practices ii) the practices entirely employed locally available natural resources iii) and they promoted on farm resources (Lee, 2005). In a similar line, the appropriateness and adoption of organic agriculture varies upon a range of interrelated environmental and socio-economic factors like the degree of intensification of farming system, agro-climatic factors, labor input, environmental concerns, land size and ownership, cropping system and sub-system within the farm, proximity to urban markets, economic factors, education, availability and cost of organic materials, culture, gender, and aversion to the use of organic methods (Sharma, 2002).

The non-governmental organization extension service also convinced farmers to take up on-farm experimental plots for organic farming experimentation. Provision of getting information about natural alternatives from these extension services motivated farmers to take part in experimentation and had sustained farmers' interest to continue experimentation in organic farming (Kumar, 1998). The economic viability of organic farming may be another reason for the increasing adoption of these technologies. In this background, the study was planned to assess the extent of

adoption of different organic farming technologies and to analyze the viability of organic farming technologies in keeping agro-ecosystem sustainability.

Methodology

The study was conducted in the Kerala state. Farmers who were actively involved in organic farming and its further promotion in Kerala formed a random sample of eighty respondents from these four districts: Thiruvananthapuram, Thrissur, Palakkad, and Wayanad. A pilot study was conducted to finalize the sampling units and to enlist the different organic farming technologies recommended by the state department of agriculture, agricultural scientists and certification agencies in Kerala. The identified eco-friendly farming technologies were categorized six groups of technologies, which are given in the following Table 4.5. The details of these six groups of organic farmers are given in Appendix III and the details of preparation of bio-pesticides and organic nutrient supplements are given in Appendix IV. Their sustainability aspects were also measured on the three dimensions of sustainability: ecological and economic sustainability and social compatibility.

Table 4.5: Technological Innovations in Organic Farming

Sl. No.	Organic Farming Practices
1.	Bio-pesticides
2.	Bio-fertilizers and manures
3.	Use of traditional seeds
4.	Selective weeding
5.	Inter cropping and crop rotation
6.	Minimum tillage and mulching

The study was based on primary data and data were collected through personal interviews from the organic farmers with the help of a specially designed semi-structured schedule. The schedule included selected six groups of organic farming technologies along with measures of sustainability aspects of these technologies. To analyze the obtained data statistical tools like percentage analysis, correlation and Kruskal-Wallis (KW) test were used. In the sustainability analysis a multiple comparison procedure was also adopted along with KW test to show how many statements are different from each other as well as the homogeneity of different statements under each of the three dimensions of sustainability.

Results

Six major sets of organic farming practices were studied and their results are presented in this section: extent of adoption, and mean ranks of KW test.

Extent of Adoption of Technological Innovations in Organic Farming: The distribution of respondents on level of adoption for the selected organic farming technologies is given in Table 4.6 and the results of mean ranks of extent of adoption of the six groups of technological innovations are given in Table 4.7.

Table 4.6: Distribution of Respondents on Different Levels of Adoption

Sl. No.	Organic Farming Technologies	Full Adoption		Partial Adoption		No Adoption	
		f	%	*f*	%	*f*	%
1.	Bio-Pesticides	47	58.7	31	38.8	2	2.5
2.	Bio-Fertilizers and Manures	32	40.0	48	60.0	0	0.0
3.	Use of Traditional Seeds	27	33.8	33	41.2	20	25.0
4.	Selective Weeding	34	42.5	24	30.0	22	27.5
5.	Inter Cropping and Crop Rotation	8	10.0	30	37.5	42	52.5
6.	Minimum Tillage & Mulching	36	45.0	22	27.5	22	27.5

Results in Table 4.6 revealed the varying degrees of extent of adoption of major technological innovations of organic farming by the respondent group of organic farmers. The highest percentage of organic farmers had ‘fully adopted’ bio-pesticides (58.7 per cent). About 60 percent of respondents had partially adopted bio-fertilizers and organic manures while 41per cent of them had partially used traditional seeds for their crops. Majority of respondents (52.5 per cent) had ‘not adopted’ the inter cropping and crop rotation in their farms.

Table 4.7: Mean Ranks for the Adoption of Organic Farming Technologies

Sl. No.	Organic Farming Technologies	Mean Rank
1.	Bio-Pesticides	308.08
2.	Bio-Fertilizers and Manures	276.90
3.	Use of Traditional Seeds	228.28
4.	Selective Weeding	240.85
5.	Inter Cropping and Crop Rotation	143.40
6.	Minimum Tillage and Mulching	245.50

Chi-Square (Kruskal-Wallis K): 73.865; df: 5; Significance level (p): < 0.05

The results of the study (K = 73.865, p < 0.05) showed that there was statistically significant differences in the extent of adoption among different organic farming technologies and the differences in the mean rank for the selected technologies were not due to sampling error. The bio-pesticides with a mean rank of 308.08 was identified as the most widely adopted technology followed by bio-fertilizers and manures (mean rank = 276.90) among the organic farmers. Even though inter cropping and crop rotation were advised as important agronomic practices for organic farming that was the least preferred in the adoption level with a mean score of 143.40 among the organic farming technologies.

Correlates of Extent of Adoption

To understand whether any linear relationship exists between the extent of adoption of various innovative technologies of organic farming and different socio-economic variables, correlation technique was used. Since the observations on the extent of adoption were taken under an ordinal scale, Sperman's rank correlation, a non-parametric statistic was found to be the suitable measure and hence the same was used to measure degree of linear relationship and the results are given in Table 4.8.

Table 4.8: Correlation between the Extent of Adoption of Organic Farming Technologies and Socio-economic Variables

Sl. No.	Category	Correlation Coefficient (*rho*)
1.	Age	0.480**
2.	Total Land Size	0.546**
3.	Land under Organic Farming	0.547**
4.	Farming Experience	0.657**
5.	Experience in Organic Farming	0.659**

** Correlation Significant at the 0.001 level of significance

The correlation analysis revealed the direction of association as well as the strength of correlation of different socio-economic variables with the extent of adoption of organic farming technological innovations. The five variables were found to be positively correlated with the extent of adoption of the six groups of organic farming technological innovations.

Plate I

Methods of Soil and Water Conservation

Dry Leaf Mulching for Moisture Conservation

Green Leaf Mulching for Moisture Conservation

Check Dams for Water Storage in Hilly Tracts

Field Channels for Irrigating the Field

Inter-cropping of Perennial Crops: Arecanut, Jack fruit, Diascorea, Papaya,

Soil Conservation in Pepper Field using Stones Piled Across Slopes

Sustainability of Major Technological Innovations in Organic Farming

The measurement of sustainability was carried out under the three dimensions viz; ecological sustainability, economic sustainability and social compatibility, and the results obtained for the analysis of statements under these three dimensions of sustainability are given in the following Table 4.9.

Table 4.9: Computed Value of Kruskal-Wallis Statistic and its Significance Level for Sustainability Analysis

Category	Values
K (Observed value)	169.400
K (Critical value)	5.991
DF	2
p-value (Two-tailed)	< 0.0001
Alpha	0.05

As the computed value is lower than the significant level at one percent ($p<0.01$) it can be inferred that at least one factor is different from other two. Since the result could not convey which dimension is different from other here a multiple comparison was also done for the same data and the result obtained is given in the following Table 4.10.

Table 4.10: Comparison of the Sustainability Dimensions of Organic Farming Practices

Sustainability Dimensions	Frequency	Means of ranks	Groups		
Social Sustainability	80	60.375	A		
Economic Sustainability	80	102.388		B	
Ecological Sustainability	80	198.738			C

The above Table 4.10 explicitly conveyed that from the farmers' perspective *ecological sustainability* of the organic farming practices. The agro-ecosystem was improved as a result of the adoption of different organic farming technologies compared to the rest two pillars of sustainability tripod. Among those *social compatibility* found to be the benefited least because of the adoption of organic farming. There was no homogeneity in the response pattern of practicing organic

farmers to these three dimensions of agro-ecosystem sustainability and the grouping proved again that ecological sustainability is significantly different from the rest two.

Ecological Sustainability

Analysis for statements related to ecological sustainability revealed the following results (Table 4.11 and Table 4.12).

Table 4.11: Computed Value of Kruskal-Wallis Statistic and its Significance Level for Ecological Sustainability

Category	Values
K (Observed value)	19.330
K (Critical value)	9.488
DF	4
p-value (Two-tailed)	0.001
Alpha	0.05

Here also the computed *p*-value is less than the significance level alpha=0.05 and that explicitly conveyed that there are significant differences between the response pattern to various statements under ecological sustainability.

Among the five statements related to different factors of ecological sustainability, statements associated with the *protection and recharge of farm resources* and *chemical free environment* were found to be with high mean rank.

Table 4.12: Comparison of the Statements related to Ecological Sustainability

Statements	Frequency	Means of ranks	Groups	
Low negative impact on environment	80	168.10	A	
Reduces soil erosion & improves soil fertility	80	180.03	A	B
Increases the system biodiversity	80	211.63	A	B
Chemical free environment	80	221.38		B
Protects and recharges the farm resources	80	221.38		B

Mean ranks having same letter are not significantly different

However, the similar grouping of three more statements with the same showed that respondent groups have given somewhat similar preference to those factors like

chemical free environment, system biodiversity and improvement of soil that why the last four statements can be considered as homogenous in nature.

Economic Sustainability

The values obtained for the analysis of economic sustainability is given in the following Table 4.13

Table 4.13: Computed Value of Kruskal-Wallis Statistic and its Significance Level for Economic Sustainability

Category	Values
K (Observed value)	42.374
K (Critical value)	9.488
DF	4
p-value (Two-tailed)	< 0.0001
Alpha	0.05

Here, the computed *p*-value is less than the significance level alpha=0.05 revealed that there are significant differences between the response pattern of farmers to various statements under economic sustainability.

Table 4.14: Comparison of the Statements related to Economic Sustainability

Statements	Frequency	Means of ranks	Groups
Reduction in cost of cultivation	80	164.98	A
High quality food at reasonable price	80	180.98	A
Farmers become self sufficient in long run	80	187.88	A
Enable to accumulate working capital	80	206.23	A
Improve net income from the farm	80	262.45	B

Mean ranks having same letter are not significantly different

A multiple comparison procedure done for exploring more valid results for the statements for economic sustainability conveyed the following result (Table 4.14). From Table 4.14 it is clear that in the measurement of economic sustainability of organic farming technologies the most prominent aspect was the availability of *improved net income from the farm* and the east favoured aspect was found to be the argument of *reduction in cost of cultivation* due to the adoption of organic farming.

Social Sustainability

The values obtained for the analysis of statements related to social sustainability and its level of significance is given below Table 4.15. Further, the result for the multiple comparative analysis of the statements is given in Table 4.16.

Table 4.15: Computed Value of Kruskal-Wallis Statistic and its Significance Level for Social Sustainability

Category	Values
K (Observed value)	138.162
K (Critical value)	9.488
DF	4
p-value (Two-tailed)	< 0.0001
Alpha	0.05

As the computed *p*-value is less than the significance level alpha=0.05 it can be concluded that there are significant differences between the response pattern of farmers to various statements under economic sustainability.

Table 4.16 Comparison of the Statements related to Social Sustainability

Statements	Frequency	Means of ranks	Groups
Equitable access to assets	80	81.200	A
Rural poor involved in the approach	80	215.100	B
Technology safer to human beings and animals	80	216.500	B
High quality foodstuffs available in sufficient quantity	80	218.200	B
Recognition of Indigenous knowledge	80	271.500	C

Mean ranks having same letter are not significantly different

In the social sustainability analysis the most preferred aspect found to be related to the *recognition of indigenous technical knowledge* associated with the traditional farming with highest mean rank and the grouping shows that the factor significantly different from rest while considering the response pattern of the respondent groups. Whereas, the statement associated with the *equitable access to the*

assets was found to be the least favourable one with the lowest mean rank, and the grouping also could convey the same.

Discussion

In pure organic farming concept, the application of inorganic fertilizers and chemicals were completely eliminated and organic manures and fertilizers along with biological methods of pest and disease management practices were advocated. However, organic farming is not restricted to these two aspects but, that included a number of agronomic aspects too. The results of the study of different aspects of extent of adoption clearly showed that most of the practicing farmers were not so innovative in the complete adoption of all the relevant technologies that contribute more benefit to the overall improvement of their farmland. This might be due to the lack of sufficient resources to meet the complete requirement of the farm or due to misconceptions about the organic farming as it was just the complete elimination of chemicals from the farmland.

In the correlation analysis, a strong positive correlation between the experience in organic farming and the extent of adoption of organic farming technologies ($r = 0.659$) explicitly conveyed that when farmers became more experienced in practicing organic farming, they were started to adopt more and more technologies of organic farming. Hence, it can be concluded that when the experience in organic farming is more there will be an increased chance exist in the adoption of different innovative organic farming technologies. In similar lines, all the socio-economic variables have shown a very high positive correlation with the extent of adoption of organic farming technologies.

From these results of sustainability analysis of the different organic farming technologies, it was obvious that due to the adoption of organic farming the agro-ecosystem could retain its sustainability through the creation of a safe and diverse agro-ecosystem that could meet the food requirement of the society in a sustained way along with the conservation of its scarce resources. However, this technology still in the nascent stage of development in many aspects and could not advocate for the small and marginal resource-less farmers who were depending on agriculture for subsistence. Because, the results of economic aspects of organic farming were

suggesting that this could not be recommended as an alternative to reduce the cost of cultivation as it involved the requirement of bulk amount of organic manures and other bio-fertilizers compared to the conventional farming. So, for a subsistence farmer the complete adoption of organic farming might be a way to indebtedness.

It was also clear from the results of economic sustainability that there was an in increase in the net income from the farm as a result of shift to organic farming and so most of the organic farmers could accumulate working capital also. This might be due to the high demand for the organic farming in the export market coupled with the high price for the produce. However, the technology donating less to a sustainable social development as there was no assurance in the equal accessibility to the common assets of the society. Most of the farmers preferred to adopt organic farming because of its more emphasis on rural farmers and their indigenous sustainable technological base that have less negative impact to them as well as to the other members of the society with the availability of high quality food locally.

Conclusion

Organic farming and its innovative technologies were a blend of modern and traditional knowledge and technologies without compromising the sustainable resource base of the ecosystem. So, farmers could take the advantage of both of these if they take right decisions related to relevant technologies and their adoption. However, though organic farming can enhance the ecological sustainability of an agro-ecosystem, scientists and policy makers should be vigilant while advising the technology to the rural poor farmers, because organic farming practices need to ensure economic and social sustainability too among all categories of farmers.

CHAPTER IV

RESEARCH PAPER-III

Impact of Farmers' Group Efforts in the Spread of Organic Farming in Kerala

Abstract

The study was undertaken in four districts of Kerala state in order to understand the impact of group efforts in the spread of organic farming throughout the state. The study could come with a valid result that strongly support the fact that in spreading the organic farming concept, group movements had more influential role compared to individual efforts as they had the power to invite other farmers even from the non-interested group. Since the localization of safe food is becoming the need of tomorrow, incorporation of food crops in the cropping systems deserve immense importance. However, to ensure economic security, non-food crops should also be a part of the agro-ecosystem.

Key words: Organic farming, group efforts, localization of food

Introduction

In the Indian scenario, the arable land availability will be reduced to 0.087 ha 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 we 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.

According to Lampkin *et al.* (1999) organic agriculture is a production system which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. It relies on crop rotation, crop residues, animal manure, legumes, green manure, off-farm organic waste and biological means of pest control.

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 upliftment 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 study was conducted to understand and analyze the role of group movements in Kerala in spreading the organic farming throughout the state.

Methodology

The study was conducted in Thiruvananthapuram, Thrissur, Palakkad, and Wayanad districts of Kerala state with an objective of understand more about the impact of group movements in the promotion 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.

A pilot study was conducted to identify the relevant cases from the selected districts of the state. One case was identified from each district. Thus this chapter constituted four case studies on organic farming in the state. Data collection was mainly through interview method with the help of extensive, open-ended questions as well as direct observations. Responses were recorded using a digital recorder.

Results and Discussion

Case Study No.1

Localization of Organic Vegetables: The Case of Urban Vegetable Growers

Usha 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 news papers. 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.

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 travelers 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.

Intervention

Disturbed by all these happenings that jeopardized the health and lives of people, 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 *Azhakulam* 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 farmers' 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.

Reflections

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 earn 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.

Case Study No.2

***Adat* Model: The Case of Non-Pesticidal Management in *Kole* Lands**

Bhaskaran Nair, the president of *Adat Padasekhara Committee* in Thrissur district of Kerala, had laid the corner stone for the movement to transform the kole land rice cultivation of the village as chemical free not only to revert the *kole* land rice farming but also to preserve the biodiversity of the ecosystem.

History of *Kole* Land Rice Cultivation in *Adat*

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. The 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 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 strip 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 in a year instead of two. 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.

Intervention

In the year 2003, Mr. Bhaskaran Nair, the president of *Adat 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 Mannuthy, Thrissur. 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 1cc (20,000 eggs) Tricho cards of two kinds for 1 acre land to control the two pests. The cost was only Rs.20 for 1cc 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 each 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 '*Adat Rice'* 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 Ernakulam 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.

Reflections

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.

Case Study No.3

The Sustainable Agricultural Development Model of Tribal Farmers

The Pooppara Colony inhabited by the Muthuvan tribes, located inside the Karimala forest range of the Parambikulam Wildlife Sanctuary in Palakkad district of Kerala state. Parambikulam Wildlife Sanctuary is a well protected ecological portion of the Anamalai sub unit of Western Ghats.

History of Tribal Farming in Pooppara

The Muduva tribe of Pooppara 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 ha land for settlement and for agriculture purposes. The average land holdings of farmers range from 50 cents to 5 acre and 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 cultivate tapioca, vegetables, banana etc. 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.

Even if almost all factors for the promotion of a good agriculture favourable in the area, marketing of the product was the major constraint to the tribal farmers since the area was isolated inside the forest area. The tribal colony was 12 km away from Parambikulam town that was located at a distance of 110 km from Palakkad and 60 km from Pollachi, the two nearby markets. However, the quality of the produce

attracted a number of middle men from Valpara (located at a distance of 30 km) to this area to purchase the produce for low price. Since these farmers were not empowered to bargain for their produce, they were easily convinced with the argument of high transportation cost to the respective markets. So, there had been a difference of nearly Rs.80-100/Kg in the selling prices for their produce than that of the open market price.

Intervention

To look after the overall development of tribes settled in Pooppara tribal colony Pooppara Eco-Development Committee (EDC) was formed in 2002 under the Forest Development Agency (FDA), Parambikulam, with the participation of the tribes. Pooppara EDC targeted on income generation to the tribes by selling their agricultural and other products through the eco-shops run by the Forest Development Agency (FDA).

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, kasthuri manjal (*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, the 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.

Reflections

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.

Case Study No.4

Growing Together to Organic: The Case of 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 Scenario of Agricultural Development

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 *vayal nadu* 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 of Coffee, Pepper, Vanilla, Cardamom, Ginger, Turmeric, Cocoa, etc., and now coffee-based cropping system is a notable feature of Wayanad agriculture. 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 achieveing 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.

Intervention 1

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 1 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.

Intervention 2

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, Germany. Compared to the former initiative the certification cost was less with FTK since the organization bears a hand to lessen the burden on individual small farmers. The premium fund that had been coming back to the FTK account after each trade was the source for this activity. Fair Trade certification was mainly doing for perennial cash crops like Cashew, Coffee and Spices. There were two evaluations each year in the farmer's field as a part of Internal Control System (ICS) of 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 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, the total number of organic farmers in Wayanad had moved to 5762 covering an area of 3982 hectares by the year 2010.

Reflections

1. It is a persuasive story of a group of farmers who put the corner 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.
2. 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.
3. The case study clearly revealed the determination of 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, is a great example for others to learn.

An Overview

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, socio-ecological

impacts, etc. 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 a 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, we never forget one fact that 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.

Conclusion

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.

CHAPTER IV

RESEARCH PAPER-IV

Institutional Mechanisms for Promotion of Organic Farming in Kerala

Abstract

The study was conducted in the Kerala state with an objective of understanding the existing institutional networks and their role in the promotion of organic farming in the state. The results revealed that there were mainly six categories of institutions: government, non-governmental institutions, certifying agencies, farmers' societies, educational institutions and family & Homestead, which were promoting the spread of the organic farming in the state. Each institution was unique with its own purpose as well as type of activities. Yet, they were considered as a network and worked in complementary action to lead the state to a better future. In the promotion of organic farming, the role of farmers' groups and family & homesteads, non-governmental institutions and government institutions were acknowledged to be exercising a major influence in promoting and spreading organic farming in Kerala.

Key Words: *Organic farming, institutional networks*

Introduction

Organic farming that is being talked about in the global market is something that is not within the reach of neither more than 70 percent of the marginal farmers who are struggling with less than 30 percent of the most degraded lands nor the rest 30 percent better off farmers who are handling rest 70 percent of the land (reference, year). As they are so scattered and spread across the country it is impossible to develop uniform certification standards for them.

If international markets are to be the target, farmers with small holding who depend on the same piece of land for food and income, never going to afford it as it is beyond their scale of operation. Hence to begin with the untapped domestic market with focus on supplying healthy food at affordable prices hold some promises (Balamatti, 2007) for a better sustainable development. However, to promote any sustainable agricultural technology package either in research or in farmers' field, an effective institutional framework is an indispensable factor.

The institutional framework for a sustainable agriculture development covers a spectrum of formal bodies, organizations, networks and arrangements that are involved in its policymaking or implementation of activities. North (1990) defines institutions as the rules of the game in the society. According to him, the most important role of institutions is to reduce uncertainty by establishing a stable structure for human interaction. Wynen (1997) reported that constraints for the advancement of research in organic agriculture are institutional rather than technical.

An ideal institutional framework enhances the integration of the three pillars (ecological, social and economic) of sustainable development. Institutional factor is very important, because, as mentioned by Tschirley (1997) Human and institutional capacity to manage the development process through participatory and transparent approaches is fundamental to sustainable agriculture. This has been pointed before by Blobaum (1983) as the barriers to the conversion to organic include refusal of loans or insurance for organic production, problems with grant application, and legislative and certification constraints.

The transformation of the agricultural sector and challenges of developing towards sustainable agriculture can be studied within an institutional framework (Platje, 2003). And as stressed by Ciegis and Matiusaityte (2011) a change towards a more sustainable agriculture is in fact a process of institutional change, the creation of the rules of the game, hardware and enforcement mechanisms that stimulate sustainable agriculture activities. And a step-by-step evolution of institutions may be most sustainable.

In order to spread the organic movement throughout the state the government of Kerala came to the forefront with its new policy on organic farming. The policy document promises the integration of different institutions for the better implementation of the policy throughout the state.

In this context, the study was aimed to study the existing organizational networks and institutional mechanisms for the promotion of organic farming in the state as well as to analyze the institutional mechanism developed for the execution of *Kerala State Organic Farming Policy, Strategy and Action Plan*.

Methodology

The study was conducted in the Kerala state. As the state is famous for its position in the export of organic produce and also pioneering efforts in the organic farming movement it was important to enlist the various institutions and other organizations involved in the promotional activities of organic farming. For this purpose a pilot study was conducted to identify different institutes and networks associated with the promotion of organic farming in the state. Further four groups of institutions were selected; Kerala Agricultural University (KAU), Certification Agency (INDOCERT), Department of Agriculture, and Non-Governmental Organizations (NGOs). Five respondents were selected from each institution and that formed a sample size of twenty officials for further data collection.

Interview method was followed for the collection of data. For that a semi structured schedule was prepared and statements were made on six groups of institutions: government, non-governmental organizations, certifying / exporting agencies, farmers' societies, educational institutions and family & Homestead. Data were collected from secondary sources also for getting an explicit understanding about the issue.

Results and Discussion

As a result of a comprehensive study of various formal and informal institutions engaged with the promotion of organic farming it was identified that there were mainly six categories of institutional networks that could make a positive impact in the same. The components of the existing institutional network are as follows

1. Government
2. Non-Governmental Organizations
3. Certifying / Exporting Agencies
4. Farmers' Societies
5. Educational Institutions
6. Family & Homestead

Different Activities under the identified institutions

1. Government

The state government was promoting organic agricultural practices through the implementation of new programs and policies. The two agencies engaged with these activities on behalf of the state government were the Kerala State Biodiversity Board (KSBB) and the State Agriculture Department. The former was responsible for the formulation of the state policy on organic farming and the latter was doing the implementation of the policy. The KSBB had adopted organic farming as a component of their three year project on biodiversity enhancement in 2008 to evaluate the potential of this alternative agricultural system.

Institutional Framework for implanting Organic Farming in Kerala

The state agricultural department had started implementation of the policy through their grassroots level agencies called *Krishibhavans* of each Panchayath. The agriculture officer and two agriculture assistants were responsible for extending the technology to the farmers. The state agricultural department is getting relevant technologies from its research system, the Kerala Agricultural University including 27 major research stations and other institutional networks. In order to ensure coordination from all other departments for implementing the state policy on organic farming, two formal bodies were formed

General Council: was formed with the honorable Chief Minister as the chairman and the Secretary of Agriculture Department as convener. The ministers for Agriculture, Animal Husbandry, Fisheries, Local Self Governance, Finance and representatives from Kerala Agricultural University, Agricultural Department, different research institutes and line departments, Plantation Corporation, Spices Board, Tea Board, Coffee Board, Rubber Board, Coconut Development Board, State Agricultural Prices Board, State Biodiversity Board, State Horticulture Mission, Planning Board, Vegetable and Fruit Promotion Council, NGOs working in the field of agriculture were also included in this council.

Executive Committee: was formed with the honorable Minister of Agriculture as the chairman and the Director of Agriculture as the convener. The secretaries to the

Department of Agriculture, Animal Husbandry, Fisheries, Local Self Governance, Directors of Animal Husbandry, Fisheries, Chairman of State Biodiversity Board, representatives of State Planning Board, Organic Farmers and NGOs working in the field of organic farming were included in this committee.

The department of agriculture has started taking up organic farming projects in selected villages and launched the programme on promoting organic farming.

2. Non-Governmental Organizations (NGOs)

In spreading the concept of organic farming NGOs had made a visible impact 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. The one and only organic farmers' association, the *Kerala Jaiva Karshaka Samithi* with organic farmers from the whole state as its members, was managed by this NGO.

The major NGOs working for the promotion of organic farming in different parts of the state were *Thanal* (Thiruvananthapuram), *Peermede Development Society* (Idukki) *Malanadu Development Society* (Kottayam), *Kuttanad Vikasana Samity* (Alappuzha), *AVARD* (Thrissur), *Vanamoolika and Wayanad Social Service Society* (Wayanad), *Thalassery Social Service Society, KAIROS* (Kannur and Kasargod).

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.

3. Certifying / Exporting Agencies

Organic certifying agencies as well as agencies, engaged with the export of organic produce to international markets, were also playing a major role in popularizing organic farming. This was found to be true especially in the case of organic farmers who were exporting the high value low volume produce like spices and beverage crops like tea and coffee. The major identified certifying agency of the state was *Indocert* by almost all of the exporter farmers as they were offering reliable and affordable inspection and certification services in the state.

Among the exporting agencies *Elements Homestead Products Pvt. Ltd.* was found be more close to the organic farmers in extending the helping hand to solve their marketing problems. This was a business initiative started with an aim of bridging the physical as well as emotional distance between the environmentally sensitive producers and the health-conscious consumers. The *Elements* had trading partnership with different organic farmers' groups and associations like *Fair Trade Alliance Kerala, Malabar Development Centre, Malabar Organic Agriculture Society* etc. They were marketing the organic produce collected from the organic farmers throughout the state in the national as well as international markets like Switzerland, Italy, France and UK. The *Elements* had outlets called *Green Counters* in all the major super markets in every district of the state.

4. Farmers' Groups

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, in the previous section amply justified 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 *Marappan moola* of Wayanad district, *Karunapuram* of Idukki district, and *Tholoor* of Alappuzha. The first two groups were mainly cultivating organic spices and beverage crops whereas the third group was concentrating on organic rice and vegetables. In the third case, along with the farmers' group the respective Padasekhara

samithi members, Self Help Groups, the Agricultural Officer, Krishi Vigyan Kendra and the whole Panchayath joined hands to make the effort more fruitful. They could transform 454 ha of barren land for rice cultivation with the help of the above group. *Indian Organic Farmers Producer Company limited*, Kochi of Ernakulam district was one important registered farmers' group mainly concentrating on the promotion of high value export oriented crops like spices and beverage crops.

5. Educational Institutions

Among the different educational institutions in the state, schools were taking more innovative steps on spreading the concept of organic farming among the young generation. A case study on urban vegetable growers, presented in previous section, amply justified the role played by educational institutions in creating awareness among young people on organic farming. Many schools of the state were promoting the cultivation of organic vegetables among the students to utilize their leisure time effectively and also as a part of *earn while you learn* program. They were depending on different information sources like Krishibhavans, nearby NGOs, etc., for establishing the simple input development technology units like composting and vermicomposting, within the school compound and growing organic vegetables.

6. Family and Homestead

Being the base institution of the society, family & Homestead also had its role in the transferring the concept of good agriculture to the next generation. Even without being influenced by the government or NGOs or any farmers' groups most of the families of the state live in homesteads with their own kitchen gardens and other different kinds of crops and tress that were being managed by the locally available manures. These families were growing these crops and tress not to make any profit but just to meet their family requirements and also to preserve the nature and culture of their rural society. All the family members share the work in the homesteads and preserve the prevailing agro-ecosystem.

In fact, they take pride in living in harmony with Mother Nature and in letting many kinds of useful trees grow naturally in their homesteads without the use of any external inputs. The plants include: plantation crops like coconut (*Cocos nucifera*), arecanut (*Areca catechu*), banana (*Musa* spp.), coffee (*Coffea Arabica*), fruit trees like

mango (*Mangifera indica*), sapota *(Acharas sapota*), mangosteene (*Garcinia mangosteena*), guava (*Psidium guajava*), custard apple (*Annona reticulate*), tamarind (*Tamarindus indicus*), jack fruit (*Atrocarpus heterophyllus*), vines like betel leaf (*Piper betel*), pepper (*Piper nigrum*), dioscorea (*Dioscorea spp.*), passion fruit (*Passiflora edulis*), spices like turmeric (*Cucurma longa*), ginger (*Zingiber officinalis*), cloves (*Syzygium aromaticum*), nutmeg (*Myristica fragrance*), allspice (*Pimento dioica*), cinnamon (*cinnamomum zeylanicum*), etc. and other plants like agave, rain tree (*Samanea saman*), Caesalpinia (*Caesalpinia indica)*, Plumaria (*Plumaria spp.*), teak (*Tectona grandis*), sandalwood (*Sandalum album*) etc. Thus family & homestead is also an institution that is playing a significant role in the promotion of organic agriculture.

Network of Different Institutions

The linkages between different institutions of the existing network had been illustrated in a figure (Please see Fig.4.2 for the network of institutions). Though the six categories of institutions were identified from the state as individual units in its existence, they were found to be complementary in action in the promotion of organic farming. It was identified that the government had a good working relationship with various non-government organizations and other institutions, farmers' groups and existing financial support to the educational institutions were also receiving the relevant technologies from the government through its research system

The certifying agencies were linked to the chain by creating awareness about the standards and procedures of certification of organic produce and grading as well as marketing aspects. Above all, family & Homestead that had the most influenced role at the bottom level of the society to get good values of agriculture transferred to the younger members of the social system. Thus, all the six existing categories were as inseparable units of a major network with its own minor networks.

Major Influence of Institutions as perceived by officials working for promotion of organic farming

An attempt has been made to elicit selected sample of officials from government and non-government agencies, scientists of agricultural university, office bearers of farmers' groups on the major influence that the six institutions may exert

on promotion of organic farming in Kerala. Their responses were ranked and analysed. The frequency distribution is given in Table 4.18. The results revealed that four institutions viz., farmers' groups, family & homesteads, NGOs and GOs were perceived to play a decisive role for promoting organic farming, in that order of major influence. Educational institutions and certification and/or export agencies were found to be less important in promoting organic farming.

Table 4.17 Distribution of Respondents to the Major influence of Different Institutions Promoting Organic Farming (n = 20)

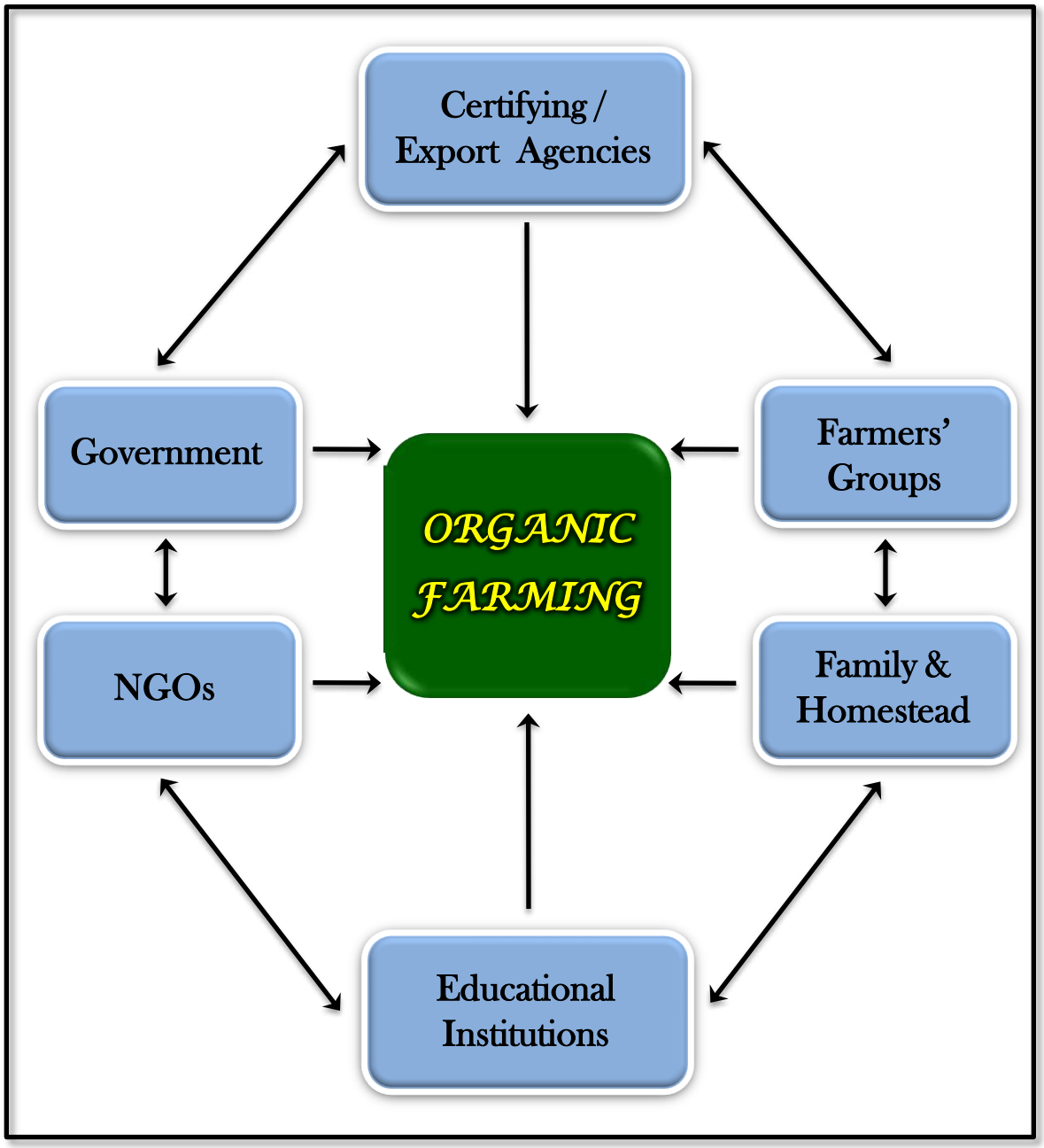
Sl. No.	Institutions	Ranks											
		1		2		3		4		5		6	
		f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
1	Government	4	20	5	25	2	10	5	25	4	20	0	-
2	NGOs	-	-	3	15	2	10	8	40	2	10	5	25
3	Certifying/ Export Agencies	-	-	-	-	6	30	5	25	4	20	5	25
4	Farmers' Group	5	25	10	50	5	25	-	-	-	-	-	-
5	Educational Institutions	-	-	-	-	-	-	2	10	8	40	10	50
6	Family & Homesteads	6	30	5	25	5	25	4	20	-	-	-	-

Among the network of institutions the leading role of farmers' groups and families with their homesteads along non-governmental organizations can be observed over the other institutions. The role of government institutions that were engaged with the promotion of organic farming cannot be overemphasized. The state government was promoting organic with new packages and policies and providing adequate financial support for the first 1-3 years of possible yield loss.

Conclusion

There was no doubt in the fact that the different institutions have good access to each corner of the social system and play a major role in promoting organic farming among the farmers. However, compared to a centralized network of government, decentralized networks of farmers' organizations and homesteads have more power to influence almost all members of any social system for promoting organic farming systems, and for agricultural development in harmony with nature.

Figure 4.2 Institutional Network for the Promotion of Organic Farming



Components in Homestead Farming Model

Teak, Coffee, Banana, Pepper

A Homestead Model includes Arecanut, Pepper, Coconut,

Amorphophallus, Banana, Guava

Multi-storied Planting Model of Homestead Farming

Turmeric Growing as Ground Level Crop in Homestead Farming

Ginger Growing as Ground Level Crop in Homestead Farming

CHAPTER IV

RESEARCH PAPER-V

Constraints to the Promotion of Organic Farming in Kerala

Abstract

In the study undertaken among eighty organic farmers of four districts of Kerala state to analyze the various constraints coming in the way of adoption and promotion of organic farming, three important constraints before were found: grading and marketing constraints, economic constraints, certification constraints out of the seven group of constraints. A number of organic farmers were not aware of the grading procedures for getting good price. Initial yield loss was found to be affecting these farmers economically along with the high cost involved in the certification process. The lack of a standardized package of organic farming practices to guide the newly converting organic farmers was also found to be a major technological constraint as perceived by organic farmer respondents.

Key Words: Organic farming, Constraints

Introduction

Organic farming, despite its ability to restore and maintain the sustainability of the agro-ecosystem and its ability to provide chemical-free safe food at low costs of production, is often met with a lot of skepticism among farmers. When Kerala announced its organic farming policy, it is met with a mixed response from diverse sectors. Many raised concerns on complete shift to organic farming and its promotion in the entire state. Yet, many farmers of the state had started experimenting with organic farming for various reasons. The increasing demand for organic food products in developed countries and the extensive support for organic farming by the Indian government (Chandrashekar, 2010) may be seen as the key drivers for this development. While some innovative farmers have succeeded in exploiting the advantages of organic farming, yet some others were in the transition process of a slow and steady movement.

As in any other phenomenon, organic farming movement also had its own obstacles throughout the way. The study of Gabriel (1994) revealed that the single biggest constraint to the development of organic agriculture is that most people in all sections of our society, including farmers, scientists, researchers, extension officers

and politicians strongly believe that organic agriculture is not a feasible option to improve food security. For this reason, very few farmers feel the need for obtaining information about this organic farming system, even when the deteriorating agro eco-system demands it. Chandrashekar (2010) delineated the four pillars of organic farming as organic standards, certification/regulatory mechanisms, technology packages, and market networks. However, Altieri and Nicholls (2004) stated that the high variability of ecological processes and their interactions with heterogeneity of social, cultural, political, and economic systems making the standardized technological packages inappropriate for a number of field situations. And many standardized guidelines proved unworkable for some farmers for technical reasons.

Several studies indicated different constraints in different phases of organic farming movement. Das (2004) outlined that the mechanism of organic produce marketing is quite different from that of regular marketing. Organic produce markets are still a niche segment in which specific buyers are targeted. Careful selection and development of target markets and distribution channels is of utmost importance in case of organic farm products. Furthermore, reliable market information, which is often difficult to obtain, may turn out to be another obstacle in the marketing of organic produce.

Paul (2006) stressed the major constraints coming in the way of adopting organic farming as the bias towards chemical farming, inappropriate use of local varieties, high cost of certification, bias in incentives, lack of research and extension support, poor marketing and lack of awareness among farmers and consumers. Jaganathan (2009) also came up with a similar report as the reasons for not practicing organic farming as unorganized market for organically grown produce, low premium for organic produce, lack of knowledge about organic farming innovations and no subsidies for organic farming.

A thorough analysis of various constraints to organic farming raised concerns that these constraints may also crop up in Kerala's efforts to shift from conventional farming to organic farming. Hence, this study was formulated to analyze the different constraints that hinder the adoption and spread of organic farming throughout the state.

Methodology

The study was conducted in Thiruvananthapuram, Thrissur, Palakkad, and Wayanad districts of Kerala. Based on the available information on the organic farming and its promotional activities from different parts of the state, different constraints coming in the way of promoting organic farming were enlisted from practicing farmers, agricultural scientists, and also from different agencies engaged with the organic farming scenario of the state. Further, all the identified twenty-eight constraints were categorized into seven groups of four constraints each: social, personal, ecological, technological, economic constraints and constraints related to certification, grading and marketing of organic produce. The respondents were given these constraints to rate them on a three point continuum from *most severe, severe* to *not severe*. Farmers, who were keenly involved in organic farming and its promotion in Kerala, formed a random sample of eighty respondents from these four districts. The farmers' response scores were converted into ranks for one-way analysis of variance using a non-parametric test, Kruskal-Wallis Test to ascertain the most important constraints as perceived by organic farmer respondents.

Results

Seven sets of different constraints were enlisted and farmer's response on their severity was solicited. The Table 4.18 given below shows the calculated value of Kruskal-Wallis statistic and its level of significance.

Table 4.18: Computed Value of Kruskal-Wallis Statistic for Constraints in Organic Farming and its Level of Significance

Category	Values
K (Observed value)	220.617
K (Critical value)	12.592
DF	6
p-value (Two-tailed)	< 0.0001
Alpha	0.05

As the computed *p*-value is less than the significant level at one per cent ($p < 0.01$) it can be inferred that the level of influence of different constraints to the promotions of organic farming is different according to farmers' perception. To

explore it further, multiple comparisons procedure was adopted to identify the major constraints to the promotion of organic farming. The Table given below (Table 4.19) shows the mean of rank corresponding to each of the statements and also the grouping letter.

Table 4.19: Comparison of Different Constraints in the Promotion of Organic Farming based on Mean Ranks

Constraints	Frequency	Mean of Ranks	Groups
Social Constraints	80	97.081	A
Personal Constraints	80	180.988	B
Ecological Constraints	80	259.138	C
Technological Constraints	80	315.381	C D
Certification Constraints	80	353.544	D E
Economic Constraints	80	366.163	D E
Grading and Marketing Constraints	80	391.206	E

Mean ranks having same letter are not significantly different

It can be seen from the Table that the mean rank corresponding to *Grading and Marketing Constraints* is more and hence it was the major constraint to the promotion of organic farming and was on par with the *Certification Constraints and Economic Constraints* as it has got the same grouping letter. Hence it can be concluded that these three sets of constraints were perceived to be highly severe and significant by the organic farmer respondents. Technological and ecological constraints were moderately severe and rest of the constraints: social and personal constraints have less significance as constraints to the promotion of organic farming.

Thus it can be concluded that 'grading and marketing constraints, economic constraints, certification constraints, technological constraints and ecological constraints have been perceived as most important in that order. Indeed, it has been observed that grading, marketing and getting organic certification were crucial issues in the spread of organic farming and these constraints acted as inhibiting factors for farmers to pursue organic farming. In addition, among the economic constraints, the loss of yield during the initial three years of conversion from conventional agriculture to organic agriculture was also observed to be a real inhibiting factor in the adoption and spread of organic farming in Kerala. Each of the sets of constraints discussed

above have been studied in detail by collecting information on four specific constraints under each set, based on farmers' perception of severity of constraints to organic farming.

1. Social Constraints

Among the set of social constraints, four specific social constraints were considered and the data were analyzed statistically and results are given in Table 4.20.

Table 4.20: Computed Value of Kruskal-Wallis Statistic for Social Constraints and Its Level of Significance

Category	Values
K (Observed value)	191.158
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

As the *p*-value is less than 0.01 it is very evident from here that the four economic constraints are significantly different from each other. A pair wise multiple comparisons procedure was done for the same specific social constraints to exploit more possibilities and the results are given in Table 4.21.

Table 4.21: Comparison of Different Social Constraints in the Promotion of Organic Farming based on Mean Ranks

Social Constraints	Frequency	Mean of ranks	Groups
Lack of group initiatives in organic farming	80	92.500	A
Poor quality produce due to hesitation of neighbors to adopt organic farming	80	117.175	B
On-going debate about the relevance and need of organic farming	80	175.875	C
Inability to produce organic food for all	80	256.450	D

Mean ranks having same letter are not significantly different

Here, each of the four specific social constraints was found to be different from each other not only with mean ranks but also with their grouping letters. The social constraint associated with statement: *inability to produce enough organic food*

for all the members of the society (mean rank of 256.450) was perceived by organic farmer respondents as the most severe among all the four social constraints.As the state is reeling under acute food shortages on one side, and several agro-ecosystems were degrading and losing their vitality to produce a good crop, the on-going debates on relevancy of organic farming for Kerala were inconclusive and disturbing to the farming community in particular and the society in general.

2. Personal Constraints

Four specific personal constraints were considered for eliciting responses from organic farmer respondents and the data were analyzed statistically and the results are given in Table 4.22.

Table 4.22: Computed value of Kruskal-Wallis Statistic for Personal Constraints and Its Level of Significance

Category	Values
K (Observed value)	79.179
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

Here, as the *p*-value is less than 0.01 it is explicit that at least one among the four aspects of personal constraints is significantly different from rest. The multiple comparisons procedure result is given in the Table 4.23 below.

Table 4.23: Comparison of Different Personal Constraints in the Promotion of Organic Farming based on Mean Ranks

Personal Constraints	Frequency	Mean of ranks	Groups
Lack of interest to gain more information	80	119.600	A
Lack of concern: *better to follow conventional farming now and let tomorrow take care of it*	80	124.550	A
Fear of profit loss	80	173.313	B
Declining interest due to lack of owned resources	80	224.538	C

Mean ranks having same letter are not significantly different

It can be inferred from the above Table 4.23 that *declining personal interest* due to the inability to make avail of sufficient own on-farm resources was perceived to be the most severe personal constraint perceived by the organic farmer respondents. This is followed by *fear of loss in farming* due to low yield in the initial period as another major personal constraint. Lack of concern and lack of interest and apathy were also perceived as personal constraint, but less severely, by the respondents.

Technological Constraints

The response of organic farmer respondents on four specific technological constraints was analyzed and the results are given in Table 4.24. The Table given below shows the calculated value of Kruskal-Wallis statistic and its level of significance.

Table 4.24: Computed Value of Kruskal-Wallis Statistic for Technological Constraints and its Level of Significance

Category	Values
K (Observed value)	44.207
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

Since the computed *p*-value is less than the significant level at one per cent ($p < 0.01$) it can be inferred that at least one among the four aspects of technological constraints used in the study was significantly different for the practicing farmers of organic farming. The Table given below (Table 4.25) shows the significant difference among the four specific technological constraints with the help of multiple comparisons procedure.

In Table 4.25, the high mean rank given for the specific technological constraint: '*non-availability of a unique package of practices for organic farming'* clearly indicated that it was the major technological constraint and the similar grouping for *non- availability of different organic inputs* showed this factor was also on par with the former technological constraint.

Table 4.25: Comparison of Different Technological Constraints in the Promotion of Organic Farming based on Mean Ranks

Technological Constraints	Frequency	Mean of ranks	Groups	
Shortage of disease free planting materials	80	118.938	A	
Lack of timely information	80	140.544	A	
Non-availability of enough organic inputs	80	187.694		B
Non-availability of a unique package of practices	80	194.825		B

Mean ranks having same letter are not significantly different

Here, as organic farming is locale-specific and based on use of locally available on-farm resources, specific packages of practices was a clear felt need from the farmers' perspective. It may not be possible to bring out a standardized package of organic farming practices for all crops for all agro-climatic conditions. In the same way, there was a dearth of all sorts of organic inputs. Hence, lack of technological backup was a real impediment in the progress of organic farming movement.

3. Ecological Constraints

Among the ecological constraints, responses to four specific ecological constraints were analyzed and the results are given in the following Table 4.26.

Table 4.26: Computed Value of Kruskal-Wallis Statistic for Ecological Constraints and Its Level of Significance

Category	Values
K (Observed value)	24.612
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

Here also the computed *p*-value is less than the significance level alpha=0.05 and that explicitly conveyed that there are significant differences between the response pattern to various statements under ecological constraints. The results of pair wise multiple comparisons procedure are given in the following Table 4.27.

Table 4.27: Comparison of Different Ecological Constraints in the Promotion of Organic Farming based on Mean Ranks

Ecological Constraints	Frequency	Mean of ranks	Groups	
Loss of ecosystem viability to produce good crop	80	137.113	A	
Inability to reconstruct destroyed links of ecosystem functions	80	150.263	A	
Higher Pest and disease problems	80	154.750	A	
Need of long period to get positive responses	80	199.875		B

Mean ranks having same letter are not significantly different

From Table 4.27 it is clear that *Requirement of long period to get positive responses* from the agro-ecosystem was the most severe ecological constraint coming in the way of adoption and spread of organic farming from the respondent farmers' perspective. It is true that as the agro-ecosystems lost their vitality to produce a good crop, it may usually take a long time for recovery and restoration of ecological balance of an agro-ecosystem and to regain its lost vigour and vitality. Hence this ecological constraint was a significant constraint coming in the way of adoption and spread of organic farming among the farmers of Kerala.

4. Economic Constraints

Four specific economic constraints were considered here and data were analyzed statistically and the results are given in Table 4.28.

Table 4.28: Computed Value of Kruskal-Wallis Statistic for Economic Constraints and Its Level of Significance

Category	Values
K (Observed value)	119.268
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

It is very evident from the Table 4.28 that the four economic constraints are significantly different from each other as the *p*-value is less than 0.01. Results of the pair wise multiple comparisons procedure are given here under Table 4.29.

Table 4.29: Comparison of Different Economic Constraints in the Promotion of Organic Farming based on Mean Ranks

Economic Constraints	Frequency	Mean of ranks	Groups
Initial low price for the produce	80	110.538	A
High establishment cost of manure sources	80	140.088	B
Lack of government financial support	80	143.375	B
Initial yield losses	80	248.000	C

Mean ranks having same letter are not significantly different

From the Table 4.29 it can be concluded that the single most important economic constraint to organic farming was *initial yield losses in the first few years.* Indeed the loss of yield during the initial three years of shifting to organic farming was also found to be a real inhibiting factor in the adoption of organic farming by farmers in Kerala.

Certification Constraints

Under the set of certification constraints four specific constraints were included for eliciting responses from organic farmer respondents and the data were analyzed statistically and the results are given in Table 4.30.

Table 4.30: Computed Value of Kruskal-Wallis Statistic for Certification Constraints and Its Level of Significance

Category	Values
K (Observed value)	35.856
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	< 0.0001
Alpha	0.05

As the computed *p*-value is less than 0.01 it can be concluded that there are significant differences between the response patterns of farmers to various statements under certification constraints. The multiple comparisons Table given below (Table 4.31) can be better explain the differential responses of farmer respondent groups.

From Table 4.31 it can be inferred that in the analysis of different factors related to personal constraints, the most severe constraint to organic farming was

associated with the *high cost involved in the organic certification* process with a mean rank of 191.665 followed by the constraint related to the *requirement of a long waiting period to get the organic certification* with a mean rank of 183.050. These two were found to be on par in the pair wise analysis of statements with the same grouping letter.

Table 4.31: Comparison of Different Certification Constraints in the Promotion of Organic Farming based on Mean Ranks

Certification Constraints	Frequency	Mean of ranks	Groups	
Stringent standards for the certification process	80	121.775	A	
Lack of certifying agencies in nearby place	80	145.500	A	
Requirement of long period certification period	80	183.050		B
Higher cost of organic certification	80	191.675		B

Mean ranks having same letter are not significantly different

This shows the response pattern of respondent farmers to these two constraints were more or less same and thus these two factors can be considered as homogenous in nature. Certification procedures were indeed expensive and time consuming for the small farmers.

5. Grading and Marketing Constraints

Four grading and marketing constraints were considered for eliciting responses from organic farmer respondents and the data were analyzed statistically and the results are given in Table 4.32.

Table 4.32: Computed Value of Kruskal-Wallis Statistic for Grading and Marketing Constraints and Its Level of Significance

Category	Values
K (Observed value)	15.907
K (Critical value)	7.815
DF	3
p-value (Two-tailed)	0.001
Alpha	0.05

Here, the computed *p*-value is less than the significance level alpha=0.05 had revealed that there are significant differences between the response pattern of farmers

to various statements under grading and marketing constraints. The result of multiple comparisons procedure given in Table 4.33 explains more about the importance of different factors under grading and marketing constraints. Among the different grading and certification constraints, the highest mean rank obtained for the statement related to the inability of the organic farming to produce high grade products with the limited resources of the farm (mean rank = 179.28).

Table 4.33: Comparison of Different Grading and Marketing Constraints in the Promotion of Organic Farming based on Mean Ranks

Grading & Marketing Constraints	Frequency	Mean of ranks	Groups	
Difficulty in selection & development of target markets	80	130.594	A	
Lack of reliable market information & distribution channels	80	162.294	A	B
Lack awareness about grading & different grades	80	169.838		B
Inability to produce high grade produce with limited resources	80	179.275		B

Mean ranks having same letter are not significantly different

This dimension of grading and certification constraint is on par with that of *lack of awareness about the grades* for the agricultural produce and *inaccessibility to reliable distribution channels and 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.

Discussion

From the results of analysis for different constraints coming in the way of the organic farming movement it was obvious that all the enlisted constraints were important in one way or other way. However, still those related to the economic and marketing aspects had a major role in creating obstacles to promotion of organic farming and its spread in the state. Consumption of organic food remained a costly option for a huge portion of our population and this had a direct impact on the development of sufficient domestic markets for organic produce. In the context of lack of adequate domestic markets, organic farmers were forced to produce for

international markets, where demand and prices were high, but standards are more stringent compared to the domestic markets. So farmers need to concentrate more on the grading aspects too along with getting the produce certified as organic, in order to meet high quality standards and get good revenue for their organic produce in global markets. Here, the organic farmers were observed to be falling in dilemma because of the inability to meet the high quantity of organic manures to match the nutritional requirements of crop to produce a first grade organic produce that may fetch a premium price in the export market. Organic farming was proved to be cost-effective only when the farm is self-sufficient to meet all input requirements to produce a good crop. However, most of the small and marginal farmers depend on off-farm resources as there was a high cost involved in the establishment of producing organic manures and bio-pesticides at the farm itself. This may be the reason for the non-availability of organic inputs for the farmers in adequate quantities.

The economic constraints continued to be most severe factors hindering most of the small and marginal farmers in the adoption of organic farming practices. Indeed it was observed to be a shock for neo-converts to organic farming as the agro-ecosystem had lost its vitality to produce a good crop without application of fertilizers or chemical pesticides and might cause huge yield losses initially. Although, new organic farmers were enthusiastic about organic farming, initial yield loss was a real dampener for their spirits. Along with this, the lack of any external financial support might be another reason why many farmers were keeping away from taking the risk of converting their inorganic farms into organic farms. While analyzing the technological constraints, the call for the development of a need based standardized package of practices for organic farming was evident. However, as the resources and climatic conditions were not unique throughout the state, formulation of a standardized package of organic farming practices ideal for all the zones might be a tedious task for the agricultural scientists and researchers.

Conclusion

At the outset, the initial yield loss along with lack of grading and marketing opportunities and stringent certification procedures were the major constraints faced by organic farmers. Technological constraints were also major constraints.

CHAPTER IV

RESEARCH PAPER-VI

Advocacy Strategies for the Implementation of Organic Farming Policy of Kerala

Abstract

The study was conducted in the four districts; Thiruvananthapuram, Thrissur, Wayanad and Palakkad of Kerala state on the adoption, constraints and sustainability aspects of organic farming and the policy on organic farming in Kerala. The study revealed that there were several dilemmas, strengths, weaknesses, threats and promises in the policy on organic farming as well from the practice of organic farming in several pockets by the farmers. The empirical results coming out of the present study were collated and a list of issues of concern that need immediate action by all the stakeholders was made. To address these issues of concern, a set of advocacy strategies were developed for all stakeholders for furthering the organic farming movement in Kerala

Key Words: *Organic farming, advocacy strategy*

Introduction

There is an old saying, “If you don't know where you are going, any road will take you there”. Frequently, certain organizations working for any kind of social change start out on the road without a clear sense of where they are going, and without a shared understanding of the best route for getting there. For them, a strategy is simply a road map for getting to the destination or achieving the goal.

An advocacy strategy helps these kinds of organizations to identify the decision-makers, make connections, translate the opportunities, and mobilize for action. This also helps government agencies to weigh alternative policy options and bring people who are directly affected into the process of decision-making.

For evolving an appropriate policy on organic farming a few patterns of consensus are required, which may act as the base on which the policies are laid out and appropriate mechanisms developed for their implementation.

Methodology

The study was conducted in the four districts of Kerala state; Thiruvananthapuram, Thrissur, Palakkad, and Wayanad districts. A pilot study was carried out to finalize the sampling units and the four districts; Thiruvananthapuram, Thrissur, Palakkad, and Wayanad of the state were identified based on the performance of organic farming initiates carried out in the districts. Farmers, who were actively involved in organic farming and its further promotion from these four districts, formed a random sample of eighty respondents from Kerala. A survey approach was used for the study and appropriate schedule was developed for data collection. As a logical ending to this research study, an attempt has been made to collate all the major results of the study and arrive at a few issues of concern that need action and advocacy strategies were suggested for all stakeholders to address these issues of concern. All results and discussion is based on the empirical results and observations of this research study only.

Results

A thorough analysis of the findings of the study revealed that there are both strengths and weaknesses in the *approach* to promotion of organic farming in Kerala. All the respondents of the study had come to a consensus on one issue: the natural resources have degraded to such an extent that getting a good yield from land and water resources is definitely a tough task and continuing the same approach to agriculture in the Kerala state is not advised. Both food safety and food security have assumed equal significance due to environmental pollution with chemical fertilizers and pesticides.

At the outset the critical issues of concern can be enlisted here for discussing and evolving advocacy strategies for all stakeholders. These issues have emerged from the empirical results of the study and observations made by the researchers and other stakeholders.

1. There is indeed a heavy toll on natural resources by chemical poisoning caused by indiscriminate dumping of chemical pesticides, and fertilizers for reaping rich harvests of all crops. Soil, water, air, and plant and animal

resources have accumulated toxic chemical residues well beyond permissible limits of WHO health standards.

2. There are no standardized reliable packages of practices for organic farming across eight agro-climatic zones of Kerala and across various crops: cereals, pulses, oilseeds, spices, plantation crops, tuber crops, fruit trees, etc. A systematic research on organic farming on scientific lines is missing from public agricultural research establishments. Non-availability of adequate quantities of organic inputs was also a severe constraint.

3. There has been observed that the domestic demand for safe food is increasing gradually, as people become more health conscious and nutrition conscious.

4. Organic produce is observed to be fetching high premium price in both domestic and international markets.

5. Organic farming is believed to enhance sustainability of an agro-ecosystem by recharging farm resources and by enhancing the vitality and bio-diversity of the agro-ecosystem.

6. Organic farming ensures economic sustainability of farmers by improving their net incomes and thereby resulting in accumulation of working capital for the farm.

7. Initial yield loss and agro-ecosystem's viability and long time taken for recovery and restoration of degraded agro-ecosystem were a severe constraint.

8. Maintaining quality of organic food, lack of awareness of permissible limits of chemical residues and lack of awareness of grading and quality standards was a severe impediment in the spread of organic farming.

9. Inadequate financial support to new organic farmers from government, high costs involved in establishing on-farm resource base, especially organic manures and bio-pesticides.

10. High cost involved and long waiting period requirement (3-7 years) for organic certification.

11. Agencies involved in policy framing, the Kerala State Bio-diversity Board and the Secretariat in the Ministry of Agriculture could not bring together the

participation of possible implementing agencies: the Department of Agriculture and the Kerala Agricultural University while formulating the Organic Farming Policy and Strategy and Action Plan of Kerala in 2008.

12. Non-Government Organizations were found to be actively involved in policy formulation and promoting organic farming among a few sections of people (farmers, urbanites, retired government servants, etc.)

Discussion

A cursory look at the above mentioned issues of concern revealed that there were both strengths and weaknesses in the approach to organic farming promotion in Kerala. There were promises, threats and dilemmas in the inconclusive debate on the relevancy and appropriateness of organic farming in Kerala state.

Advocacy Strategies for all stakeholders

As several organizations are working towards promotion of organic farming, their basic assumptions and approaches seemed to be in varying degrees. Hence, following advocacy strategies are suggested to move forward in the process of achieving the major goal of attaining sustainability in agriculture and ensuring both food security and food safety.

Achieving Consensus

All the stakeholders need to come together and discuss and debate only to achieve consensus on some key issues and develop a common minimum program for furthering organic farming movement in Kerala.

Strategy 1: Ensure Food Safety and Food Security: The issue of food safety and food security cannot be seen as mutually exclusive but mutually inclusive. Both are equally important and one cannot be compromised for the other. So understanding these two issues of the same coin is essential to evolve any pertinent strategy and action plan for promoting organic farming. Both issues demand immediate attention and the implementing agencies need to work for restoration of agro-ecosystems and

conserving Nature without jeopardizing the food and nutritional security at household, state and national level.

Strategy 2: Conservation of Environment: Protection of the existing models of natural agro-ecosystems and improvement of degrading agro-ecosystems is an important aspect in the promotion of organic farming. Specific steps need to be taken up by all agencies for restoration of already destroyed agro-ecosystems in Kerala.

To achieve consensus on some key issues, several workshops and meetings need to be organized by the Department of Agriculture in collaboration with other concerned government and non-government agencies need to work together and reformulate strategies with specific focus on some selected food crops, spice crops, plantation crops, tuber crops, fruit trees and other special ones like tea, coffee, rubber, etc. Some of the specific agro-ecosystems may also be taken on priority for ameliorating the current condition of these agro-ecosystems.

The existing organic models of agro-ecosystems like Kaipad rice ecosystem (Kaipad is a saline-prone natural organic rice production tract of North Kerala. The Kaipad system of rice cultivation is an integrated organic farming system in which rice cultivation and aquaculture go together in coastal brackish-water marshes, which are rich in organic matter), Kole rice lands (The lagoons formed due to the recession of the sea and very productive for rice cultivation without the addition of any chemical fertilizer) etc., may be taken up for evolving strategies and action plans for promoting organic farming.

Strategy 3: Ensure Financial Support: In order to promote and spread adoption of organic farming in Kerala, those farmers, who are coming forward to take up organic farming need to be supported financially through specific schemes of providing organic inputs, and ensuring a subsidy at least for first three years of transition, during which period the farmers might face a heavy risk of acute shortages in yields and profits. These neo-converts need to be provided hand-holding support during the initial shock period in order to boost their morale and compensate for their losses.

Strategy 4: Develop Infrastructure for Organic Farming : Promotion of organic farming requires setting up of adequate infrastructure in terms of provision of organic

inputs, grading and packaging facilities, food safety and quality testing labs, marketing infrastructure including cold chains and marketing intelligence on organic produce.

Organic farming input resource base needs to be developed in each agro-ecological zone of Kerala to provide assured supply of adequate inputs at reasonable cost.

Grading and packaging facilities need to be developed through '*Food Parks'* concept so that modern cooling, cleaning, sorting, grading and packaging services are provided to farmers venturing out to export vegetables, fruits and flowers to international destinations. In addition, specific hinterlands of seaports and airports may be developed for providing supply of fruits, vegetables and flowers for export through sea and air routes.

Special Food Quality Testing Labs need to be developed by the state government that can provide testing facilities for food safety, assessing permissible levels of chemical residues in food products for adhering to Codex Alimentaris standards, etc., and for meeting export quality requirements of importing countries.

Marketing information of all national and international markets on all key agricultural products may be provided on-line to farmers and other agri-business entrepreneurs for ensuring further spread of organic farming.

Strategy 5: Ensure Relevant Technology Backup from the Agricultural Research Institutions of Kerala: Development of standardized reliable package of practices of organic farming specifically for each of the eight agro-ecological zones of Kerala is a first step for providing a good foundation of GAP (good agricultural practices) on organic farming. To achieve this, the existing contemporary organic farming innovations may be taken up and standardized, tested, refined and promoted. A sound scientific basis needs to be developed to evaluate and standardize the organic farming innovations.

Strategy 6: Establish a Network of Training Institution(s) to throughout Kerala: Farmers need to be provided with adequate education and training on organic farming

through intensive training schemes. For that establishment of a proper network of institutions that include both agricultural and allied departments like animal husbandry, fisheries etc should be ensured. Further, specific training curricula may be developed for all crops and for all agro-ecological zones of Kerala for ensuring knowledge and skill dissemination and adoption by all farmers.

Strategy 7: Develop Food Safety Standards: Grading organic food for ensuring food safety and analyzing for permissible levels of chemical residues needs to be done in a professional manner. Certification procedures can be made simpler and cheaper. Participatory Guarantee Scheme (PGS) of organic certification as promoted by National Council of Organic Farming (NCOF) may be taken up by the Department of Agriculture and Department of Commerce, Kerala.

A multi-pronged approach needs to be taken up by all the concerned agencies at all levels (bureaucratic, voluntary, trade, community, and individual levels). All concerned people need to sit together and develop action plans and work together keeping aside their personal egos, whims, and fancies and develop a consensus on critical action plans and promote organic farming in good earnest.

Conclusion

As there were a number of risks and uncertainties existing in Kerala along with the factors that encourage organic farming movement the implementation of organic farming may not be an easy task throughout the state in a short period. But, the different success stories of organic farming that include both individual and group efforts convey the fact that the target of conversion of the potential areas of the state to organic may not be so far if the implementing agency can opt for the right strategy at right time. Hence, it can be concluded that the feasible strategies listed above may be adopted by all the stakeholders in order to enhance the organic farming movement to a long way.

CHAPTER - V

GENERAL DISCUSSION

Organic farming has a great promise. Research studies have shown that organic agriculture helps restore and maintain ecological balance in an agro-ecosystem augments conservation of natural resources and boosts sustainability of the production system over generations. Organic agriculture has the potential to produce safe food free from toxic chemical residues. Now it is one of the emerging sustainable agriculture models, that is catching wide attention of people worldwide for its ability to protect environment and produce safe food.

On the contrary, organic agriculture is burdened with some limitations as chemicals are removed completely from the agro-ecosystem. It may not result in higher production, as chemical fertilizers and fertilizer responsive high yielding seeds are not used. Further organic farming may suffer from crop losses due to severe pest and disease infestation in the absence of pesticide application to control pests and diseases.

In the current agriculture scenario, since the soil, water and other natural resources in agriculture sector have got degraded, the soil fertility depleted, and agro-ecosystem lost its vitality and viability to produce a good crop, it is a tough task to convert from conventional agriculture to organic agriculture. First, the degraded agro-ecosystem takes a long time for recovery and restoration. The chemical deposits in soil take time for disintegration. The soil pH may recover slowly to normalcy. The soil microbial flora and fauna need to build up again. The soil humus may also build up gradually. During this process of soil recovery, crop plants may suffer from nutrient deficiencies and may yield quite less. The initial shock of yield loss may annoy the neo-convert to organic farming. Thus, household food security may become a serious issue and the neo-convert may start rethinking on continuing with organic

farming. Hence, conversion to organic agriculture from the current scenario of soil fertility depletion would require much greater support and effort from all stakeholders.

Now there exists a sort of ambiguity in several peoples' minds about organic agriculture as there is a great debate going on the need for an organic agriculture in a country like India where food security remains an critical issue. The current prices for organic food produce coupled with the low yield from organic farming system, compared to the conventional farming methods, act as a supporting document to the anti-organic farming advocates. However, another question, that deserves immense importance here, is how long can we extend the viability of an already over exploited agro-ecosystem through the addition of more and more chemical amendments to attain a good crop yield.

With these arguments and counter arguments the organic farming movement entered into a new phase of its development in our country. Several state governments have announced their policies on organic farming. Kerala state too had brought out its policy on organic farming in 2008, but received both praises and criticism by many stakeholder groups. Many arguments and counter arguments with supporting empirical evidences on '*for and against'* organic farming were put forth. In this regard the study entitled "*Organic Farming in Kerala: An Assessment of Adoption, Sustainability and Constraints"* was an attempt to add more clarity to the prevailing ambiguity related to organic farming and its potential to sustain the ecosystem as well as meet food needs of the society.

Factors behind the Need for a Shift to Organic Farming in Kerala

According to yin-yan principle, in any process, there is a pair of factors that pull and push in both directions before attaining balance. Here too, diverse views and forces were found to be operating in the debate on the relevancy of organic farming. The analysis for the major factors behind the recent shift of Kerala agriculture towards organic farming revealed that the farming community of the state was becoming more convinced about the need for conserving the agro-ecosystem and its resources to get a sustainable crop yield for a long period. This had been clear through the responses of majority of the organic farmers as the prime reason for the shift to

organic farming and its capability to reduce the environmental pollution to a larger extent compared to the conventional agriculture.

Consumers had become health conscious and started demanding for safer food and were willing to pay extra. Along with the consumers, the producers of the food had also started being sensitive towards the health hazards associated with chemically contaminated food. Organic food was once the trade mark of the wealthy elite of the society that could be purchased only in big supermarkets of the metros and a costly affair for the middle class group. However, due to the increasing awareness about the ill effects of food products contaminated with chemical residues people started to spend more for safe food stuffs and this situation was creating an increased demand for organic food. Thus majority of farmer respondents started shifting to organic agriculture for reducing environmental pollution. This result is found to be in accordance with that of Bhattacharyaa and Chakraborthy (2005). Eventually, farmers were also motivated to produce chemical free food to meet the emerging demands in market. This might be one of the reasons why more than fifty per cent of the organic farmers had given either first or second rank to the capability of organic farming to produce chemical free food as the major reason behind their shift to organic farming.

Even though there was a risk of economic loss in organic farming due to the low yield factor, especially in the initial conversion period, no farmers were found to be motivated by the financial support of the government to adopt organic farming. This revealed another fact that the recent shift to organic farming in the Kerala state was not solely for monetary reasons.

Extent of Adoption of Different Organic Farming Technologies

The extent of adoption of any technological development reveals the worth of the technology among the beneficiaries. As organic farming encompasses a set of technologies related to the agronomic, pest and nutrient management aspects, the extent of adoption of each group of technologies deserve importance to measure the level of adoption of organic farming among the practicing farmers. The results of the study unambiguously revealed that more than sixty per cent of the farmers had adopted all the technological innovations. However, insufficient on-farm resources

and non-availability of organic manures were restricting many of them in further adoption.

The high adoption level of the agronomic management practices like selective weeding, minimum tillage, and mulching had indirectly shown the farmers' awareness about moisture conservation technologies. The minimum tillage with sufficient mulching promotes the prevention of loss of soil moisture and productive top soil and thereby increases the water holding capacity of the soil. Thus, along with the reduced irrigation requirement, different water resources of the farm would be recharged faster.

The correlation analysis of the extent of adoption with various socio-economic variables exposed certain relevant associations. Socio-economic variables like age of the farmer, land size, experience in farming, number of crops grown, cropping pattern were shown a valid positive correlation with the level of adoption of organic farming. As the farmers with more age and farming experience could easily differentiate the benefits of the organic farming system that prevailed in their farmlands as well as the changes that had happened along with the over adoption of conventional chemical agriculture, there might be more adoption of organic farming technologies. In a multi-cropping system with a number of perennial crops as that of a typical Kerala homestead model, the high range of adoption would not only benefit the different crops but also improve the whole farm in several aspects for a sustained long period.

The reason behind the strong negative correlation between the adoption level of organic farming technologies and irrigation potential of the farm might be due to most of the farmers' inclination to conserve soil moisture through various agronomic management practices and thus requiring less irrigation water. With the improvement in the water holding capacity of the soil, irrigation requirements decline in an organic farming system. Further, this would produce a long term impact in the recharge of different water resources of the farm. So through the adoption of different technologies the resource-less farmers could be benefited in the long run.

Sustainability of Organic Farming to the Agro-Ecosystem

Sustainability is an inevitable component of any agro-ecosystem to produce a good crop and thus to provide a better livelihood to the farmers who are depending on

it. The whole concept of sustainable agriculture is based on the integration of the three main goals – environmental health, economic profitability, and social equity. To keep the agro-ecosystem sustainable for a long time, the farming technologies being adopted in it should be compatible with the system without generating any harmful effects. The analysis for the sustainability aspects of organic farming technologies to the three pillars of sustainability showed that it had more positive impact on the ecological aspect compared to the economic as well as social aspects. However, as the three pillars exist in a mutually beneficial way the benefits to the one component definitely have an indirect complementary effect on the rest two components of sustainability.

Environmental sustainability involves keeping the four ecosystem processes viz, energy flow, water cycle, mineral cycles, and ecosystem dynamics in good condition. The study revealed that through the adoption of organic farming, the agro-ecosystem had benefited in several ways like protection and recharge of the different farm resources like soil and water, protection of the system from the dreadful effects of chemicals, and an enhanced biodiversity in the farm. The synergic effects of these factors made the agro-ecosystem more sustainable to generate good results through the provision of safe food and water.

However, sustainability of an agro-ecosystem demands not only ecological benefits but economic benefits too. It demands that farmers continue to make a good living and population as a whole be supplied with an abundance of high quality food at reasonable cost. The study revealed that the net farm income had increased due to the organic farming even though the cost of cultivation was not shown any drastic decline because of more dependence on off-farm resources. As the success factor in the reduction of cost of cultivation in organic farming lies in the farm's self sufficiency with its own resources, these farmers might be have more economic advantage if they had developed their own resource base to meet the nutrient as well as plant protection needs of the farm.

The social leg of sustainability tripod is important because no human activity can continue and flourish unless it fully incorporates individual and social needs. This mainly is based on some broad principles: say equitable access to resources as support of decent standard of living, opportunities to participate in decision making,

opportunities for cultural and integral growth etc. However, the results of the study showed that even though rural farmers were also a part of the development of organic farming, there was no equitable access to the scarce natural as well as social resources.

Impact of Group Efforts in the Spread of Organic Farming

Group efforts of any kind, irrespective of the change agent were found to be having an impact in the spread of organic farming throughout the state. Through the four cases it was clear that everyone in the society needs a change agent to motivate them to think beyond the barriers and we could understand about the different influence patterns that made a positive impact to change the mindset of a society, especially the farmers' groups and their farmer-leaders. The cases also helped to realize the worth of the proverb *Unity is strength*. Even before, organic farming has been practiced by a number of innovative farmers; but they were scattered here and there throughout the state and were unorganized. Most of them were resourceful farmers with adequate ability to take risk in their organic farming initiatives. However, when the organic farming was launched as a viable group enterprise by a group of people, irrespective of the profit or loss due to low initial yields, surrounding people also started to think about following their lead. The convinced people even adopted organic farming practices in their own farmland and slowly the small group efforts began to take the form of a big movement. Such a silent movement of organic farming caught the attention of the state government too to think about supporting and promoting organic farming throughout the state.

The phenomenon was more evident especially in the case of Thiruvananthapuram district where the NGO-led organic farming movement could penetrate through the different social strata and eventually the concept of organic farming had spread throughout the district within a short period. The same thing had happened with the farmers of Wayanad too. Even though they had no supporting agency like *Thanal* of Thiruvananthapuram, the small group of determined farmers fought with the uncertain situations and many other constraints and they could add their name too in the history of organic development of the state. Their success led many other NGOs of the district to promote the same intensively and finally the

Wayanad district's name topped with the maximum number of organic farmers and more certified organic farming area.

Institutional Mechanism in the Promotion of Organic Farming

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 of 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 schools had played their role in generating interest on organic agriculture in the young minds. This organic farming movement was being taken forward by several NGOs and farmer's groups.

Constraints in the Promotion of Organic Farming

Organic farming and its promotion carries a number of barriers too along with the favourable factors. Seven groups of constraints were analyzed through the study and the grading and marketing constraint was ranked first out of the seven. Previously Das (2004) and Jaganathan (2009) also came up with a similar kind of report. Even though there was an increasing demand for organic produce even in the domestic market, the proper development of these markets to get out of the status of a niche market as well as to rise to the level of a regular market still take a long time. Well developed distribution channels especially for organic food produce were identified in several districts like *Elements Green Counters* in Kozhikode, Thrissur, and Ernakulam districts, *Ecoshops* in Thrissur, *Organic Bazar* in Thiruvananthapuram. However, these initiatives were few and quite inadequate to meet growing demand for organic food among health-conscious consumers.

As identified in the social constraints the hesitation from the neighbouring farmers to adopt organic farming definitely makes the produce of less quality coupled with this the problem of inability to produce good grade produce with limited farm

resources fetch only less price in the market. This might be another reason for the marketing problems. Along with these the initial yield loss due to the long term requirement of the agro-ecosystem to revive the potential to produce a good crop, was adding more stress to the farmer and leading the farmers to even debt situations. These kinds of situations could be observed especially in the case of farmers with limited resources and finally some of them might be losing interest and forced to leave the organic farming practices.

Advocacy Strategy for implementing of Organic Farming Policy in Kerala

As several forces were found to be pulling organic farming in opposite directions, a need was felt to bridge the consensus among all the stakeholders for arriving at some common minimum programme for promoting organic farming in Kerala. So, several strategies were suggested. Some of them are:

- ⇨ Organizing workshops and seminars to achieve consensus among different stakeholders
- ⇨ Educating and training organic farmers
- ⇨ Creating infrastructure for establishing organic input production centers, bio-fertilizer units, bio-pesticides units, food quality testing laboratories, grading and packaging food parks for export quality, cold chains and supply chains for assured marketing of organic produce
- ⇨ Developing reliable packages of practices for organic farming
- ⇨ Protection of environment, detoxification of soil and water resources
- ⇨ Providing economic support through special subsidy schemes for compensating the initial yield losses in organic farming
- ⇨ Working in a collaborative and coordinated manner by setting aside personal agenda and personal egos and working for a common cause of safe food, safe environment and conservation of Nature.

CHAPTER VI

SUMMARY AND CONCLUSION

Cultivators of the earth are the most valuable citizens. They are the most vigorous, the most independent, the most virtuous and they are tied to their country and wedded to its liberty and interests by the most lasting bonds.

- Thomas Jefferson (1785)

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 to investigate the various issues related to the conversion of Kerala's agriculture into completely organic from the ecological, economic and sociological perspectives with the overall objective of *assessing the adoption, sustainability and constraints in organic farming in Kerala.* The specific objectives of the study are given below.

Specific Objectives

1. To delineate factors behind the need for a shift to organic agriculture in Kerala.
2. To assess the extent of adoption of major technological innovations in organic farming and their sustainability to agro-ecosystem.
3. To study the impacts of farmer's group efforts in the spread of organic farming.
4. To study the institutional mechanisms for promoting organic farming.
5. To study the major constraints to the promotion of organic farming in Kerala.
6. To map the advocacy strategies for implementing organic farming policy strategy and action plan in Kerala.

Research Methodology

An ex-post-facto and survey research design was adopted for the study and Thiruvananthapuram, Thrissur, Palakkad, 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 80 organic farmers was randomly selected from the four districts. In addition, four cases were analysed from these districts to study in depth the group efforts in organic farming. A sample of 20 officials associated with promotion of organic farming was also interviewed to understand the existing institutional mechanisms for spreading organic farming and to map the advocacy strategies for promotion of organic farming in Kerala. The data collected were analysed with the help of SPSS package.

Major Findings

Factors behind the need for a shift to organic agriculture in Kerala

- There was a significant difference between the eight factors, which were given as major factors of shift to organic farming in Kerala. The capability of organic farming to reduce environmental pollution was ranked as the major reason for the shift to organic farming by nearly 50 per cent of the farmers. Influence of financial support of the government for organic farming was assigned last rank by the whole respondent group among the different factors that led the state to an organic shift.

Adoption of organic farming innovations

- There were significant differences in the adoption of different technological innovations of organic farming. Adoption of bio-pesticides and bio-fertilizers was found to be the first two in ranking among the different organic farming technologies. Nearly 59 per cent of the organic farmers were fully adopting bio-pesticides. About 40 per cent of the organic farmers found to be fully adopting bio-fertilizers and organic manures and the rest 60 per cent of them were partially adopting them. Minimum tillage and mulching were also adopted by majority of organic farmer respondents.
- Among the socio-economic variables, age, land size, experience in farming, were found to be positively correlated while education, major occupation, irrigation potential were found to be negatively correlated with the extent of adoption of organic farming innovations.

Sustainability of organic farming

- The beneficial effects of organic farming were found to be different significantly to the different dimensions of sustainability and more to the ecological sustainability with a mean rank of 853.73 compared to the economic sustainability (mean rank of 523.93) and social sustainability (mean rank of 423.84).

Case Studies on impacts of farmer's group efforts in the spread of organic farming

- Group movements in organic farming were found to be influential in spreading the organic farming movement throughout the state. The group movements led by NGOs were found to be mainly focused on key issues like the localization of safe food and preservation of ecosystem potential to produce good crop for a long period whereas, farmer-led organic farming group efforts were found to be dominant with a profit motive and giving more importance to cash crops for export.

Institutional mechanisms for promoting organic farming

- Among the six institutions: government, NGOs, certifying/ exporting agencies, Farmers' societies, educational institutions, and family & homesteads. Farmer's groups, family & homesteads and NGOs were found to be playing an important role for promoting organic farming among the organic farmers of Kerala. Government agencies were also working with the organic farmers by providing technical and financial support.

Major constraints to the promotion of organic farming in Kerala

- Significant differences were identified between the different constraints in the promotion of organic farming. Grading and marketing constraints (mean rank of 1378.00) and economic constraints (mean rank of 1299.58) were found to be in the first two positions among the seven groups of constraints. Among the grading and marketing constraints, inability to produce high grade produce with the limited on-farm resources was found to be significant. Whereas, fear of initial yield loss was found to be having the top rank among the economic constraints.
- Among the technological constraints, lack of a reliable package of practices for organic farming was found to be the most important problem. Whereas, the inability of organic farming to meet safe food requirement of all members of the society obtained the first rank among the social constraints. Among the personal constraints, the declining interest due to the shortage of on-farm resources was most significant one. High cost for the certification process was

found to be important among the certifying constraints and the long term requirement to get positive response from the ecosystem was the key issue among the ecological constraints.

Advocacy strategies for implementing organic farming policy strategy and action plan in Kerala

- Farmers' readiness to address the issues of resource degradation, environmental pollution need to be exploited through organizing workshops and seminars among farmers.
- Economic support need to be provided at least for the first three initial years of yield loss for neo-converts to organic farming
- Education and training programs need to be organized for farmers
- Creating adequate infrastructure for establishing organic input making, bio-fertilizer units, bio-pesticide units, food quality testing labs, grading and packaging facilities, and creating marketing channels for promoting organic farming in Kerala
- Developing reliable packages of practices for organic farming should be taken up as a priority through the network of research stations of Kerala Agricultural University for all the seven agro-climatic zones of Kerala state.

As all the stakeholders have a key role to play in promoting organic farming in Kerala, concerted group actions need to be taken up some common minimum programme decided by consensus of all stakeholders. The organic farming movement needs to be taken forward as it has a great promise for the future generations.

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केरल में जैविक खेती – ग्रहण, स्थिरता व बाधाओं का मूल्यांकन

सारांष

केरल के चार जिलों – तिरूवनन्तपुरम, त्रिस्सुर, पलक्कड एवं वयनाड में जैविक खेती का ग्रहण, स्थिरता एवं कठिनाइयों पर किये गये अध्ययन की मुख्य अनुसंधान समस्याएं इस प्रकार हैं। जैविक खेती को परिवर्तित करने के पीछे अंगीकरण तथा जैविक खेती का विस्तार, नवीकरण संस्थान की प्रक्रिया और दबाव। इसके अतिरिक्त चार वृतान्त के अध्ययन द्वारा समूह के प्रयास से जैविक खेती के विस्तार का प्रभाव भी केरल में लिखा गया तथा उसका विश्लेषण किया गया। अन्त में जैविक खेती के पक्ष–समर्थन की रूपरेखा की सलाह सभी शेयर धारकों को कार्यान्वित करने के लिए दी गई। चार जिलों में जैविक खेती के किसानों को अध्ययन के लिये चुना गया।

केरल में खेती को जैविक खेती में परिवर्तित करने के पीछे कुछ मुख्य कारण यह है। सर्वप्रमुख किसानों को कृषि–परिस्थितिकी का संरक्षण, स्थिरता और सक्षमता।

जैविक खेती पर्यावरण प्रदूषण कम करने में, रसायन रहित स्वस्थ आहार उत्पन्न करने में, कृषि परिस्थितिकी के सहज संसाधनों को सुरक्षित करने में और कृषि में सुस्थिरता कायम रखने में जैविक खेती सबल व सक्षम है। ऐसा किसानों में विश्वास है। बहुत से जैविक किसान जैविक खेती पद्धतियों को ग्रहण करते हैं। जैविक किसानों में ज्यादातर वयस्क हैं और खेती में अधिक अनुभवशाली हैं। वे कम पढ़े–लिखे हैं। वे अपने खेतों में फसलों में विविधता कायम रखते हैं। खेतों व घरों के परिसर में वे बहुत विविधता के साथ अनेक पेड़–पौधे व फसलें उगाते हैं। जैविक खेती में पारिस्थितिकी सुस्थिरता एवं आर्थिक स्थिरता ज्यादा पायी गयी है क्योंकि कृषि पारिस्थितिकी में संतुलन बनाये रखने में और संसाधनों को सुरक्षित रखने में सफल हो रही है।

जैविक खेती को बढ़ावा व प्रोत्साहित करने में जो संस्थायें कार्यरत हैं उनमें गैर–सरकारी संस्थायें और किसानों के समूह जैविक किसानों की जरूरतों को समझते हुए उनको फायदा पहुंचाने में एक मुख्य भूमिका अदा कर रहे हैं, मुख्यतः जैविक खेती के उपयोग में आने वाली निविष्टियों को उपलब्ध कराने में और विपणन सुविधाओं को मुहैया कराने में।

इस अध्ययन में जैविक खेती को अपनाने व विस्तार कराने में मुख्य कठिनाइयां हैं विश्वसनीय व परिष्कृत जैविक खेती पद्धतियों का अभाव, जैविक खेती की मुख्य सामग्री का अनुपलब्धता, जैविक किसानों में जैविक आहार का श्रेणीकरण व उन गुणवत्ता मानकों के बारे में कोई जानकारी न होना, जैविक

प्रमाणीकरण में अधिक धन व अधिक समय खर्च होना, अपने खेती को जैविक खेती में परिवर्तित करने के दौरान पारिस्थितिकी को वापस अपनी पूर्व स्थिति पाने व सकारात्मक प्रतिस्पंदना देने में अधिक समय लेना और पहली 1–3 वर्षों में उत्पादन में अधिक कटौती से हानि पहुंचना इत्यादि।

चार वृतान्त अध्ययनों से यह ज्ञात हुआ कि जैविक किसानों को संगठित करने में गैर सरकारी संस्थाऐं व किसान समूहों ने अत्यधिक प्रयास किया है। जैविक खेती का उत्पादन, गुणवत्ता नियंत्रण व जैविक बाजार व ईको–शॉप द्वारा विपणन जैसे कार्यों में जैविक किसानों को बहुत महत्वपूर्ण सहायता व समर्थन दिया है।

इस अध्ययन के अन्त में जैविक खेती विधान को अमल में लाने हेतु कुछ समर्थन युद्धस्तर तंत्रों को रचाया गया है जिन्हें सब संस्थाएं, समूहों व व्यक्तियों को ध्यान देना चाहिए। अलग–अलग संस्थाएं व व्यक्ति व समूहों को अपने निजी व्यक्तिगत मतों को ध्यान न देते हुए कुछ सामान्य न्यूनतम कार्यक्रम बना कर जैविक खेती को समुच्य प्रोत्साहन देने में सहयोग व सहकार सहित काम करना होगा। जैविक खेती पद्धतियों पर प्रशिक्षण व शिक्षा कार्यक्रम चलाना है। जैविक खेती उत्पादों का सस्ती व सरल प्रमाणीकरण होना चाहिए। सामूहिक गारंटी पद्धति भी उपयोग में लानी चाहिए। जैविक खेती में उपयोग करने वाले निविष्टियों को बनाना व वितरण करना, आहार गुणवत्ता जांच हेतु प्रयोगशालाओं को स्थापित करना, जैविक उत्पादों को उचित मूल्य पर विपणन करना इत्यादि सुविधाओं को बनाने के लिए सरकार को अति शीघ्र कुछ ठोस कदम उठाना पड़ेगा। पर्यावरण व प्रकृति को बचाने में, स्वास्थ्य सम्बन्धी विषयों में, जागृत प्रजा को सुरक्षित आहार प्रदान करने में सरकार जैविक खेती को प्रोत्साहन देते हुए, प्रजा सेवा कर सकती है। जैविक खेती के किसानों को उपज कम होने की संभावना के जोखिम को झेलने के लिए सब्सिडी/राहत देनी चाहिए।

Organic Farming in Kerala: An Assessment of Adoption, Sustainability and Constraints

ABSTRACT

In a study conducted in the four districts: Thiruvananthapuram, Thrissur, Palakkad, and Wayanad of Kerala on adoption, sustainability and constraints to organic farming in Kerala, the key research issues that the research study addressed were: factors behind the shift to organic farming, extent of adoption and sustainability of organic farming innovations, institutional mechanism and constraints to organic farming. In addition four case studies on impact of group efforts for the spread of organic farming were also written and analyzed. In the end a set of advocacy strategies were suggested for all stakeholders for implementing the organic farming policy in Kerala. A set of organic farmers were randomly selected from the four districts for the study.

Among the various factors behind the shift to organic farming in Kerala, the foremost was the conviction of the farmers for conserving the agro-ecosystem and its sustainability and the capability of organic farming to reduce environmental pollution and ill effects of pesticides and produce chemical free safe food. Majority of organic farmers were adopting all organic farming practices. Most of the organic farmers were old with more farming experience, less educated and growing more diverse crops in land holdings. Crop diversity was very high both in homesteads and fields. Organic farming was found to be high on ecological sustainability and economic sustainability as it was found to be enhancing ecosystems' ecological balance and conserving resources.

Among the institutions working for promotion of organic farming, NGOs and farmers groups were found to be playing a pivotal role in understanding and catering to the needs of organic farmers, especially in providing organic farming inputs and marketing support. Among the constraints to organic farming the most crucial were: lack of reliable package of practices of organic farming, non-availability of organic farming inputs, lack of awareness of grading and food quality standards among organic producers, high cost and long certification period for organic certification, loss of yield in the first two years and long time taken for recovery and positive response of ecosystem.

Four case studies revealed that the NGOs and farmers' groups helped in organizing the organic farmers' groups and providing land-holdings support in production, quality control and marketing through organic bazar, eco-shops etc.

The advocacy strategies suggested for implementing the organic farming policy included collaborative and coordinated efforts of all stakeholders through a common minimum programme, educating and training organic farmers, promotion of simpler and cheaper organic certification procedures, and participatory guarantee scheme, establishment of adequate infrastructure for organic input making and distribution, food quality testing laboratories, marketing channels etc. Provision of subsidies to organic farmers to compensate the yield loss in initial years of conversion, to promote safe food to health conscious local consumers and to conserve nature.

Appendix I

INTERVIEW SCHEDULE

1. Name of the farmer:

2. Age (in years):

3. Village:

4. District:

5. Educational Status:

Sl. No	Category	Score
1	Illiterate	
2	Functionally literate	
3	Primary school	
4	UP school	
5	High school	
6	College & above	

6. Occupational Status:

Sl. No.	Category	Score
1	Fulltime Farmer	
2	Farming and other occupation	
3	Any other	

7. Family Type:

Sl. No	Category	Score
1	Nuclear Family	
2	Joint Family	

8. Family Size:

9. Type of House:

Sl. No	Category	Score
1	Thatched	
2	Tiled	
3	Concrete	
4	Others	

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:

Sl. No.	Category	Score
1	Monoculture	
2	Crop Rotation	
3	Dry land Farming	
4	Mixed and Multistoried	
5	Mixed Farming	

16. Allied Agricultural Activities:

Sl. 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:

Sl. No.	Category	Score
1	From farming alone	
2	Partially from farming	
3	Not at all from farming	

18. Irrigation Potential:

Sl. No.	Category	Score
1	Throughout the year	
2	Seasonal	
3	Not assured	

19. Water Source:

Sl. No.	Category	Score
1	Well	
2	Pond/Tank	
3	Canal	
4	River	
5	Bore well	

20. Farmer's Perception of his Farming Methods:

Sl. No.	Category	Score
1	Traditional	
2	Modern	
3	Partly Organic	
4	Fully Organic	

21. Resources for Organic Farming:

Sl. 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	2005	2006	2007	2008	2009
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

26. Extent of adoption of major technological innovations in organic farming

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			

27. Sustainability of Organic Farming Technologies to Agro – ecosystems

Organic Farming		Rating			
		Always True	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 human and animals				

28. Major constraints to the promotion of organic farming

Particulars		Rating		
		Most Severe	Severe	Not Severe
Technologic Constraints	1. Lack of timely information related to organic farming 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 Low Price for the Produce			
Social Constraints	9. Inability to produce chemical free food for all in the society			
	10. Hesitation from 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			

	certification process			
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 grades			
	24. 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	

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
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?

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 II

Means of Different Socio-economic Variables

Sl. No	Variables	Means	SD
1	Age	45.03	10.82
2	Education	3.46	1.50
3	Occupation	1.61	0.49
4	Family type	1.06	0.24
5	Land size	1.98	0.15
6	Land under organic farming	1.86	0.2
7	Experience in farming	20.48	11.74
8	Experience in organic farming	11.74	8.84
9	Crops grown	5.43	3.74
10	Type of farming	3.92	1.48

Appendix III

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, plantation and orchard crops, *Azospirillum* - suitable for both upland and wetland conditions, Blue green algae -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.

5. **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.

6. **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 IV

PREPARATION OF SOME OF THE BIO- PESTICIDES AND ORGANIC 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

Organic Nutrient Supplements

Neem Seed Kernel Powder

Panchagavya during Fermentation Process

Plate IV

Organic Nutrient Supplements

Fish and Jaggery in Fermentation Process

Fish and Jaggery Extract

6. Panchagavya: Cow dung -7 kg and cow ghee-1 kg are mixed in a clean container thoroughly both in morning and evening hours and kept aside for 3 days. After 3 days, cow Urine -10 litres and water - 10 litres are added. The mixture is kept for 15 days with regular mixing both in morning and evening hours. After 15 days, add cow milk – 3 litres, cow curd - 2 litres, tender coconut water - 3 litres, jaggery - 3 kg and well ripened poovan banana - 12 nos. Panchagavya can be prepared in a wide mouthed mud pot or concrete tank or plastic can.

Never mix buffalo products and it should be stored in shade covered with a wire mesh or plastic mosquito net to prevent houseflies from laying eggs and the formation of maggots in the solution. Stir the contents twice a day both in morning and evening and the Panchagavya stock solution will be ready after 30 days

7. Dasagavya: Dasagavya is a mixture of Panchagavya with plant extracts. The plants used are given below

1. *Azadirachta indica*
2. *Calotropis sp*
3. *Tephrosia purpurea*
4. *Vitex negundo*
5. *Datura metel*
6. *Jatropha curcas*
7. *Adathoda vasica*
8. *Pongamia pinnata*

The plant extracts are prepared by separately soaking the foliage in cow urine in 1:1 ratio for ten days. The filtered extracts of all the plants are then added @ 1 litre each to 5 litres of the *Panchagavya* solution. The mixture is kept for 25 days and stirred well, meanwhile, to ensure thorough mixing of *Panchagavya* and the plant extracts.

8. Fish and Jaggery Extract: To prepare this mix 1 kg sardine fish with 1kg jaggery and keep it for one month in an air tight container preferably a mud pot. After one month strain the solution and keep it in a glass bottle/mud pot. This solution is used as a nutrient supplement and should be diluted nine times before spraying to crops.

9. Egg and Lemon Extract: The main ingredients here are egg and lemon juice. Keep any number of eggs in a plastic or mud pot and pour lemon juice till that covers the whole egg. Keep this for twenty one days, and then strain it and dilute five times to spray on crop plants as a nutrient supplement.

10. Pumpkin, Papaya and Banana Extract: Take 100g each of pumpkin, papaya and banana and mix it with 250g fresh jaggery solution and the egg yolk of three eggs. Keep this mixture for ten days and then strain it. Keep the extract in a bottle and dilute it nine times with water and can be sprayed to crops as a nutrient supplement.

Plate V

Organic Nutrient Supplements

Egg and Lemon Extract (during Fermentation)

Pumpkin, Papaya and Banana Extract (during Fermentation)