Future in the Past:
A study on the status of organic farming in Kerala

Balachandran V

Discussion Paper No. 82

Kerala Research Programme on Local Level Development
Centre for Development Studies
Thiruvananthapuram

Future in the Past:
A study on the status of organic farming in Kerala

Omana Cheriyan

English
Discussion Paper

First published 2004
Editorial Board: Prof. S. Neelakandan, Prof. P. R. Gopinathan Nair, H. Shaji
Printed at:
Kerala Research Programme on Local Level Development
Published by:
Dr K. N. Nair, Programme Co-ordinator,
Kerala Research Programme on Local Level Development,
Centre for Development Studies,
Prasanth Nagar, Ulloor,
Thiruvananthapuram

Cover Design: Defacto Creations

ISBN No: 81-87621-85-0

Price: **Rs 40**
US$ 5

KRPLLD 2004 0500 ENG

Contents

Future in the past: A study on the status of organic farming in Kerala

Balachandran. V

1. Introduction

Death hovers over Andhra Pradesh (AP)

More than 150 cotton farmers in the districts of Adilabad, Karimnagar, and Warangal in the Telengana region have committed suicide since 1997, five of them in the first five days of January 1998. All consumed the same pesticide they used 40 times a year to get rid of Spodoptera, *supposedly an 'insignificant' agricultural pest. The pest is not dying, but the farmers are.'* (Mahapatra, Richard. 'Suicide by Pesticide', *Down To Earth*, January 1998**)**

The unsustainability of modern agricultural practices have led farming communities the world over to look for alternatives. The majority of these alternatives indicate a return to traditional, eco-friendly practices; organic farming is one among them. Organic farming over the last few decades has proved to be successful; but the differences in culture, ecology and geographical factors necessitate adoption of situation-specific principles and techniques. The farmers of Kerala, as elsewhere are experimenting on this. Some have succeeded, others are in the process of evolution and yet others have failed but new options are being tested out. In this study, we look at the organic farming scenario in Kerala and analyze a few case studies drawn from different parts, which are examples of different organic farming approaches adopted by the farmers. These examples could serve as role models for those who plan to switch over to eco-friendly agricultural practices.

The impact of modern agriculture

"The side-effects of the modern agricultural chemicals and machines raise serious questions about the overall benefits of the new technology. Chemical fertilisers and pesticides pollute our air and water. Agricultural chemicals, including hormones and antibiotics leave residue

ACKNOWLEDGEMENTS: *The author would like to express his sincere gratitude and appreciation to: Mr C. K. Sujit Kumar, for assisting in collecting the information and doing most of the fieldwork; Mr P. R. Parameswaran, who assisted as field investigator; Messrs. K. O. Francis, P. N. Unnikrishnan IFS, Rajan Robert, and other friends of ECOFARM for their wholehearted support and encouragement; Dr Selvin Jebraj Norman, and Mr Margasagayam of GRI, Dindigul for their guidance; Mr Pradeep Chinnakonda of AME, Bangalore for his advice in designing the data sheets; The farm households who participated in this research and shared their experience, for sparing so much of their time and energy and for their invaluable advice; Programme Co-ordinator Dr K. N. Nair, Dr P. R. Gopinathan Nair and other members of the Programme Secretariat of KRPLLD, CDS for their support; Parvati Menon, friend and wife, for everything*.

Balachandran. V is Honorary Secretary, ECOFARM, Thiruvananthapuram.

in food that may cause cancer or genetic damage. Soil and energy resources are being depleted. Instead of recycling our wastes back onto land as fertiliser, we allow them to pollute our water. We use non-renewable energy resources to produce artificial fertiliser. In the future we may be forced to make radical adjustments on such agricultural practices." (Oelhaf, 1978).

Two decades later, we in India still extol the virtues of modern agriculture even while the agricultural economy lies in tatters and farmers commit suicide in droves. With a tradition in agriculture dating back to more than 4000 years how could this happen to our farmers?

Altieri traces it to three historical processes which "obscured and denigrated" the agronomic knowledge that was developed by the local peoples and non-western societies: *'(1) the destruction of the means of encoding, regulating and transmitting agricultural practices; (2) the dramatic transformation of many non-western indigenous societies and the production systems on which they were based as a result of demographic collapse, slaving and colonial and market processes; and (3) the rise of positivist science.'* (Altieri, 1987)

The adverse environmental and social impacts of modern agriculture are universal. Pretty (1995) summarized them as follows:

- '*contamination of water by pesticides, nitrates, soil and livestock wastes, causing harm to wildlife, disruption of ecosystems and possible health problems in drinking water;*
- *contamination of food and fodder by residues of pesticides, nitrates and antibiotics;*
- *damage to farm and natural resources by pesticides, causing harm to farm workers and public, disruption of ecosystems and harm to wildlife;*
- *contamination of the atmosphere by ammonia, nitrous oxide, methane and the products of burning, which play a role in ozone depletion, global warming and atmospheric pollution;*
- *overuse of natural resources, causing depletion of groundwater and loss of wild foods and habitats and their capacity to absorb wastes causing water-logging and increased salinity;*
- *the tendency in agriculture to standardise and specialise by focusing on modern varieties, causing the displacement of traditional varieties and breeds;*
- *new health hazards for workers in the agrochemical and food -processing industries'.*

Definition of Organic Farming

Given the plethora of types of organic farming, it has to be seen how various authorities define organic farming.

The *US Department of Agriculture* defines organic farming. Thus "Organic *farming is a production system which avoids or largely excludes the use of synthetically compounded fertilisers, pesticides, growth regulators and livestock feed additions. To the maximum extent feasible, organic farming systems rely on crop rotations, crop residues, animal manures, legumes, green manures, off- farm organic wastes and aspects of biological pest control to*

maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests" (Lampkin, 1990).

*Masanobu Fukuoka***,** in his book, *One-straw Revolution*, indicates four basic principles of natural farming: They are *(1) No ploughing (2) No chemical fertilisers (3) No weeding and (4) No plant protection*. (Fukuoka, 1985).

'*Eco -friendly farming is a farming of integration of biological, cultural and natural inputs including integrated disease and pest management practices. It not only advocates for stopping or restricting the use of chemical fertilisers, pesticides, weedicides and other chemicals but it emphasises the need for farming which should create an ecological balance and a micro-environment suitable for health and growth of soil microflora, plants, animals, farm workers and finally the vast population which consume the farm produce'* (Harendar Raj, et al, 1996).

According to *Francis Blake* the principles of organic agriculture are (1) *Organic agriculture aims to be in harmony rather than in conflict with natural systems. The powers of nature are harnessed and developed to their fullest extent, rather than dominated. (2) It adopts an approach that minimises the use of non-renewable forms of energy (3) Organic food aims to be of optimum nutritional value (4) The organic world strives to be localised. Local markets, decentralised systems of distribution and processing are sought. (5) Organic agriculture does not pollute the environment* (Blake 1987).

The ultimate goal of farmers in sustainable agriculture according to *J.F. Parr*, are to (1*) maintain or improve the natural resource base, (2) protect the environment, (3) ensure profitability, (4) conserve energy,(5)increase productivity,(6) improve food quality and safety, and (7)create more viable socio-economic infrastructure for farms and rural communities* (Parr, 1990).

A general definition of organic food is food which has not been subjected to chemical pesticides or artificial fertilisers and which has been grown in soil whose humus content has been increased by the addition of organic matter. Organic farming is the raising of such food (Oelhaf, 1978).

Another comprehensive definition is by *Martha Kiley-Worthington*. She defines ecological agriculture as '*the establishment and maintenance of an ecologically self-sustaining low-input, economically viable, small farming system managed to maximise net production without causing large or long term changes to the environment, or being ethically or aesthetically unacceptable'*. (Kiley-Worthington, 1993).

The Persisting Ecological Constraints of Tropical Agriculture, say that the '*underlying principle of the eco-farming approach is to handle agriculturally used natural units as well as specifically farm units as ecological systems, intended to render lasting productivity. The three economically limiting conditions of eco-farming are (1) Ensuring continuous productivity takes precedence over maximising output; (2) Guaranteeing subsistence is*

more relevant that commercialisation; and (3) Utilisation of internal resources is preferable to external input' (Weischet Wolfgang et al, 1993).

For a farm to be sustainable, it must produce adequate amounts of high quality food, protect its resources and be both environmentally safe and profitable. Instead of depending on purchased materials such as fertilisers, a sustainable farm relies as much as possible on beneficial natural processes and renewable resources drawn from the farm itself (Papendick and Parr, 1990).

The principles of organic farming lie in the maintenance of soil fertility through careful husbandry, the recycling of agricultural wastes, avoidance or reduction of external inputs and the use of natural forms of pest management and weed control (Goldsmith& Hildeyard, 1996).

The vision of sustainability

The 1992 Rio conference provides a frame of sustainable development indicators with the following four categories:

- Social aspects of sustainable development;
- Economic aspects of sustainable development;
- Environmental aspects of sustainable development – further subdivided into water, land, atmosphere and waste;
- Institutional aspects of sustainable development.

Agriculture has been at the centre of the sustainability issue for two main reasons:

1. 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.
2. The product of agriculture is often food, and we all eat! Agriculture is therefore one of the foundations of human society. (Lele, 1991)

Larry Harrington (in Let Farmers Judge – Ed. Wim Heistra, et al, ILEIA, 1992) categorises the numerous definitions of sustainability and sustainable agriculture into three concepts: the agro-ecological concept, the resource concept and the growth concept. In the agro-ecological concept, agriculture can be made more sustainable by increasing system diversity and by fostering nutrient energy (and thereby reducing the use of external inputs) through the development of suitable new farming systems. Monitoring trends in system diversity and in the internal cycling of nutrients and energy is perceived as fundamental when measuring the sustainability of an agricultural system.

The resource concept is expressed in those definitions focussing on the continuing availability of resources over time, especially with regard to future generations and the rights of non-human species. The emphasis is on stewardship, the proper care and protection of resources.

The third view of growth concept focuses on the need for continued growth in agricultural productivity while maintaining the quality and quantity of the resources in agriculture. It implies using renewable resource at rates lower than that at which they can be generated, emitting wastes at rates lower than those at which they can be absorbed by the environment, and optimising the efficiency with which renewable resources are being used.

Environmental Soundness of Organic Farming

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

The environmental qualities of organic farming methods have been proven extensively and beyond any doubt. Long-term studies in the US and many other countries have shown that even a reversion to organic farming after years of modern high-input chemical farming has shown the resilience of nature to come back to a healthy state. Scores of researches have shown the higher quality of the soil and other natural resources and the low negative impact organic farming has on the environment. Not only has the natural resource base benefited but also the quality of the produce improved. Consumer expectations have been met as regards the standards of nutritive and health values.

Economic viability of organic farming

What is sustainable agriculture after all? The only sustainable agriculture is profitable agriculture. Short and sweet. Ainsworth (1989)

The ennobling, virtuous way of life that agriculture was once considered to be has been swept away in the global cultural changes that have taken place since the Industrial revolution. Agriculture, once a mode of life, has become a mode of production (Krimsky & Wrubel, 1996). The industrialisation of farming has rendered the traditional values of life redundant. The ownership of land, the freedom to nurture and evolve it to one's own liking; the intimate, instinctive love, labour and the tremendous satisfaction as the farmer looks at his creation – to the traditional farmer, it meant everything. Income generation was only a fringe benefit. Socially, too, the farmer was among the most respected in a community. Land ownership and the control of food production put him at the apex of the social pyramid. However, when the objective of human way of life changed its course from that of subsistence and sustenance to leisure and luxury, agriculture too, changed its colours. Changes in the mode of agricultural production reflect concurrent changes in other aspects of social and cultural life.

Thus it becomes imperative to highlight the economic viability of any mode of interaction. Whether introduction to a new concept or invitation to reconsider existing modes of behaviour, the emphasis has to be on the possible benefits that may be derived from accepting

the changes. As everything has to be assigned a market value, such is the case with organic farming besides an invitation to change to that mode of agricultural production. This is very much so in the case of farmers who are reluctant to step away from the established pattern of sustenance. As the lure of less labour, more production and huge profits veered away almost entire nations from their time tested and enduring way of life, a similar promise has to be kept for winning them over to organic farming.

To be economically viable, farmers should be able to produce enough for self-sufficiency and income and ensure sufficient returns to meet the costs. The yield as well as resource conservation and minimal risks should the measure of the sustainable farm.

Organic agriculture is more or less traditional agriculture; at least it is so to India which has a past and where traditions still survive, and to similar other countries. However, a change to organic farming cannot mean a return to the traditional way of life. A few non-conforming individuals may opt for it, but not the majority who want to improve their living standards. Esoteric aesthetics, principles and values may appeal to them, but not to the vast majority whose principal objective is to get richer.

Organic farming and social justice

One of the main arguments against organic farming is that it would not meet the food requirements of an ever-increasing population. But a brief look at the era of modern agriculture would show that, in spite of the booming agricultural production, more people die of starvation and malnutrition than before. Inequitable distribution of food rather than insufficient production is the root of the problem.

Studies on ecological farming in South India show that ecological farms produce similar levels of output as that of conventional farms (van der Werf, et.al. 1992). Thus ecological agriculture does not put food security at risk in the short term. As ecological farming practices slow soil erosion and the depletion of soil fertility, it safeguards the future food security of the nation. The low dependence on external inputs is likely to reduce the drain on foreign exchange reserves. (ibid.)

Description of the region

Located in southwest India, Kerala is a narrow coastal strip bounded by Kerala on the northeast Tamil Nadu on the east and Arabian Sea on the west. The state is about 580 km long and 130 km broad at the widest point. Temperature ranges from a minimum of 19-26^{o}C to a maximum of 27-37^{o}C and rainfall ranges from 1943mm–3667mm.Though one of the smallest states in India with a geographical area of 38863 km^{2} (1.18% of the Indian Union), Kerala has a diverse physiography: a range of altitude from sea level to about 2690 m. It is divided into three distinct natural zones: lowlands, midlands and the highlands, forming parallel belts running across the length of the state from North to South. Lowlands are the low-lying coastal belt on the west, densely populated (1385 p/. km^{2}), where rice and coconut are the main crops. The highlands consist of the Western Ghats mountain

range forming the eastern part of the State. Rubber, Spices, Coffee and Tea are the major crops in the highlands. The midlands, a varied terrain of small valleys and hills in between, have a wide variety of crops including rice, tapioca, banana, plantain, coca, clove, nutmeg, ginger, pepper, areca nut, cashew, coconut, rubber, etc.

Despite its relatively small size and high density of population, Kerala accounts for several important agricultural commodities: Pepper (95% of India's production) Rubber (92%), Cashew (85%), Cardamom (70%), Ginger (60%) and Coconut (43%). Other than plantations and paddy fields, rural Kerala abound with homestead farms that have an astonishing variety of crops. Predominance of perennial tree crops, very small operational holdings (average size 0.36 ha.), and mainly rainfed farming are the singular features of Kerala's agriculture. (KLUB, 1997)

Modern agriculture and Kerala

Diverse agricultural systems had evolved in Kerala, as diverse as its landscapes. But in the last few decades, traditional agriculture was rejected in favour of the modern, intensive kind. This had a negative impact not only on agriculture but also on the economy, environment, culture and social life of the people. The transformation of 'agriculture' to 'agri-business' is most evident in Kerala. Oilseeds, rubber, tea, coffee, cashew, spices, sugarcane, horticulture, and floriculture have relegated food crops to the background. (Madhusudanan, 1995). Decreasing share of agriculture in the total domestic production and individual earnings from agriculture, diminishing importance of agriculture as a source of livelihood, shift from short term annual crops to long term cash crops and tree crops which have a lesser potential for employment, decrease in the area under paddy cultivation mainly due to conversion of paddy lands to coconut plantations, brick kilns and construction of residential houses, acute shortage of farm workers, fragmentation of land, pollution due to chemical pesticides and fertilisers, etc. are some of the major problems faced by agriculture in Kerala (Verghese, 1995).

Studies have shown that in Kerala, increased fertiliser consumption does not necessarily lead to higher productivity (Pillai, 1994). The other major factors contributing to productivity such as HYV coverage and modern irrigation methods also have not made any decisive impact in improving the per hectare productivity of crops in the state level. (Thomas, 1999).

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

specific pests and diseases' (Kerala Land Use Board, 1997)

In the past 10-15 years, many farmers in Kerala other than those who continued the traditional methods, have taken up organic farming quite earnestly. Those who reverted from modern intensive agriculture to organic farming had to face many immediate problems. Sudden withdrawal of the external inputs led to steep fall in yield. The high yielding varieties of seeds had to be replaced by indigenous ones. The gap of 30 - 40 years created a vacuum in the knowledge of traditional agricultural practices. The prevalence of modern agriculture in the majority of the cultivable areas makes it difficult to maintain organic purity in the soil and atmosphere. Moreover, the organic farmers are scattered all over the state with a few pursuing it seriously. While it has been proven beyond doubt that the organically grown food is much better in quality, it remains to be established that, in terms of total productivity and economic viability, organic farming can compare with modern intensive agriculture.

2. Literature Review

Global

There has been a splurge in organic farming literature in the last decade, indicative of its growing importance. The literature can be broadly classified as i) those dealing with the problems of modern agriculture and suggesting alternative systems such as organic farming ii) those expounding the principles and practices of organic farming, iii) those which study the different elements such as effect of bio-inputs, studies on comparative yields. A gradual transition from modern to organic agriculture has been accepted the world over as the only solution for overcoming the present crisis in agriculture. The reconciliatory tone can be understood in the emergence of new terminology and practices like sustainable agriculture, integrated pest and nutrient management, etc. This situation has led to a splurge of literature in organic farming and allied subjects.

Organic farming is fast developing in the West as a healthy and profitable alternative to modern agriculture. Organic food produce has an exclusive niche¢ in the market. Health and environment conscious people prefer organic food. Supportive literature augments the popularity and spread of the organic food culture.

The first awakening to the danger of pesticides in the West occurred when Rachel Carson's *Silent Spring* was published in 1961. In spite of the concerted efforts of the powerful pesticide lobby to denigrate her, *Silent Spring* remains the greatest classic in the field of environmental conservation.

However, Albert Howard's *An Agricultural Testament*, first published in 1940, could be said to have marked the origin of modern organic farming in the West. It championed a type of agriculture, which emphasized feeding the soil through compost. The approach is holistic, rather than analytic. Land, farmer, food, and consumer compose a whole system. It is based on Howard's experiments while in India in 1920s when he developed the composting techniques described therein. It is possible that he borrowed the idea from Indian farmers.

The first known use of the term 'Organic farming' was in '*Look to the Land' by* Lord Walter Ernest Christopher James Northbourne**,** published in 1940. *The Living Soil (1943)* by Lady Evelyn Barbara Balfour**,** is based on 32 years' comparison of organic, mixed and chemical sections of a farm at Haughley, England, this is an extremely readable exposition of the evidence in favour of biological agriculture by one of the founders of that country's 'Soil Association.' Another important work to come out in this period was Jerome Irving Rodale's *Pay Dirt: Farming and Gardening with Composts (1945).* The classic statement on the value of soil, this and Rodale's later works sparked and fuelled the organic movement

in North America. Herbert. H. Koeff's *Bio-dynamic Agriculture- An Introduction* (1976), espouses the Bio-dynamic agricultural procedures, while Coew Reintjes' *'Farming for the Future- An Introduction to LEISA'* (1988) emphasises on reduction of external input for maintaining farming sustainability. Robert.C.Oelhaf's *Organic Agriculture (1978)* is a watershed in the history of organic farming because it is one of the earliest works that has anlaysed organic farming using the conventional scientific methodology. Francis Blake's *Organic Farming and Growing* (1987) is a comprehensive handbook on organic husbandry outlining the principles of organic agriculture, giving advice to those considering going organic and step-by-step guide to conversion. Bill Mollison's *An Introduction to Permaculture (1991) & Permaculture -A Designer's Manual (*1990) detail the Permaculture way of organic farming. It is a design system rather than a farming technique. It aims at creating systems that are ecologically sound and economically viable. A location -specific system, Permaculture, is based on a philosophy of "working with nature and not against it". The well-known works of Masanobu Fukuoka, viz., *One Straw Revolution* (1983), and The *Natural Way of Farming* (1985) could be considered as the basic philosophic texts on natural farming.

Perhaps the most widely quoted book on sustainable agriculture is Miguel A Altieri's *Agroecology: The Science of Sustainable Agriculture* (1987). This classic work emphasises the importance of agro-ecology as the discipline that provides the basic ecological principles of how to study, design and manage agro-ecosystems that are both productive and natural-resource conserving and are also culturally sensitive, socially just and economically viable. Equally important is Jules N Pretty's *Regenerating Agriculture: Policies and practice for sustainability and self-reliance* (1995). It looks at the scale of the challenge facing agriculture today and details the concepts and characteristics of alternative, sustainable agricultural practices. Martha Kiley-Worthington's *Eco- agriculture: Food first farming (1993*) is another of the no-nonsense, down-to-earth books which gives a pragmatic view of eco-friendly agriculture. The brilliant exposition of the pitfalls of modern agriculture, description of alternatives, and finally evolving a set of principles of eco-friendly agriculture based on her own experience gives the reader clarity of the whole philosophy of judicious exploitation of natural resources.

Return to the Good Earth: Damaging effects of Modern Agriculture and the case for Ecological Farming (1993) is a collection of articles and excerpts from many sources published by the Third World Network. The dangers of pesticide overuse, the green revolution and its disastrous effects in the Third World, the industrial countries' fight to control the genetic resources of the Third World, the biotechnology threat, indigenous and natural farming methods that are productive and ecologically sound, etc., are some of the aspects covered in this dossier. This book is an invaluable reference source. Sustainable agriculture, however cliché-d the phrase be, is the compromise that the proponents of conventional agriculture has been graceful enough to come down to. The International Conference on Sustainable Agricultural Systems held in Ohio, USA, in 1988, was such a venue where the developed nations finally acknowledged

the problems created by the unsustainable practices of conventional agriculture. This conference brought forth a number of studies, which touched upon all the aspects of agriculture. A collection of essays on assessing sustainable agriculture ranging from definitions to case studies and evaluation of new technologies can be found in *Let Farmers Judge,* edited by Wim Hiemstra, Coen Reijntjes and Erik van der Werf. *(Intermediate Technology Publications, 1992)*

The last two decades of 20th century witnessed an overwhelming popularity and scientific acceptance of organic farming in the western world, esp. USA, Germany and the Scandinavian countries. In-depth research has gone into the different aspects, stages and shades of organic agriculture. Many universities such as The Institute of Ecological Agriculture, Bonn University, Germany offer courses on ecological agriculture and long-term research, The FiBL, organic agriculture research institute in Switzerland, international federations like the IFOAM with HQ in Germany and scores of other institutions in Europe do exclusive research in organic farming and support organic farmers. On the other side of Atlantic, in the US, the governmental agencies have extensive programmes and policies for the promotion of organic farming and innumerable NGOs are engaged in popularizing it.

There is no doubt that organic farming has been established in the West. Natural fallout is the interest shown by the MNCs, who scent a huge killing in a new arena. The prime motive again becomes generation of easy money and opening of new markets. Organically grown food produce is already being exported to the West from Latin America and Asia under the supervision and certification of inspectors from the West. In exchange for a few more dollars, the developing nations deprive themselves of the food needs of their own people, jeopardize the physical and mental health of their people and the hard earned dollars are again channelled back to purchase arms or for other deplorable purposes. The whole idea of food export from the South to the North has to be re-examined. For example, the major food exports from Kerala are Cashew nut and seafood. With the boom in food export in the Seventies, the natives could no longer afford to buy high quality cashew nuts or the best seafood. The impact of this nutrition deprivation has to be contrasted against the amount of foreign exchange earned, its reinvestment in improving the living conditions of the people and sharing of its benefits by all sections of the society.

Organic agriculture is now practised in almost all countries of the world, and its share of agricultural land and farms is growing. The total organically managed area is more than 22 million hectares worldwide. In addition, the area of certified “wild harvested plants” is at least a further 10.7million hectares, according to various certification bodies. The market for organic products is growing, not only in Europe and North America (which are the major markets) but also in many other countries, including many developing countries. Official interest in organic agriculture is emerging in many countries (Yussefi & Mitscke, 2003).

India

India produces primary organic products; processed foods are limited. Organic products grown in various agro-climatic zones are coffee, tea, spices, fruits, vegetables and cereals as well as honey and cotton. Organic animal husbandry, poultry and fisheries do not exist. Domestic organic markets and consumer awareness are underdeveloped in India, but interest is growing. In the domestic market, organic food is usually sold directly by the farmer or through specialised shops and restaurants. At present, a price premium of about 20-30% over conventional products can be received (FAO 2002). India is an exporting country and does not import any organic products. The main market for exported products is the European Union. Another growing market is the USA. External certification bodies introduced inspection and certification programmes in 1987. In June 2001, the Government of India announced the National Programme for Organic Production (NPOP), which aims to promote sustainable production, environmental conservation, reduction in the use and import of agrochemicals, the promotion of export and rural development (FAO2002). The Indian Standards are modelled on the IFOAM Basic Standards and the seal "India Organic" has been established. In October 2001, the export of organic products was brought under government regulation, while imports and the domestic market were not (Mahale, 2002).

In his *'Tending the Earth: Traditional, Sustainable agriculture in India* (1993), Winin Pereira summarizes a wealth of information and ideas from a voluminous documentation collected over more than 25 years. He shows how the traditional agricultural system in India was so developed in terms of productivity, self-reliance, diversity and sustainability.

The Organic Farming Source Book (Ed. Claude Alvarez) (1996) is the first full document of the organic farming scene in India. From traditional agriculture through Green Revolution to the state-by state directory of organic farmers in the country, it also contains brief but very informative reviews on the publications on organic farming in India. It gives ample information about the various eco-friendly farming practices prevalent in the world. However, the lack of scientific studies and findings is a bit disappointing for a researcher seeking to validate organic farming through a conventional scientific approach. But this is overcome to a great extent through *The Organic Farming Reader (Ed. Alvarez.C,* et al, 1999), a collection of essays written and edited by persons such as Claude Alvarez, Bernard Declerq, Vandana Shiva, Korah Mathen, Ismail Sulthan, and K.Vijayalakshmi. The different sections such as 'the Philosophy and Ethics of Organic Farming', 'Soil Fertility Management and Land Regeneration', 'Seeds, Genetic resources and Food Security', 'Problems in Plant-animal relationships', and 'Economic and Social aspects of Organic Farming' cover almost the entire spectrum of organic farming.

The establishment scientists in India have till recently avoided organic farming. A study on the postgraduate research in agriculture in India revealed that there is an overwhelming bias towards modern agriculture. (Gupta et.al.1989) The abstracts of research and extension theses completed in 32 agriculture colleges and universities between 1973-84 were studied.

It was found that of 376 agronomy theses, only 2% dealt with organic fertilisers and green manuring while 27% dealt with inorganic fertilisers; 30% dealt with irrigation while 0.8% with salinity; of all the 1128 theses on all topics 4.5% dealt with drought prone areas while 73.5% dealt with irrigated agriculture and 22% with rain fed agriculture.

However, in recent times, a number of studies on related aspects of organic farming have been forthcoming; like the effect of organic and inorganic manures, chemical and bio-pesticides, comparative yield studies, studies on integrated pest/nutrient management, etc. *The National Seminar on Natural Farming (1992)* in Rajasthan brought the first comprehensive collection of papers on organic farming in India. Similar symposia across the country have attracted the interest of the scientific community to the subject of organic farming. The National Symposium on Organic Farming (1996) held at Chennai, Congress on Traditional Sciences and Technologies of India (1993, 1995, 1997) held at Mumbai, Chennai and Varanasi, the Workshop on Tropical Organic Farming (1995) and the Seminar on Sustainable farming and the Environment (1993) held at Kottayam and Kochi respectively are some of the other major events in the course of development of organic farming in the country. In her comparative study on commercial and traditional agricultural systems, Sulabha Khanna looks into the problems of commercial and traditional agriculture in Gujarat. She comes to the conclusion that commercialisation of agriculture is not the solution to low yield, hunger and poverty. The problem lies in the unequal distribution pattern of every resource of agriculture like seeds, implements, water, fertilisers, land, social services and profit (Khanna, 1993).

Two works that appeared in recent times are *Organic Farming: Theory and Practice* (SP.Palaniappan, K. Annadurai, 1999) and *Organic Farming for Sustainable Agriculture* (A. K. Dahama, 1999). In a bleak scenario where there are hardly any books on the Indian context of organic farming, the above two are quite welcome. In both the books the emphasis is on the organic farming techniques, esp., nutrient and pest management. While Palaniappan's book has more practical and useful information on these topics, the one by Dahama is superficial and a rehash of several books and typical of the genre of textbooks spewed out of the numerous north Indian publishing houses. Of the several scientific papers that conclude that a combination of organic manures and chemical fertilisers, the study by G B Singh and B S Dwivedi is typical recommending integration of organic manures, green manures and biofertilisers with chemical fertilisers (Singh and Dwivedi, 1996).

The four important factors of sustainable agriculture are balanced fertilisation, integrated plant nutrient system, in-situ nutrient cycling and changing the crops in one or both seasons in a cropping system (Rajendra Prasad, 1996). Long-term fertiliser experiments (LTFE) showed a decline in the yield of rice, wheat and maize at different centres in the country. Monocultures over long period, besides depleting essential plant nutrients, also lead to epidemics of plant pathogens. The Brown Plant Hopper (BPH), which was only a minor pest in the pre- HYV era, is today the most serious insect pest of rice (ibid.). A study

among grape farmers in Maharashtra shows that vermiculture (Organic farming) per ha, net returns and cost-benefit ratio were higher than that in conventional farming (Suryavanshi et.al., 1997). The quality of the crop produced by a mixture of organic matter and phosphate is better than that produced in control soil or that fertilised by the application of inorganic fertilisers. The protein, vitamins, and minerals are appreciably greater in the organically produced crops (Srivastava, et.al, 1982).

One of the most significant studies that have a strong relevance to this study is the one on the organic farming in Pudukkottai, Tamil Nadu by N. Margasagayam and T. Selvin Jebraj Norman. The study on the cost benefit analysis, impact of organic farming on yield, soil, income & expenditure, ecology, debt, health, etc., of the 300 odd organic farmers of Pudukkottai district, Tamil Nadu, reveals that, despite the infancy stage of organic farming, the results are very encouraging. The cost - benefit ratio of some crops are already higher for organic farming. The yield did not show much difference in comparison with that of conventional agriculture (Margasagayam & Norman, 1997).

Yet another important study is *Ecological Agriculture in South–India by E. van der Werf and A.de jager (1992*). The report describes two research programmes carried out on ecological agriculture in India. Experiences of twelve farmers, in transition towards ecological agriculture, are narrated and analysed. It points out that a gradual approach is crucial for success. The duration of the transition period is directly related to the previous farming system, specifically the amounts of mineral fertilisers used. An average transition takes three to five years. The comparative performance of seven farm pairs, consisting of one ecological and one conventional reference farm, is analysed in relation to agronomic and economic performance. Ecological farms achieve similar economic results as conventional farms, for gross margin/ha (Rs.10, 620/- and Rs.11, 515/- respectively) as well as net farm income /Labour Day (Rs.32/-). Labour input per hectare also shows no significant difference. In ecological farms, trees and livestock are far more numerous than in conventional farms (7: 1 and 4:1 respectively). (Van der Werf and de jager, 1992)

In 1963, the United Nations' Food and Agricultural Organisation (FAO) set up its 'Freedom from Hunger' Campaign. FAO launched its 'Green Revolution', known formally as the Indicative World Plan for Agricultural Development. The introduction of the high-yielding cereal varieties increased wheat yields by 50% and rice yields by 25% in India. Cereal production rose from 50.8 mln tonnes in 1951 to 198 mln tonnes in 1996-'97. But this required a massive increase in fertiliser use (from 0.07 mln.tonnes in 1951 to 0.21mln tonnes in 1960-61 to 4.26mln tonnes in 1982-83 to 13.9 mln.tonnes in 1996-'97). The pesticides input leapt from 2000 tonnes to 72000 tonnes (Goldsmith & Hildeyard, 1990).

The Mohanpur Experiment in Natural Farming by the Friends Rural Centre, Rasulia, the studies by Agriculture Man Ecology (AME), Bangalore, Agricultural Renewal in India for a Sustainable Environment (ARISE), Pondicherry, All India Federation of Organic Farmers (AIFOF), Thane, International Federation of Organic Farmers-India (IFOAM- India), etc.

are some NGOs who have made important contributions to the scientific study of organic farming in India.

To sum up; '*the greatest challenge for the coming decades lie in the fact that the production environments are unstable and degrading, and the balance between intensive and extensive agriculture is precarious. Experience over the past 20 years has shown that mismatch between crop production methods and resource characteristics has led to a decline in soil fertility, increased soil losses, disturbed hydrological balance and a build-up of pests and diseases'* (Abrol, 1994). The onus is on agricultural science to take up this challenge.

Kerala

Perhaps the most revealing statement on the agricultural situation in Kerala in recent times is in the *Kerala State Resource based Perspective Plan 2020 AD* (Kerala Land Use Board, 1997). Giving a bird's eye-view of agriculture in Kerala, it strongly recommends the adoption of sustainable agricultural practices at the earliest. It is one of the most precise indictments on the state's sorry state of agricultural affairs. Detailed data on Kerala's agriculture, on the basis of agro-climatic zones are given in the book.

Another significant study from the 1980s is the Report of the One-Man Commission on the problems of Paddy cultivators in Kerala (1981) done by M. Janardhanan Nair, former Director of Agriculture, Govt. of Kerala. Though restricted to the problems of paddy cultivation, the recommendations of the study are valid for the entire agriculture sector. Noteworthy among the observations are those on decreasing use of organic manures in the fields and the negative impacts of chemical pesticides. The Report recommends popularisation of biofertilisers and green manures; to initiate a 'Green manure perennial planting Programme'; mechanical plants for manufacture of compost in Corporations and Municipalities, minimisation of use of insecticides; and to take up biological and mechanical control of rodents.

Enquiry into the available literature on organic farming in Kerala revealed a void. Here again, there are quite a number of studies on organic manures, natural pesticides, integrated pest and nutrient management but organic farming as a system seems to have been left out. This gap is filled to a certain extent by the few studies on homestead gardens and farms of Kerala. The first major book on organic farming in Kerala is by P K Thampan of Kochi. In his book, *Organic Agriculture* (Thampan, 1995), he has compiled articles on organic agriculture, vermiculture, traditional Indian agriculture, some case studies of organic farmers from different parts of India, esp. plantation farmers. It provides data on yield returns, techniques used for maintaining soil fertility, etc.

The proceedings of the two major Seminar/Workshop held at Kochi and Kottayam organised by the United Planters Association of South India, (UPASI) brought out a number of works on farm level experiences of organic farmers, cultivation practices of various field

crops as well as plantation crops, presentations of scientific experts on bio-pesticides and organic plant nutrition techniques and marketing strategies for organic products.

First major coverage on organic farming by a popular periodical was in the 'Karshakashree'. (Vol.2.No.12.August1997). The articles by Nimi George contained the principles of organic/ sustainable farming, examples of organic farmers in the state, etc. in detail. The periodical 'Jaiva Karshaka Prakriti', published by the Jaiva Karshaka Samiti, Kerala, (Association of Organic Farmers) carries articles on organic farming and environment conservation. Organisations like the above Jaiva Karshaka Samiti and the ECOFARM has members who are actively pursuing organic farming. There is regular interaction among them through monthly gatherings and exchange of experience. Two books, which came out recently, deserve special mention. They are '*Oorvarathayude sangeetham'* by K V Dayal (1998) and *Krishimalayalam* by C K Sujit Kumar (1999). While the former serves as an excellent introduction to organic farming, the latter unravels the history and culture of agriculture in Kerala, its rich and diverse forms and its disastrous present.

The gap in knowledge

Despite the substantial number of studies that support the cause of organic agriculture, existing organic farms are yet to be put under scrutiny. Consider the following questions:

1. Are there any organic farms in Kerala? If yes, have they been studied in order to understand their mechanisms?
2. Considering the eco-climatic-cultural variations in Kerala's agriculture, what are the different principles and practices adopted by the organic farmers?
3. Traditional agriculture is still prevalent in Kerala. Has there been any attempt to revitalise it in the light of modern, scientific agricultural knowledge?
4. Recognising the problems of modern agriculture is one thing. What are the ways in which the farmer and *not* the scientist tried to solve these problems?
5. A farmer who wants to revert to organic farming looks for a model. Are there any imitable examples?

No work has taken up either a survey of organic farms or case studies of the individual farms. Thus, though we know what should and should not be organic farming, we are unaware as to what really an organic farm is. We do not know if there are any organic farms *per se* in the state. In the context of the diverse climatic, altitudinal and agricultural conditions that prevail in Kerala, can there be uniformity in the adaptations of OA techniques? Or can any basis be arrived at to categorise OA farms in Kerala? There are OA methods that are eco-friendly, but how realistic and applicable are they in the fields? These are questions that can be answered by the farmers and the farms. The exposition of such farms and their study as a system that can be emulated remains unattained by the results of hitherto investigations. If OA were to be recognised as a sustainable alternative, it would

require the support of the State for its propagation and implementation. The present study hopes to fill this gap in such a manner that the information generated would be comprehensible to an ordinary farmer.

Objectives

The objectives of the study are

1) To conduct a preliminary survey of organic farming in Kerala, which would produce an inventory of organic farmers, irrespective of varieties in crops, variations in their organic farming techniques and such other factors pertinent to farming and enable to assess the extent of organic farming in the state.
2) To conduct case studies of selected organic farmers in order to make a detailed qualitative analysis to understand the unique characteristics of the organic farm and farming operations.
3) To conduct a farm income analysis of the selected case studies to assess the economic viability of the farms.
4) To make suitable recommendations for an agricultural policy in the state which would recognise the need for sustainable agricultural practices and provide necessary support to the farmers.

Methodology

The study has three main components: 1) The survey of organic farmers in Kerala, 2) The screening of selected organic farmers, and 3) Locale-specific case studies.

Organic farmers are defined as those farmers who practice organic farming or similar eco- friendly farming techniques for a minimum of two years, no or decreasing use of chemical fertilisers and biocides, use of organic fertilisers and organic biocides and application of resource conserving technologies. For the case study, however, selected samples from the above list conform to more rigorous conditions as to the extent of organic farming.

A Mail – Questionnaire survey was followed by visits to selected farms. The samples for the case study were chosen from the screened farms. Monthly visits were made to the farms over a period of one year or more – covering one full annual cycle of agricultural activities in the farms. Exhaustive data on the qualitative and quantitative aspects of the farm operations were collected using PRA techniques, direct observation and verification of farm records in available cases in order to; I) record the different aspects of organic farming practices, ii) record the problems faced by the organic farmers and the recommendations made by them and iii) assess the profitability, productivity and viability of the farms.

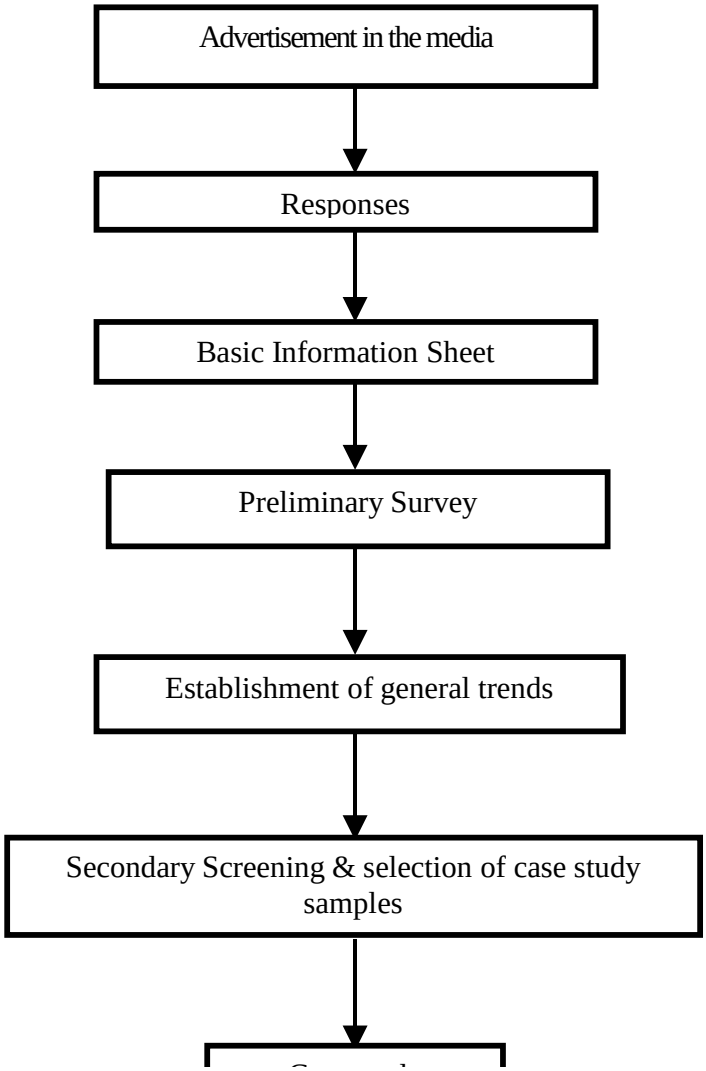


Chart A Flowchart of the study

5. Results and Discussion

The survey

Announcements were made in the regional language newspapers regarding the study and requesting organic farmers to send in their addresses. The Kerala Agriculture University Research Stations in the different parts of the state, farmers' organizations, individuals and agricultural scientists who have shown interest in organic farming were requested to provide addresses of organic farmers known to them.

Over a period of 2 months, nearly 350 addresses were collected; though all of them were not necessarily organic farmers. 25-30 of them were either sympathisers to the cause or agricultural scientists and columnists who showed interest in the development of organic farming in the state. A Questionnaire (Basic Information Sheet) with a covering letter (both in Malayalam) and a Self-addressed stamped envelope were mailed to all the respondents. During the course of one and a half-month, 151 responses were received from practicing organic farmers.

No. of mailing addresses collected: 334. No. of Persons to whom Questionnaire was sent: 325(From 1.9.1998 to 15.10.98). No. of farmer respondents: 151 (From 7.9.1998 to 15.10.98).

The cut-off date for receipt of BIS was set as 15.10.98. Late responses were not included in the survey. The questionnaires sent to the 21 agricultural research stations of the Kerala Agricultural University, several well-known agriculture officers of the state department, and those to the agricultural columnists were not returned. Some newspapers and periodicals as well as radio and television media did not accede to the request for announcing the survey over their respective media. These instances reduced the extent of publicity for the study. However, the number of responses as well as the enthusiasm shown by the farmers was much beyond expectation.

The socio-economic background of the farmers is looked at from two points – the size of the land holding and dependence on agriculture as a source of income. The rest is devoted to the description of organic farming practiced by the farmers.

Table 5.1 Title to cultivating land

Type	Own	Lease	Tharavad	Own & lease	Own & Pledge	Own & others	No information
No. of farmers	128	7	2	6	1	3	4

Table 5.2 Allied agricultural activities

Activity	Cattle	Poultry	Piggery	Bee	Fish	Duck	Goat	Rabbit	Others	None	No info
No. of farmers	67	68	4	18	18	7	18	2	5	46	5

Most of the farmers, who have cattle, also keep poultry. Only 8 farmers have a high diversity of more than 5 types of such activities.

Table 5.3 Water sources

Source	Well	Pond/tank	Canal	River	Borewell
No. of farmers	99	47	12	14	7

All farmers depend mainly on the seasonal rains as their primary water source for the farmland. In addition, they depend on well water as well as pond/tank, canal, and river and in some water scarce area, borewells are also used.

Table 5.4 Method of Irrigation in the cultivated lands

Method	Diesel	Electric motor	Traditional/ motor	Diesel & None	Solar Electric	Wind	No infor.
No. of farmers	18	81	72	8	1	1	5

The majority of the small & marginal farmers found use of motorised irrigation prohibitively expensive. Many of them use very innovative and effective traditional and indigenously developed methods of channelling, bunding, water retention and rainwater harvesting.

Table 5.5 Use of agricultural machinery

Machine	Tractor	Tiller	Harvester	Methi yantram	Coconut climber	Other	Traditional/ None	No info
No. of farmers	15	6	3	6	4	5	114	5

As above, use of machinery is limited to a few. For some farmers it is a matter of farming principles not to use machinery. Large farmers invariably used machines. Many farmers noted the acute shortage of farm hands and the subsequent need to replace human power by machine power.

Table 5.6 Market identity as organic produce

Comment	Yes	No	No sale	Not enough for sale	No info
No. of farmers	39	77	10	17	8

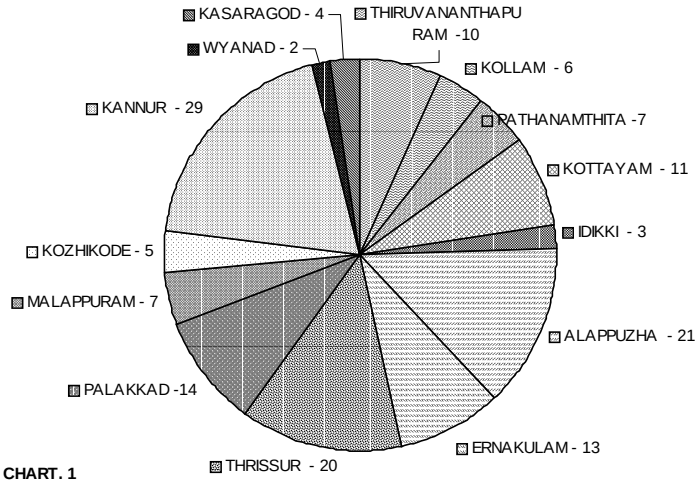
Note: Same farmer is engaged in more than one activity; he may own more than one machinery, etc.

The major problem cited by many farmers was the poor marketing prospects of organic produce. They emphasized on the need to develop marketing strategies as well as government and policy level support for organic produce marketing. Consumer awareness on the high quality of organic produce, eco-labelling for the organic produce, competitive pricing, developing strategic urban markets, etc. were some of the other suggestions made by the farmers on the marketing of organically grown produce.

District-wise distribution of organic farmers in Kerala

The larger concentration of organic farmers is in Kannur, Alappuzha and Trichur districts (Fig. 5.1). This is due to the co-operation extended by 3 major groups of organic farmers in those districts: 'Grama' in Kannur, Mediamate/Jeevarekha in Alappuzha (this is a network of environmental activists), and Vandana Organic Farmers' Society in Thrissur. The remoteness of Idukki and Wayanad districts may be the reason for the poor representation of these districts. A major regional newspaper with wide readership in the southern districts did not carry the announcement. This could be the reason for low representation from the Kollam and Thiruvananthapuram districts.

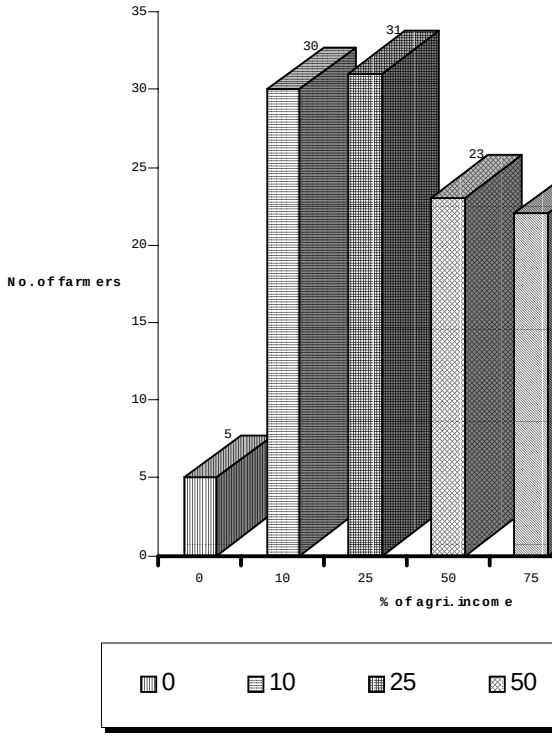
Fig. 5.1 District-wise Distribution of Organic Farmers in Kerala



Share of agriculture in total household income

The acid test for the case of organic farming is the financial viability of the method. Organic farming as a source of livelihood is thought of either wishful thinking or absurdity. The survey shows that out of 151 respondents 35; i.e., 23% fully depend on farming; 15% earn 75% and another 15% earn 50% of their total income from farming (Fig 5.2). Altogether about 50% of the farmers rely on organic farming as their major source of livelihood. It is significant that they should pursue organic farming methods and find it viable to do so despite the prevailing seemingly adverse conditions.

Fig. 5.2 Share of Agriculture in Total Household Income



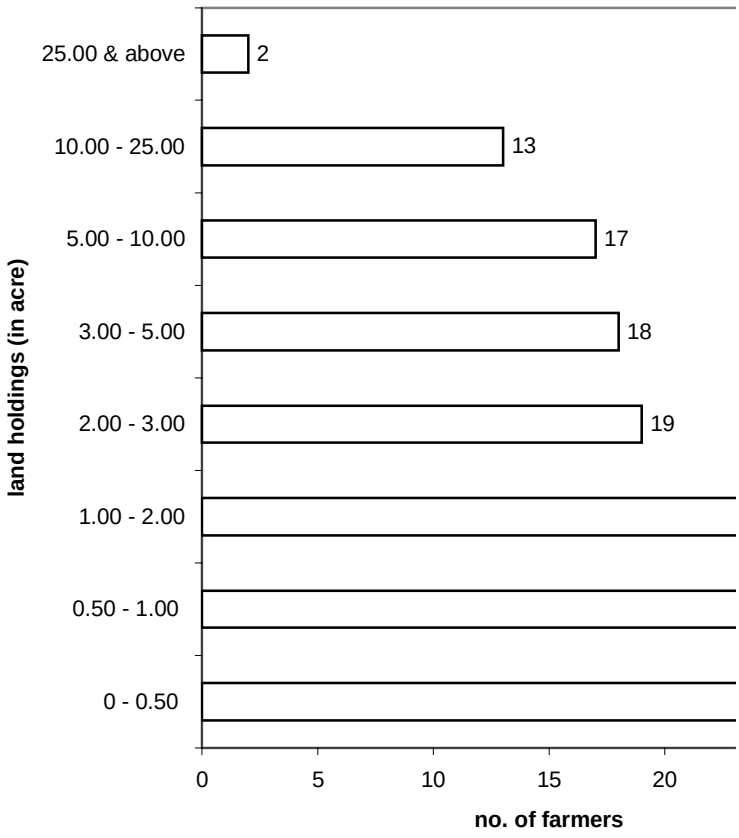
Size of Land holdings

The majority of organic farmers, i.e., about 53% are small & marginal farmers with land holdings up to 2.00 acres, as compared to 44% with holdings above 2.00 acres up to 25.00 acres (Fg. 5.3). In spite of the small size of the land holding and the consequential lower income, the farmers have adopted organic farming methods. Their motives, however, could vary from pure profitability to sound ecological principles.

Farmer's perception of his farming method

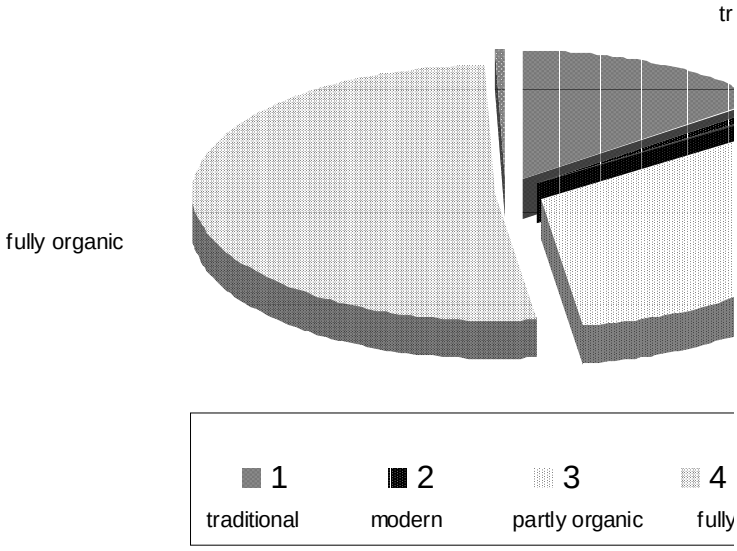
Four broad classifications were given in the questionnaire as to how the farmer classifies the nature of his farming method - Traditional/Modern/Partly organic /Fully organic- with brief but clear definitions for them. Some respondents were not clear about the distinction between traditional and fully organic, but differentiating the farmers on the basis of duration of organic farming cleared the ambiguity. This was further confirmed by noting the history of modern farming in the same land holdings.

Fig. 5.3 Land Holdings of Organic Farmers



Fifty-two percent are fully organic, followed by 32 percent partially organic and 15 percent traditional farmers (Fig. 5.4). The major influence in the spread of organic farming has to be farmers themselves; and this is evident from the expanding circles of local groups of organic farmers.

Fig. 5.4 Farmers' Perception of His Farming Method



Duration of organic farming

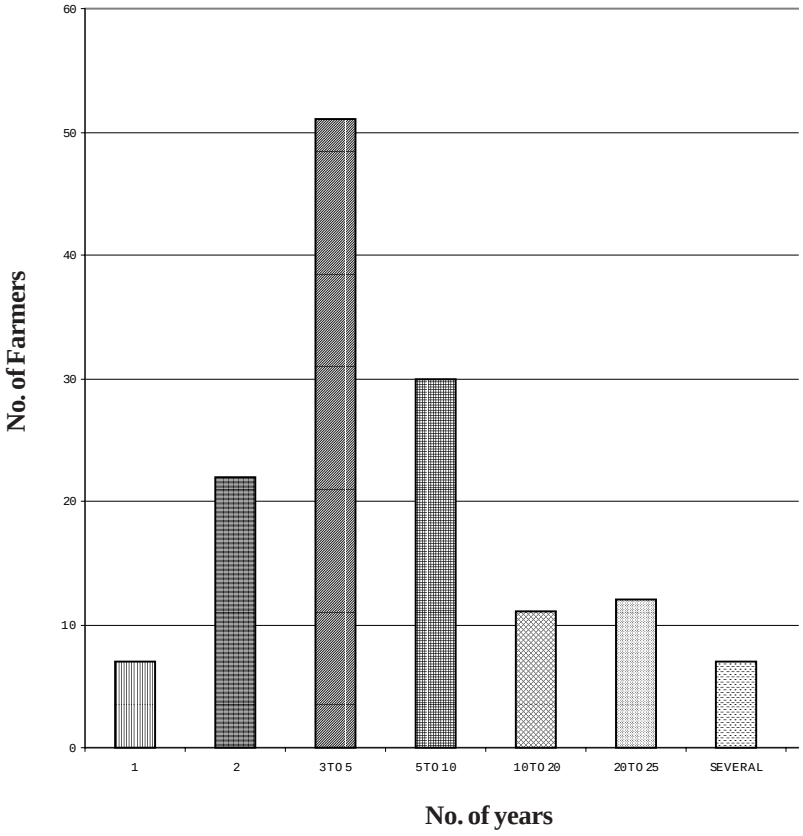
While 51 farmers (34 percent) have been practising organic farming for 3-5 years, 30 (20 percent), 12 (8 percent), 11(8 percent) and 7 (5 percent) have been doing so for 5-10 years, 2 years, 20-25 years, 10-20 years and up to 1 year respectively (Fig. 5.5). As studies have shown that it requires a minimum of 3-5 years for the soil to respond (Van der Werf, et al,1992) to a changeover to organic farming methods, the results are indicative of the transitional stage of organic farming in Kerala.

Extent of organic farming techniques

The three basic tenets of organic farming viz. i) no chemical pesticides, ii) no chemical fertilisers and iii) seeds to be used traditional/indigenous to the maximum possible extent, formed the basis of this analysis.

Of those who considered their farming as fully organic 78 (52 %), used fully organic pesticides 108 (72%) used organic manure and 56 (43%) used traditional seeds (Fig. 5.6). Those who used both organic & chemical pesticides and fertilisers and seeds of both traditional and hybrid variety numbered 33 (22 %), 38 (25 %), 67 (44 %) respectively. An interesting fact is that 28 farmers (19 %) did not use any pesticides at all.

Fig. 5.5 Duration of Organic Farming



Farmers took pain and to explain that the bare minimum chemical pesticides they used were only for cash crops. They opined that non-availability of organic pesticides and organic manure (some have indicated that the most of the organic manure recently available in the market is of dubious quality) forces them to choose the chemical option, much to their dislike. Similar is the case of seeds; traditional seeds of many crops have become extinct or rare.

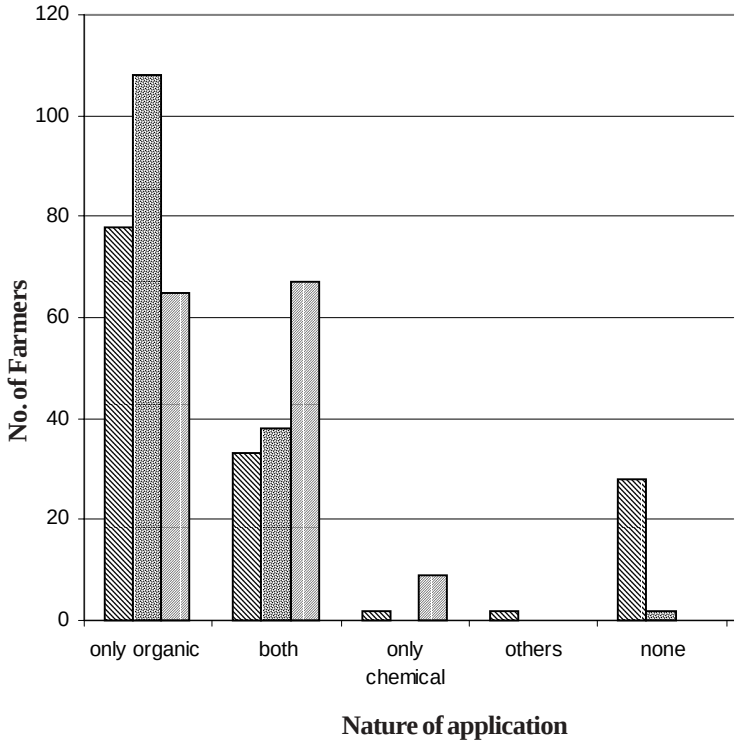
Crop preferences

The question on crops cultivated by organic farmers yielded mention of a large variety of

crops. Some farmers listed vegetables as just one entry while others gave detailed list of species. Farmers also listed tubers, fruit bearing trees and other tree species singly and severally.

Crop preference was analysed by using a simple scoring and ranking method. Fig. 5.7 shows farmer preference of first 5 major crops on the basis of extent of cultivated area. Coconut claimed the highest preference – 112 (74 %), Banana/plantain – 82 (54 %), vegetables – 64 (42 %), Arecanut – 58 (38 %), tubers – 51(34 %), pepper – 46 (30 %), rubber – 43 (28 %), paddy – 27(18 %) etc.

Fig. 5.6 Extent of Organic Farming Techniques

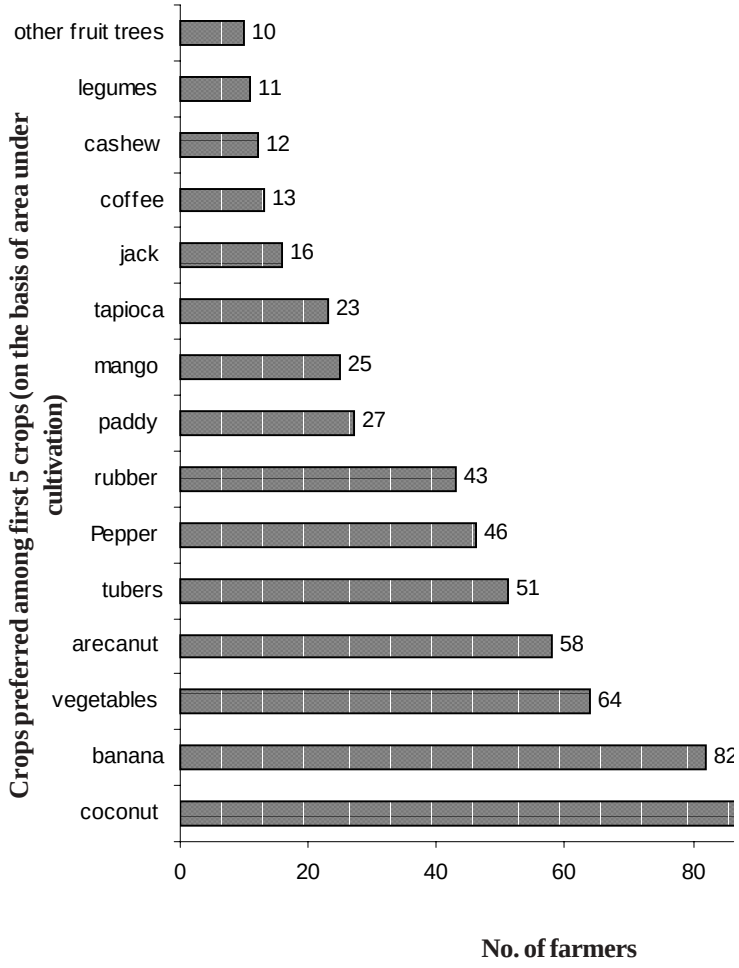


Observations

The Mailed Questionnaire method has its limitations –incomplete/wrong information, poor response, limited range, misinterpretation of questions, etc. Efforts were taken to minimize errors. The questionnaire was designed keeping in mind that the data should pertain only to organic farming and not to the socio- economic background of the farmers. While testing the questionnaire, it was found that the farmers preferred one as brief as possible and with least questions on their economic and social background.

Organic farming in Kerala is mostly in a transitional stage; but there is a distinct movement among the farmers as well agriculture experts and scientists, in favour of ecological farming. Advocates of 'less chemical- more natural' are on the increase. There is considerable consumer awareness about the dangers of pesticide poisoning and hybrid crops and high fertiliser residue in food. Farmers are finding it profitable to return to traditional farming – if they are to farm at all.

Fig. 5.7 Crop preference among organic farmers



This preliminary survey shows that organic farming is fast spreading roots in Kerala. With our history of eco-friendly farming it would not be too difficult to revert en masse. It also gives certain pointers at the emerging trends among the food producers of the state, which will determine the survival of the land and its people.

Case studies

The samples for the case studies were selected on the basis of their representation of the agro-climatic zones in Kerala. A set of criteria was laid down for the case study samples. The necessary criteria were

1. Dependency on farming as the major source of income.
2. Ownership of land.
3. High diversity of crops.
4. History of conventional farming in the farmlands.
5. Duration of organic farming above 5 years (preferably)
6. Mode of cultivation fully organic.
7. Market oriented production.

42 farmers were identified from the response sheets, and the investigators made personal visits to all of them. In order to select representative organic farmers from the different agro-climatic zones of the state (at least two farmers from each zone), several of the above farmers were studied in a little more detail.

Finally, 11 farmers were selected for the detailed case study. Through questionnaire, interview, PRA techniques, verification of farm records, wherever available, and periodic visits to the farms, both qualitative and quantitative data were collected. In depth interviews and discussions with the farmers were conducted within the frame work of the prepared questionnaire schedule to collect qualitative data from which several characteristics of organic farms in Kerala were drawn out. An adaptation of FARMS software data sheets was used to collect quantitative data. Quantitative data was analysed to arrive at Total Factor Productivity (Lynam & Herdt 1988).

The case study was conducted during the period April 1999 to March 2000. As the cultivation cycle varies from crop to crop, the objective was to collect data on one complete cycle.

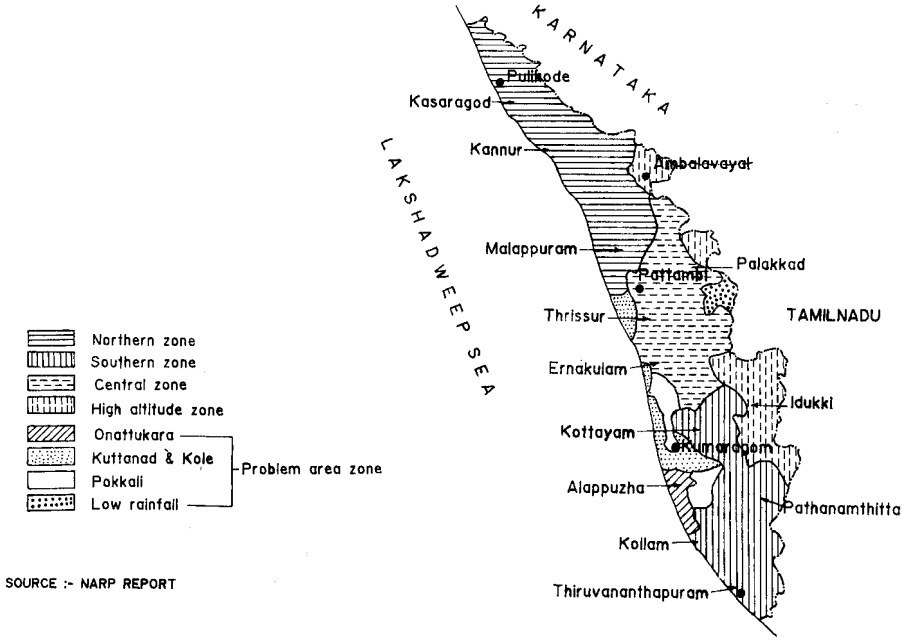
Locations of the case study areas

According to the NARP classification, Kerala State is divided into five agro-climatic zones on the basis of its physiography, climate, soil characteristics, sea water intrusion, land use pattern, vegetation, etc. The zones are (I) Southern (ii) Central (iii) Northern (iv) high altitude and (v) Special Zones for problem areas (Map). The selected farmers are 2 each from the first 4 zones and 1 each for the problem areas like Kuttanad, Onattukara, and Pokkali sub-regions. The Kole area of Thrissur district is not represented.

Table 5.7 Description of the Farmers

Farmer	Zone	Land (Acre)	No. of Crops	Main crops	Main livestock
O	Onattukara	2	33	Betel, Coconut, Paddy, Vegetables	Cows, bullocks
K	Kuttanad	2	1	Paddy	none
S 1	South	6.25	+200	Paddy, Rubber, Coconut Medicinal plants	Pigs
S 2	South	10.35	36	Rubber, Paddy, Banana	cows
P	Pokkali	6.20	2	Paddy, Prawn	none
C 1	Central	2.40	17	Arecanut, Coconut, Paddy, Pepper	Cows
C 2	Central	3.80	34	Coconut, Nutmeg, Paddy, Pepper	cows
A	Attappadi	3	96+	Arecanut, Pepper, Coffee, Coconut	Cows, goats, ducks, rabbits, poultry, guinea pigs, pigeons
W	Wayanad	2.25	19	Coconut, Pepper, Coffee, Arecanut	goats
N 1	North	23	18	Coconut, Rubber, Pepper, Arecanut	cows
N 2	North	5.5	30	Coconut, Arecanut, Rubber	none

Map of Kerala with Agroclimatic zones



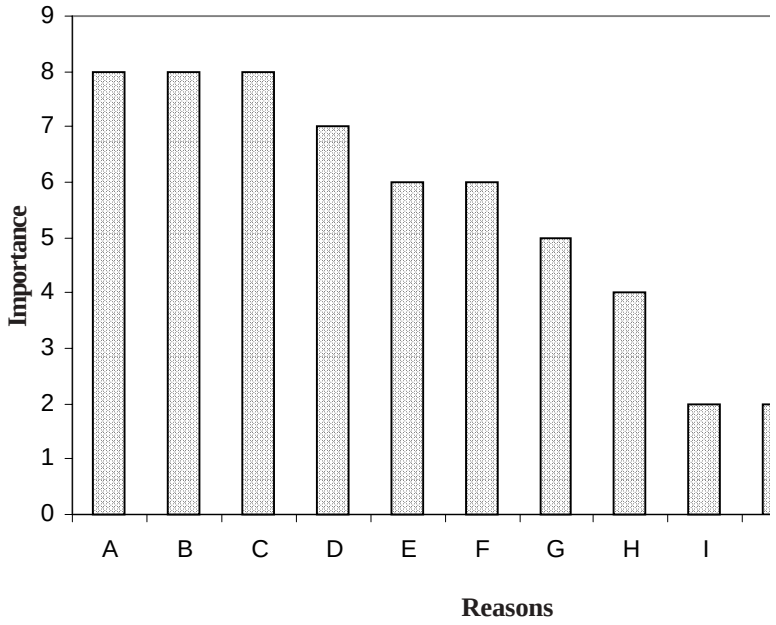
Common features are few among these farmers except that all of them practice organic farming. A notable fact is that each is typical of the area he represents in size of land and crops. Except for farmers P & K, all the rest have a high diversity of crops. The crops and farming techniques are diverse except for the fact that coconut is common among the dry land cultivators. Most of them own cows, a source of additional income.

Table 5.8 Personal profile of the farmers

Farmer	Age	Approx. annual	Education	Members	House	Ownership	Vehicles owned assets	Consumer tion	Electrifica fuel	Cooking water	Source of
O	46	>Rs. 50,000/-	SSLC	7	RCC	Own cycle	bi-	R	Yes f.wd	Biogas	Well
K	44	>Rs. 50,000/-	SSLC	5	Tiled	Own cycle	bi- M,W	F,R,	Yes LPG	Fwd,	Well
S 1	62	>Rs.1 lakh	SSLC	6	RCC	Own	Car	F,,M, T, R	Yes	Fwd, LPG	well
S 2	65	>Rs.1 lakh	SSLC	7	RCC	Own	M/ cycle	F, Mu, M,W	Yes	Fwd, LPG	Well
P	64	>Rs. 50,000/-	5th std.	11	Tiled	Own cycle	Bi-	T,M	Yes LPG	Fwd, water	Tap
C 1	68	>Rs.1 lakh	6th std.	6	Tiled	Own	Pull cart	T, Mu, M	Yes	Fwd, kero.	Well
C 2	41	>Rs.1 kero.	B E	7	RCC	Own	Bi- cycle	T, R, Mu, M	Yes	Fwd, LPG	Well
A	45	>Rs. 50,000/-	5th std.	2	Tiled	Own	None	None	No	Fwd, Agri waste	Well
W	63	> Rs.1 lakh	SSLC, TTC	2	Tiled	Own	Scooter	T, Mu, M	Yes	Fwd, LPG	Well, Bore well
N 1	58	> Rs.1 lakh	BA	5	Tiled	Own	Jeep	Mu, M, T	Yes	Fwd, LPG	Well
N 2	52	> Rs.1 LPG	PDC	5	RCC	Own	Bi- cycle	T, M, Mu, W	Yes	Fwd, LPG	Well

Location of the house I – within the farm O- outside the farm Consumer assets - F - Refrigerator M - Mixie T – television, R - Radio, Mu - Music system Washing machine - W

Reasons for changing to organic farming



A - Need for more self-dependence and freedom in farming
B - Emotional, philosophical and ideological reasons
C - Concern for human health
D - Decreasing net farm income
E - Increasing pest infestations and crop diseases
F - Escalating costs and dependence on external sources for labour, fertiliser
G - Depleting health of the soil
H - Influence of other organic farmers, naturopathy, Fukuoka, etc.
I - Concern for environment
J - Increasing risks
K - Preservation of traditions
L - Sustainable long-term agriculture

Qualitative analysis

Reasons for change over to organic farming

As mentioned earlier, changing over to organic farming is seemingly suicidal. A method which does not seem to be lucrative; which does not have any kind of external support (in fact, discouraged and derided), which would isolate them from the majority of their fellow farmers, society and in some cases, even family members, which is unable to provide the right kind of requirements like indigenous seeds, organic manure and which does not have a distinctive market. In fact, all cards seemed stacked against the farmer. Yet, why did

these people take the risk? What made them, against all odds, opt for organic farming? The farmers gave the following reasons and these were graded according to the frequency in the descending order.

1. Concern for human health.
2. Self-dependence and freedom in farming, emotional and philosophical reasons.
3. Decreasing farm income due to escalating costs of external inputs: labour, fertilizer etc.
4. Increasing pest infestations and crop disease, depleting health of the soil.
5. Influence of other organic farmers, Naturopathy and Fukuoka.
6. Increasing risks, concern for environment.
7. Preservation of traditions.
8. Long-term sustainable agriculture.

2. Changes Observed During/ After Transition

The farmers reported the following as the changes that they had observed during/after transition. The list is not exhaustive, but includes most of the major points noted by them. The difference is quite visible, especially in comparison with the neighbouring conventional plots. Certain point such as increased leisure time is not applicable to all – but majority of them spend comparatively less time in the field than they used to. This spare time is either used for giving talks to farmer groups or travelling or on other social activities. Data on yield was collected as part of this study. However, yields as well as price were generally low for all crops during the study period. But the organic farmers fared better due to the diversity of the crops.

1. Production of healthy & nutritive food by oneself
2. Live & healthy soil
3. Reduced pest infestations and diseases
4. Increase in biodiversity
5. Reduced labour requirement
6. Less dependence on external inputs
7. Own-reliance in manure needs.
8. Less soil erosion.
9. Increase in number of natural pest controlling species.
10. Increase in tree cover.
11. Increased water retention in the land
12. Increase in leisure time
13. Increase in yield.
14. Ploughing became unnecessary.
15. Development of model plot for organic farming.

3. Fertiliser Management

Fertiliser management is one crucially different aspect of organic farming from the modern farming. The types vary according to the different farms and the crops to which they are

applied. The details are noted in the individual cases. The following is a generally common list of fertiliser management methods adapted by them.

1. Organic manure – cow dung, wood ash, bone meal, and poultry wastes.
2. Green manure
3. N- fixing crop cultivation
4. Recycling of organic matter
5. Animal excreta (slurry from gobar gas plant)
6. Mulching
7. Land protection from erosion and run –off
8. Farmyard manure.
9. Composting
10. Maintenance of tree crops as a source for green manure
11. External inputs: Neem cake, castor oil cake,
12. Bio-fertilisers: Bacteria Kit (Ph. bacteria, N bacteria)

4. Pest Management

Some of the farmers do not use any pesticides whatsoever. They believe in letting nature take care of the pests or diseases. Only in the cases of certain widespread, contagious diseases that affected crops like coconut, areca, pepper, etc., state-wide, have they resorted to the use of some bio-pesticides or bio-treatments. Even though they claim that the proximity to other farms which undergo chemical treatments do not affect the organic farms, this has to be validated by a detailed analysis of their produce, the soil, water and other natural resources. As in the previous instances, pest/disease control varies farmer-wise and crop-wise; the general nature is as follows:

1. De-weeding is done manually and the weeds are used for mulching or as cattle feed.
2. Pest attacks and diseases are few. Manual removal, bio-controls like providing resting places for predatory birds, allowing social spiders to weave webs, insect-repelling crops, using concoctions of neem, garlic, tobacco, oscimum, application of cowdung, Trichoderma for fungus infestation, etc. Bordeaux mixture is one chemical treatment used by some for the Mahali disease of Areca palms.
3. Proximity of modern farms does not generally seem to affect the organic farms.
4. Use of plastic is rare, and is recycled and carefully destroyed.

5. Water Management

Although most farmers depend on natural sources like rain, well, pond, stream, etc., some have electric/diesel pumps to bring water in and use sprinklers to distribute it. Only one or two has access to irrigation canals. A point of considerable interest was that in places where water is comparatively scarce, the farmers have developed their own techniques either to retain available water or to use it in an optimum way. The following are some of the common water management techniques the farmers have adopted.

1. Bunds stone & mud walls, ridges, terracing.
2. Percolation trenches, pits, rain channels.
3. Spreading coconut husks on the ground for water retention.
4. Mulching of farmyard wastes.
5. Ground cover by grass, shrubs, trees like Erythrina, Glyrecedia.
6. Natural plant species regeneration.
7. Minimal soil disturbance.
8. Rain water collection.
9. Dependence mainly on rain, wells, ponds and streams as water source.
10. Minimal artificial irrigation.
11. Prevention of cattle grazing.

6. Crop diversity of Organic Farmers

A detailed list of planted species, crops and otherwise, was collected. There are bound to be some omissions; plants could have been naturally generated. However, it serves to show the biodiversity of organic farms. Conventional homestead plots might not have the same feature, principally because homestead farms are, by and large, few in the conventional system. Only a comparative study could determine this fact.

Table 5.9 Farmer N1 (North zone)
No. of planted species: 18

Major crops	Medium crops	Minor crops	Others
1. Coconut	1.Vanilla	1.Nutmeg	1.Ginger.
2. Rubber	2.Plantain	2.Colocasia	2.Turmeric
3. Arecanut	3.Kaemferia Gal.	3.Dioscoria	3.Cassava
4. Pepper			4.Vegetables
5. Cashew Nut			5.Jack
6. Elephant Foot Yam			6.Pappaya

Table 5.10 Farmer O (Onattukara area)
No. of planted species: 33

Major crops	Medium crops	Minor crops	Others
1. Betel Vine	7. Bitter Gourd	16. Peas	24. Jack
2. Coconut	8. Snake Gourd	17. Cassava	25. Mango
3. Pepper	9. Cucumber	18. Diascoria	26. Pappaya
4. Banana	10. Pumpkin	19. Elephant Foot Yam	27. Wild Jack
5. Paddy	11. Ash Gourd	20. Colocasia	28. Tamarind

6. Areca Nut	12. Amaranthus	21. Arrowroot	29. Cashew Nut
	13. Green Chilies	22. Turmeric	30. Cinnamum
	14. Brinjal	23. Ginger	31. Cotton
	15. Ladies Finger		32. Guava
			33. Custard Apple

Table 5.11 Farmer P (Pokkali area)
Total no. of planted species. 1

Major crops

1. Rice (Pokkali – indigenous variety)
2. Prawn

Table 5.12 Farmer A (Attapadi area)
Total no. of planted species: 96 +

Major crops	Medium crops	Minor crops	Others
1. Arecanut	1. Vegetables	1. Mango	1.Teak
2. Pepper	2. Tubers	2. Jack	2. Rosewood
3. Coffee	3. Plantain	3. Cashew	3. Manjium
4. Coconut	4. Medicinal Plants –77-		4. Venga
5. Betel Vine	5. Cardamom		5. Cotton
	6. Pineapple.		6. Glyrecedia

Table 5.13 Farmer C1 (Central zone)
No. of planted species: 17

Major crops	Medium crops	Minor crops	others
1. Areca Nut	1. Colocasia	1. Mango	Vegetable –5-
2. Coconut	2. Elephant Foot Yam	2. Jack	
3. Paddy	3. Ginger		
4. Pepper	4. Turmeric		
5. Plantain	5. Arrowroot		

Table 5.14 Farmer C2 (Central zone)
No. of planted species: 34

Major crops	Medium crops	Minor crops	Others
1. Coconut	1. Pepper	1. Papaya	1. Elephant Foot Yam
2. Nutmeg	2. Arecanut	2. Jack	2. Colocasia
3. Rice	3. Cashew Nut	3. Mango	3. Diascoria
	4. Plantain	4. Moringa	4. Ginger
	5. Gingelly		5. Turmeric
			6. Chillies
			7. Other Tubers –2-
			8. Other 14 Vegetables

Table 5.15 Farmer S1 (South zone)
No. of planted species: above 200

Major crops	Medium crops	Minor crops	Others
1. Paddy	1. Papaya	1. Several Tubers- 5	1. Lichi
2. Rubber	2. Teak	2. Vegetables	2. Chilies
3. Coconut	3. Mahogany		3. Chowchow
4. Pepper	4. Jack		4. Star Apple
5. Areca Nut	5. Arana		5. Passion Fruit
6. Plantain	6. Nutmeg		6. Mango
7. Coffee	7. Jamba		7. Akil
8. Plantain	8. Guava		8. Cinnamon
9. Medicinal Plants.			9. Wild Jack
(150 Approx.)			10. Sandal Wood
			11. Other Fruit Trees

Table 5.16 Farmer W (Wayanad zone)
No. of planted species: 19

Major Crops	Medium Crops	Minor Crops	Others
1. Coconut	1. Areca Nut	1. Cardamom	1. Vegetables -6
2. Pepper	2. Plantain	2. Eucalyptus	2. Malabar Tamarind
3. Coffee	3. Vanilla		3. Papaya
			4. Chikku
			5. Mangosteen
			6. Jack

Table 5.17 Farmer N2 (North zone)
No. of planted species: 30

Major	Medium crops	Minor crops	Others
1. Coconut	1. Pineapple	1. Vegetables –7	1. Jack
2. Areca Nut	2. Plantain	2. Tubers – 2	2. Mango
3. Rubber	3. Elephant Foot Yam	3. Ginger	3. Pappaya
	4. Diascoria	4. Turmeric	4. Guava
	5. Colocasia	5. Kaempferia Gal.	5. Chikku
			6. Mangosteen
			7. Butter Fruit
			8. Indian Gooseberry
			9. Rose Apple
			10. Custard Apple

Table 5.18 Farmer K (Kuttanad area)
No. of planted Species: 1.

Major	Medium	Minor	Others
Paddy	—	—	—

Table 5.19 Farmer S2 (South zone)
No. of planted species: 36

Major crops	Medium crops	Minor crops	Others
1. Rubber	1. Pumpkin	1. Cassava	1. Ladies Finger
2. Paddy	2. Plantain	2. Elephant Foot Yam	2. Peas
3. Banana		3. Colocasia	3. Bitter Gourd
4. Coconut		4. Diascoria	4. Chilies
5. Pepper		5. Turmeric	5. Areca Nut
6. Coffee		6. Ginger	6. Vanilla
			7. Nutmeg
			8. Other Fruit Trees –15

The diversity of crops in these farms shows a direct relation to the agro-climatic zones in which they are situated. The highest is at S1's farm, situated on the foothills of Western Ghats and enriched by the Meenachil River. This is one of the most fertile areas in the midlands of Kerala. At the other end we have Farmer K and Farmer P with paddy as the only crop. While the traditional farm of Farmer P has a multiple crop of paddy and prawn,

Farmer K's homestead has several species; however, we have not taken the homestead plot for study, since, due to family and peer pressure, the homestead plot has not been brought under organic methods. Moreover, due to the ecological uniqueness of these two areas, they cannot be considered along with the others. The farms of Farmer N2 and Farmer N1 in the northern zone, which has a less fertile soil, differ in no. of crops (30&18) because the former is an idealistic organic farmer while for the latter, it is a matter of convenience. Most of the farmers produce their own vegetables. All does mixed cropping. Majority of the seed variety is indigenous. The cropping pattern differs from area to area. Those who have cattle, grow fodder grass.

7. Characteristic features of crop management

1. High diversity of crops.
2. Intercropping.
3. Selective weeding.
4. Distribution of cash and food crops.
5. Use of indigenous as well as exotic seeds suited to the local conditions.
6. Own-sufficiency in vegetables.
7. Abundance of fruit trees.
8. 3-tier strata vegetation of trees, shrubs and herbs.
9. Closed canopy cover in homestead plots.
10. 'Sacred' groves.

The crops are well distributed among food crops and cash crops. While the major crops are generally cash crops, the medium and minor crops are both for consumption and the market. Typical of the homestead farms in Kerala, the farmers grow a number of fruit trees – most common are the Mango and Jack. Most of the farmers grow tubers like Elephant foot Yam, Diascoria and Colocasia which are traditional items in the Malayalee's diet, but fast disappearing in the 'globalisation' of vegetables. Vegetables such as Cabbage, Carrot, Beetroot, Beans, Cauliflower, etc. have taken over from the traditional varieties. Farmer A in Attappadi and Farmer S1 in Palai grow medicinal plants in their plots amidst other crops. For S1 it is a main source of income also. Most of the farmers keep aside a little part of their homestead plots for a grove modelled after the sacred groves of Kerala. The reasons for maintaining it are cultural, aesthetic as well as spiritual. The sacred grove in a way symbolizes the reverence the farmers have for the land and their profession.

8. Problems faced by the Farmers

There are locale specific problems as well as universal. Noted below is a mixture of both, pertinent to most of the farmers.

1. Climatic changes, erratic rains.
2. Unavailability of labour & exorbitant wage rate, esp. for paddy cultivation.
3. Pest infestations and diseases.
4. Being part of a collective farm restricts innovations and adaptation of different techniques.

5. Unavailability of good, indigenous seeds/ saplings.
6. Artificially created price slump in the harvest season forces small-scale farmer to sell at under-price.
7. Conversion of paddy fields to other crops such leads to fragmentation of paddy fields and break in nutrient flow.
8. Silt blockage due to construction of roads and dams.
9. Lack of support during transition to organic farming.
10. Industrial pollution affects river water and thus paddy-prawn cultivation.
11. Lack of market / consumer awareness regarding organic produce.

9. Recommendations of the Organic Farmers

All farmers opined that the fundamental need is to create awareness in the society on the ill effects of modern agriculture and the positive qualities of organic agriculture. It was suggested that the government and other institutional agencies should support development of model organic plots in the different regions of the state where farmers can learn the techniques. While rapid transition to organic farming is not advisable, even phased reversion can cause temporary financial risk, which can be reduced if there is support from the authorities. Some of the farmers were, however, vehement in opposing the tendency to ask for any kind of external support since that would again mean surrender of their independence. Due to the latest stance of the agriculture department, which advises use of organic manure along with chemical inputs, numerous units have come up in the state claiming to produce organic manure, the quality of which is suspect. There should be a system, which can monitor this and make it available at reasonable prices. Some of the farmers disagreed – their opinion is that each farm should become self-sufficient in their manure requirements. As more and more farmers turn to organic methods, it was felt that organic farming experts should guide new farmers. Marketing of the organic produce was one area that required projection. As there are at present no methods in Kerala for quality assurance, this has to be developed and the produce graded accordingly. Many of them felt that the NGO sector has a major role in propagating organic farming. It was suggested that local networks of farmers should be formed and they should be given opportunity to interact with others farmers. Environmental problems such as industrial pollution, dams, deforestation, land reclamation, etc. have to be addressed and rectified for agriculture to sustain in the state. Further, scientific research has to be conducted into every aspect of organic farming so that it is acceptable to all.

1. Awareness programmes both for the producer and consumer.
2. Development of model organic plots with institutional support.
3. Financial support during transition.
4. Assuring availability of quality organic manure at reasonable prices.
5. Development and maintenance of organic manure sources within the farm.
6. Supportive role of the government in marketing; subsidies and loans.
7. Guilds of skilled and experienced organic farming experts to guide new entrants to organic farming.
8. Alternative markets for organic produce with no intervention of middlemen.

9. Processing of organic produce as a key area of development
10. Grading of organic produce.
11. Establishment of public warehouses for storage of organic produce using organic methods.
12. Assurance of better prices for organic produce.
13. Restrain trends of large-scale commercialisation of organic produce.
14. Creation of networks of organic farmers to facilitate exchange of ideas, technology, inputs and experience.
15. Reduction of environmental pollution.
16. More studies on organic farming esp., on the marketing aspects.

Quantitative analysis

The immediate purpose of collecting quantitative data was to find out whether organic farming as practiced by these farmers was profitable. This would also indicate whether the system is sustainable, and whether it sustains the farmer and his household. Measuring sustainability or quantification of sustainability may be objectionable to many. But the developing branch of Farming Systems Research show that it is possible to quantify sustainability based on accurate facts and figures.

Total factor productivity (TFP)

Lynam and Herdt (1988) suggest measuring sustainability in terms of trends in total factor productivity.
TFP = O / I, where O is the total value of all outputs and I is the total value of all input. A sustainable system would feature a positive trend in TFP (Harrington 1992).

Table 5.20 Total Factor Productivity of the farmers during the study period

Farmer – Region	Total output (Rs.)'O'	Total input (Rs.) 'I'	TFP= O/I	Remarks
P- Pokkali	75446	81760	0.92	Loss – effect of large scale virus infection and industrial pollution.
K -Kuttanad	20437	13908	1.46	Profit –adverse socio-economic, political and environmental conditions for organic farming.
O-Onattukara	258633	97855	2.64	Profit – recognition and support from govt.agencies.
S1- South	201058	51017	3.94	Profit – drop in value of Rubber is an adverse effect.

S2- South	269650	95282	2.83	As above
A- Attappadi High Altitude	97107	2655	36.57	Highest TFP – minimum external labour, full time own labour, efficient soil management.
W – Wayanad High Altitude	109020	28825	3.78	Profit – minimal labour input
C1- Central	124550	26375	4.72	Profit – minimal labour input. No extra efforts to enhance yield.
C2- Central	91918	26675	3.45	Profit-
N1- North	659800	123495	5.34	Profit – majority of the crops are in a pre-yielding stage.
N2- North	201058	40234	4.99	Profit – naturopath, organic farming researcher & activist

If the study is made for a longer duration of say, 5 years, the trend in TFP of every farm could be established. This method could also be effective for a comparative sustainability study of conventional plots and organic plots. One of the major drawbacks of the TFP method is the diverse components whose relative value may be hard to assess. The value of the land has not been taken as an input since the study is restricted to cultivation costs and returns. External factors such as resource degradation (eg. Virus infection of prawn), declining product prices (eg. The case of rubber), non-availability of separate market for organic produce, etc. influences the TFP. Moreover TFP focuses on individual farms and cannot be applied on regional level. Considering the complexity of the organic farms, the absence of account keeping among the farmers, lack of deliberate farming plan, inability to assess value of many capital investments, reluctance of the farmers in revealing their financial status, the general indifference to evaluating goods in terms of money, time constraint and financial limitations of the study – all put together, severely limited the scope for an exhaustive pool of quantitative data. Yet the trends established by the analysis are indicative.

In future, the methodology could be more fine-tuned and data collected over longer duration. This would not only provide accurate information but also absorb the periodic fluctuations in agriculture due to several factors.

Limitations of the study

The inherent difficulty of this study is that organic farming in Kerala is rather an unexplored area, having been labelled as 'unscientific', 'impractical', 'regressive', 'past time of the affluent', etc. Therefore, it was up to committed activists and practitioners of organic farming to champion the cause of organic farming. The effort is to understand what organic farming is all about – its status, techniques, farmers' perceptions, problems and solutions and forming strategies for its wider implementation.

Organic farming is an area yet to be recognised by the conventional agricultural scientists. Only very recently have professional researchers started to take an interest in a holistic study of the organic farming systems. This is one aim of this study: to introduce the scientific community to this branch of agriculture, which until now has been ignored by the large majority of agricultural scientists and academic institutions.

Financial and time constraints prevented documentation over longer duration, which is essential for an accurate knowledge about the economics of the farm. Also, considering the fluctuations in climate, seasonal risks, yield, price etc., the ups and downs over a single calendar year can hardly determine the strength and weakness of an agricultural system. It is hoped that studies of longer duration will be taken up in the near future. In the West, organic farming/ ecological agriculture has developed as a parallel to the mainstream agriculture science. If the third world nations are able to break the grip of multinational fertiliser/pesticide companies or whatever that holds them back from protecting their own interests, fast strides can be made in understanding, restoring, preserving and propagating our heritage.

During the course of the study, it was learnt that there were more organic farmers in Kerala than we could record. It is suggested that similar studies be taken up on a zonal/district basis to create a large database. There are several reasons for the farmers not coming forward to declare themselves as organic farmers. Some farmers, who claim their farming to be far more profitable than the conventional kind, expressed the fear that the financial details, if divulged to us, might be used against them. The cost of production in organic farming is comparatively very low and thus the profit or net income is proportionately higher than that of the conventional farms. Thus many farmers shy from parting with their farm accounts. It was rather difficult to convince them that all the information would be kept confidential.

Many farms are located in remote areas with poor communication facilities. Appointments could be obtained only through postal correspondence. Even then, due to other preoccupations, the farmers may be unavailable at the time of the visit. This necessitates further visits, thus losing time in the process. Some of the organic farmers are unable to meet the requirements of organic manure from within the farm and have to buy from external agencies. The claim of such commercial products to be genuinely organic is doubtful at times. For example, in the leather bonemeal it was found that 35% potash was added. 10% Nitrogen was found to have been added in the neem cake available in some markets. Thus the purity of much organic manure commercially available has been found to be suspect.

The ordinary farmer does not have the habit of keeping farm accounts. Even though pains have been taken to reduce recall errors to the maximum (periodic visits, providing a tabular format for accounts keeping), errors/ omissions are bound to have crept in. It is suggested that a universal accounting format be designed and provided to the farmers, similar to the one by Rubber Board.

The seasonality of different crops necessitates different time schedules from planting to harvest. Thus a crop harvested in this calendar or agricultural year may have been planted in the previous year. Here, the cost of production has to be taken as that of the previous year, while the returns form part of the income during the present year. While confining ourselves to agricultural data of one year, we find it difficult to fully account for production and sales. The only way out is to collect data over a longer period, say, 2 - 5 years, which will remove the above anomaly. Moreover, agriculture in Kerala is heavily dependent on the climatic conditions. This creates unexpected fluctuations in the production of various crops and its prices. Here also, study over a longer period would absorb such variations and a mean figure could be safely arrived at.

In the case of crops like cardamom, pepper and coffee, the product can be stored over a long period. Many planters are in the habit of storing them up until the prices go up. Here again, due to time constraints, it becomes difficult for the investigators to assess the income accurately.

Policy recommendations

In the present international scenario in which Organic Farming has emerged as a major developing area, not only as having tremendous export potential but also as an answer to environmental pollution, it is high time that the concerned authorities in Kerala had addressed the following:

1. A strategy for knowledge development in organic farming – for the farmer/producers, consumers and related government departments, agricultural research institutions & such regulatory bodies.
2. Constitution of a body at a high level that can formulate policies and plans for the spread of organic farming in the state.

The strategy for knowledge development in OA could be summed up as follows:
The identified major hurdles to knowledge development are:

1. Ignorance / reluctance of farmers to convert to OA
2. Lack of support from external agencies
3. Small land holdings
4. Agro-climatic variation restricting uniform practices
5. Lack of efficient network of Organic farmers
6. Loss of traditional knowledge

To overcome these hurdles, the right lessons should be imparted to the farmers and the right environment should be provided to practice OA successfully. The elements of the curriculum should be on:

1. Organic enrichment of land
2. Crop combination for the specific region
3. Biological pest control & manure

4. Self –sufficiency in organic inputs
5. Resource conservation techniques
6. Storage & Marketing facilities

The environment or the support structure should consist of:

1. Scientific validation of OA
2. Farmer level R & D
3. Documentation of I T K
4. Conservation of crop & genetic resources
5. Restoration of environmental health

The knowledge development in OA should be based on principles such as:

1. Agro- climatic zone specific applicability
2. Indigenous crop & livestock varieties
3. Participatory Research with farmers
4. Direct, practical evidence of advantages of OA
5. Gradual reduction of synthetic inputs
6. Emphasis on agro-biodiversity

The following could be considered as the basic steps to initiate action:

1. Establish knowledge development centres
2. Develop and support model organic farms
3. Financial support during transition period
4. Support localized networks
5. Use media for enhancing awareness among farmers, intervention agencies and consumers.

In conclusion, knowledge development of organic farming, in Kerala or any other third world country where agriculture has been a way of life for several hundred years, should primarily focus on the preservation of indigenous breeds, restoration of environmental health and documentation of the traditional agricultural practices.

Model plots need not be newly created; instead, the existing successful organic farms can be utilised. External input of OA knowledge would complement the farmer's knowledge base. Adequate financial support should be provided to the farms, which are recognised as model plots.

Some of the recommendations of an international workshop on organic farming held at Bonn, West Germany in October 2002 are as follows:

1. The government and other policy makers should acknowledge, through their acquaintance with the accumulated empirical evidence, the potential of the organic approach in enabling long-term food & nutritional security and ecologically sustainable agricultural production in the State.

2. Regulatory institutions should implement policies and regulations for the development of local, regional, national and international markets which would ensure that all commercial interest groups operate within such a development framework as above, one that would not be detrimental to the rural farming communities or the natural resources of the State.

3. Efforts should focus on the preservation and protection of their genetic resource base and ensure that the right of ownership of farmers and live-stock keepers to their crops and livestock breeds gets recognized and rewarded; and to document and protect the indigenous traditional knowledge and agro-biodiversity which forms the basis of Organic Agriculture.

4. The government should acknowledge and support the farmers and NGOs involved in Organic Agriculture as pioneers of disseminating sustainable development concepts and practices, and promote Organic Agriculture through public extension networks, research institutes, universities and formal education institutes, the media, and other channels. (Kotschi J, et al, 2002)

Organic farming in Kerala faces a stiff challenge from many sides. As a culture from the past, it is severely eroded. As a system that depends on natural resources, its survival is in the hands of the people who manage the resources. The changes in the environment have altered the microclimate of most of the study areas. Humidity has decreased and the rains have become unpredictable. The soil is becoming infertile day by day.

For a society that is unwilling to reflect upon its past and take corrective measures, organic farming is reversionary. Pragmatism is as strong as pecuniary ambitions. Yet, changes are taking place. Organic farming is growing and spreading all over the world.

Organic farming is more than a new venue for export earnings; it is part of a culture that values conservation of nature and life on earth as the ultimate philosophy. The export potential is a short-term reward; restoration of environmental health is the long-term reward, which will influence all aspects of life of the people. Therefore, action plans for developing organic farming should be part of a larger plan for nature conservation and health of the community and the land, and should be relevant to the social, economic and cultural ethos of Kerala.

This study is a small beginning. It is a collection of sketches of a few farmers to whom the soil is more important than the plant. Perhaps, there is a lesson here for the custodians of planet earth. The lesson, as Aldo Leopold puts it – "*Nature conservation is a state of harmony between man and land.*" Ultimately organic farming is all about nature conservation. If these farms could serve as indicators of the farms of the future, mankind may survive yet another day.

News Weekly 16.2.1996.

Hiemstra, Wim, et al. (Ed.) *Let Farmers Judge*. ILEIA-Intermediate Technology Publications,

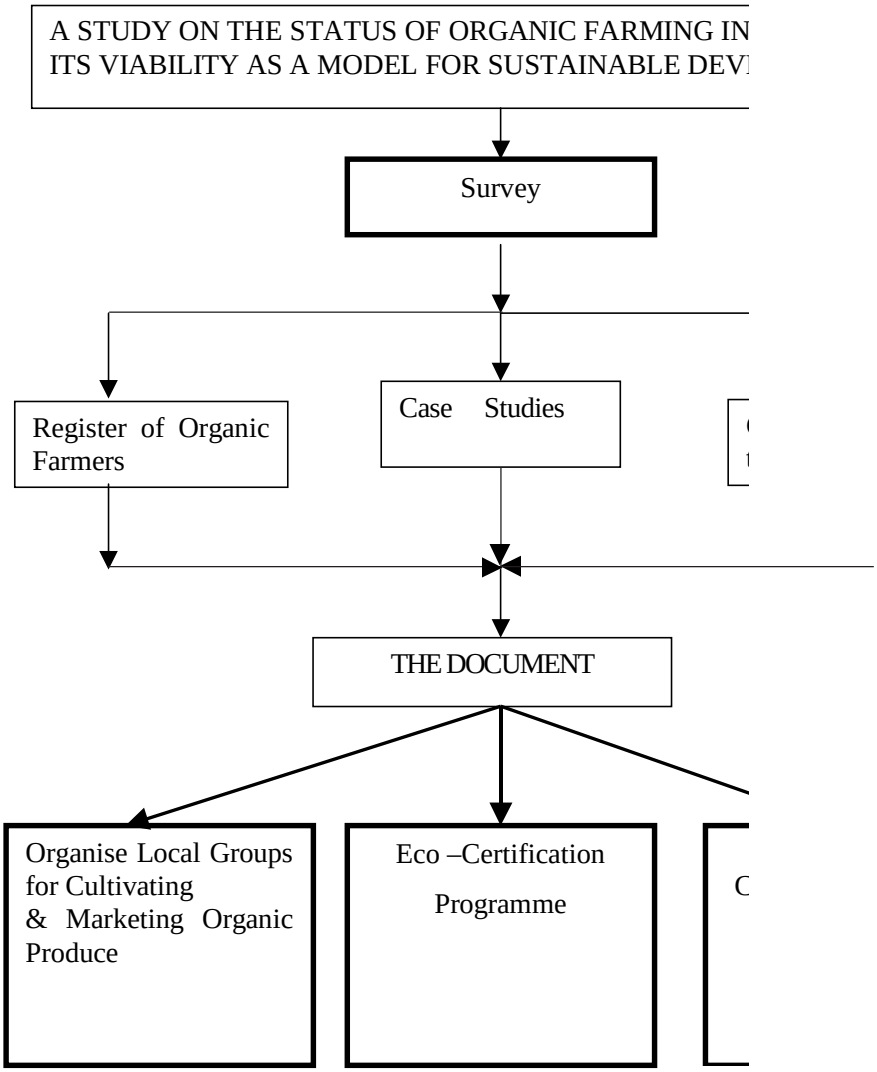


Chart.B. The Mission

Appendix 1

Profiles of Organic Farmers Selected for Case Study

I. Problem Area Zone

i. Pokkali sub zone

The Pokkali region lies north of the Thannermukkam bund in Ernakulam district and south of Enamakkal regulator in Thrissur district. The fields are situated near the mouth of streams and rivers not far away from the sea and are therefore subjected to tidal amplitude of about I M. The land lies up to 2M below MSL and is located among the Kunnathunad, Kanayannur and Paravur taluks of Ernakulam and Cherthala taluk of Alappuzha district.

A moderate climate is experienced. Annual rainfall varies between 2000 - 3500-mm. Major portion of the rainfall is received during the Southwest monsoon. The average maximum and minimum temperature in the area are 35^{o} and 25^{o} C respectively. Heavy flooding occurs during rainy season.

The soil is acid saline, frequently subjected to sea water inundation due to tidal currents. The soil is stiff impervious clay and highly acidic in reaction, with pH ranging from 3.4 to 5.2. Before commencement of cultivation the soil is washed free of salt by letting in floodwater. Rains also wash away the salts from the mounds.
The important crops are rice, prawn culture and fish farming.

The Pokkali system of cultivation

The Pokkali tradition is a unique system, which combines rice cultivation and prawn culture for one half of the year in the same field. This, in fact, is the basis of the economic viability of the Pokkali cultivation. Rice cum fish culture in the traditional paddy fields may be said to be the main farming practice in the area.

For rice cultivation, the farmers use a native variety, known by the name Pokkali itself. This has a maturity period of 120 days. 'Pokkali' seed can effectively resist flood and salinity. The plant grows to a height of 1.5 M Resistance to pest infestations and high yield are the notable qualities of the Pokkali seed.

More than 95% of the total area is cultivated with rice during the first crop season. In the rest of the area second crop (Mundakan) is raised. From October onwards when salt water enters the area, prawn culture and fish farming are undertaken. Rice cultivation is very characteristic of this area and starts in the month of April. Mounds are formed with 1 M base and half a metre height. With the onset of southwest monsoon salts are washed down and drained off. On these mounds, sprouted paddy seeds are sown. After 30 -35

days the mounds are levelled and the seedlings with a portion of soil are spread uniformly in the field. The Pokkali fields with its clayey soil are swampy, thus ruling out animal or mechanical ploughing. When drained in the summer, the fields are prepared using simple farm implements. After the harvest of first crop, the fields are flooded and used for prawn culture and fish farming which bring additional income to the farmers. Prawn culture filtration (Chemmeenkettu) in the Pokkali fields is a traditional technique practiced by the farmers. Tiger Prawn, *Penaeus monodan* is raised in these areas. The prawn season is generally between November 15 and April 13. It has also been reported that fresh water fishes like Grass carp, Mrigal, Catla, and Common carp can be successfully farmed in the Pokkali fields.

It was found that the present trend is to lease out the farmland for prawn cultivation after the rice harvest. Many farmers will have pieces of land in different *kettu* or locations, leased out to different persons. Therefore, working out the economics was found a bit difficult. But, a few do the entire farming by themselves. These farmers could be subjected to our kind of study.

Certain general points have been cited as major production constraints of this area.

1. Existence of different padasekharams lying at different levels. A scientific water balancing system for cultivation of paddy is therefore to be evolved for the situation.
2. Construction of bunds all along the boundary of padasekharams for controlling the level of water there.
3. Release of sufficient quantity of flood and salt tolerant paddy varieties in order to rectify the present shortage of non-availability of these types of seeds suitable for the area. (KLUB, 1997)
4. Being fully dependent on nature, Pokkali is susceptible to the vagaries of the weather. In the past, the Pokkali fields had very high yield, which has gone down in the last few decades. Farmers point out the following reasons:
    a. The low inflow of humus through the Periyar River due to the dams which have come up.
    b. Most of the Pokkali fields being near the Periyar River, the high influx of pollutants from the Eloor industrial area into the river as well as the air pollution caused by the factories have adversely affected the rice and prawn production.

Farm Profile - Farmer P

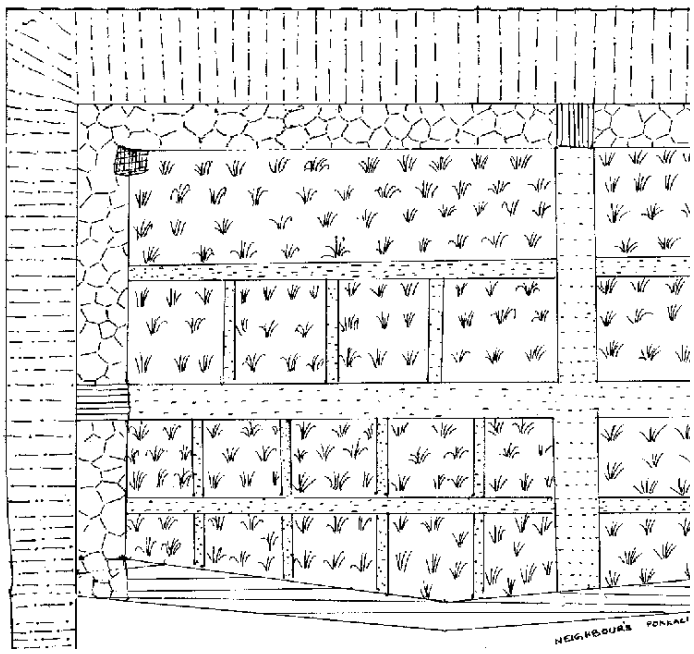
Total land holding of the farmer: 6 acres, 20 cents.
Repairs to the bunds begin by mid - April. Water is drained out of the fields. By May end sowing is over. Harvesting is done by the end of September. Prawn farming begins by November 15th and its harvest will be completed by April 13th. The prawn varieties are ‘Naran’, ‘Thelli’, ‘Choodan’ and ‘Karan’. Crabs, esp., Mud crabs are naturally developed here and is a bonus catch. Lime is added to reduce the acidity of the soil. Groundnut cake

and bran are used as food for the prawn. The long strands of straw of the paddy are left behind after the paddy harvest and that too nourishes the prawn.

Industrial pollution is very high here as the largest chemical industrial belt in Kerala is in the neighbourhood. The untreated industrial waste let into the river has drastically affected the prawn cultivation. In the past, pest infestation was unheard of. But in the last decade, paddy has been affected by Stem Borer and such insects. Many farmers now use chemical pesticides. This again is detrimental to prawn cultivation. The farmer does not use any pesticides; however, it cannot be said that his produce is totally free of chemical residue. But, being the ideal farming method for this land, Pokkali cultivation is the best organic option.

According to the farmer, if the yield is good, he gets around 9 Qtls. per acre. of paddy and the prawns fetch Rs.10, 000/- per acre. No additional manuring is done in these fields. The paddy yield used to be 12 -14 Qtls. before the pollution from the factories became acute.

Farm Profile - Farmer P



Farm Income Analysis –	**Farmer – P**
Study period	May 1999 – April 2000
Agro-climatic zone	Problem area - Pokkali
Area under study	6.20 acres
Main crops	Paddy & Prawns

Labour input

1.Land preparation – April-May 1999

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Granite Bund reinforcement	80 x110/-	8800.00
Mud walling	50 x 110/-	5500.00
Mud transportation	10 boat load x 200/-	2000.00
Sluice work	30x130/-	3900.00
Mud bunds inside	13 x130/-	1690.00
Total	21890.00	

Note: - i. The cost of labour offered by the family members has been discounted.
ii. All labourers are males.
iii. This expense is common for both paddy and prawns.
iv. This is an annually recurring expense.

2. Paddy cultivation

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Mound preparation (5/99)	47 x 125/-	5875.00
Sowing (6/99)	M. 3 x125/- F. 13 x65/-	1220.00
De-weeding (7/99)	F. 45 x 65/-	2925.00
Replanting of seedlings	F. 116 x 65	7540.00
Harvesting (10/99)	F. - In cash – 2020.00 In Paddy- 12180.00	14200.00
Total		31760.00

Note: i. The wages for harvesting is given both in cash & kind. 655-kg paddy is given as part wages.

ii. There is no application of fertiliser or pesticides for paddy cultivation. All expenses have been accounted for.

3. Prawn cultivation

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Comb (Sluice) (11/99)	6 x 225/-	1350.00
-Do- related work	6 x 130/-	780.00
Other expenses - cost of net	(1000 kg.)	700.00
lime		300.00
Total		3130.00

Note: i. The Prawn fry is fed on boiled duck egg scraps, Bran, coconut oil cake, etc. Among these, only coconut oil cake is bought from external source. It is reported that the quantity is negligible and hence need not be taken into account as expense.

Crop input

Paddy - The Pokkali rice seeds are not bought from outside but taken from own produce.

Cost of seeds - Paddy	310 kg	2,480.00
Cost of Prawn fry	35,000 nos.	21,000.00
Total		23,480.000

Fixed Cost: Construction of concrete sluice = 1500.00*

* A sum of Rs.32, 850.00 was spent on concretizing the sluice. This is not an annually recurring expense. It is reported that such concrete sluice will have a minimum life expectancy of 25 years. An approximate 5 %, Rs.1, 500.00 is taken as proportionate expense.

Total expenses

Labour - land preparation	21890.00
Paddy cultivation	31760.00
Prawn cultivation	3130.00
Crop – Paddy	2480.00
Prawn	21000.00
Fixed cost	1500.00
Total	81760.00

Harvest output

Paddy	52.43 qtls. @ Rs.800/- per qt.	41,944.00
Prawn	(Thelli, Naran, Choodan, Kara)	33,502.00
Total	75,446.00	

Loss = Rs 6, 314.00

- The major reason for the loss has been cited as virus infection of the prawn fry. Most of the Kara variety died due to the infection. Other varieties were also affected. In order to avoid total loss, prawn harvest was pre-poned and the yielding prawns were not fully mature and the quantity was quite low. The usual annual yield is worth around Rs.1, 50,000/-. Prawn cultivation is heavily demanding work for about 4 – 5 months. This exacting labour (by the farmer and family) has to be taken into account for a real picture of the loss.
- The loss during the year under study does not mean that this kind of farming is non-profitable. The virus infection, increasing industrial pollution, etc., are some of the problems faced by Pokkali farmers.

ii. Kuttanad sub -zone

The Kuttanad tract lies among the Taluks of Kuttanad, Ambalapuzha, Cherthala, Vaikom, Changanasserry, and Kottayam. There are several distinct agro-ecological situations in the Kuttanad region itself, such as Kayal, Karappadam, Kari, Koottumundakan, and Orumundakan. The farm selected here falls under the Karappadam sub zone. Extensive description of the farming in Kuttanad is outside our purview.

The Karappadams in Alappuzha district are found in the Veliyanad and Chambakulam blocks. The shallow Karappadams are up to 1M below sea level and deep regions are 1 -2 M below sea level. These are lands reclamed in the remote past, and the fields are comparatively shallow. Rivers like Pampa, Meenachil, Achankovil, and Manimala flow through this area and discharge their water into the Vembanad Lake. The deposit of silt from the rivers periodically replenishes the fertility of the fields along the banks of the river.

The climate is moderate with annual rainfall varying between 1500 - 3000 mm. The temperature varies from 24 to 34 ^{o}C. The relative humidity is 61 - 90%.

The entire area in the zone is under rice during the September, October - January, February season. The cultivation in this season is very risky as the flood level may rise up to 1M causing threats to the bunds and subsequent loss of crop. Homestead farming is practiced with coconut as main crop and banana and vegetables as intercrops.

There are several production constraints peculiar to this area. The entry of saline water

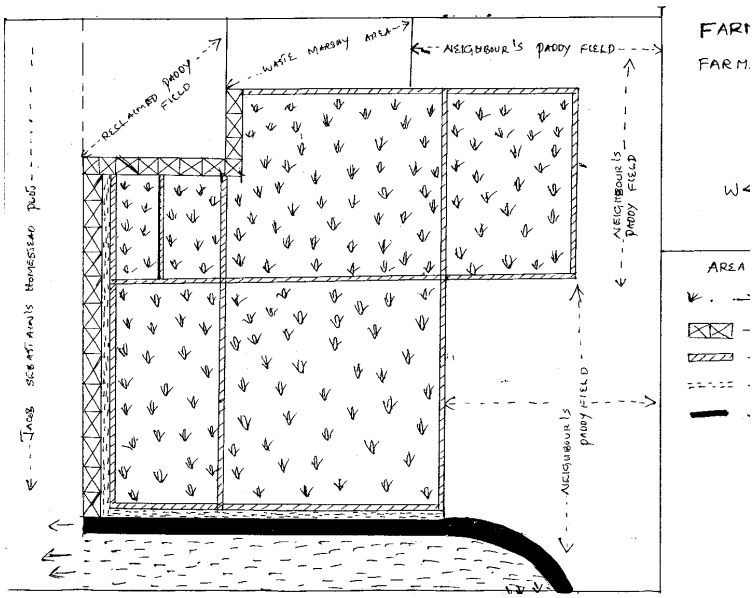
when the water level in the backwater recedes is detrimental to the crop. The maintenance of embankments of paddy fields, salinity problems, weed problems and shortage of labour during the planting and harvesting seasons escalate the cost of cultivation. There is incidence of high water pollution due to the extensive use of pesticides and weedicides. The entire economy is dependent on the vagaries of the climate and the flood in the rivers. The drainage system is very poor leading to water logging and pest and water borne diseases.

Farm Profile -Farmer K

The total cultivable land holding of the farmer is about 6 acres of which paddy is cultivated in 4 acres and rubber in 1.75 acres. Organic farming in rice is practiced in a plot of 2 acres. The rest of the field situated in another location is a family property and the farmer is not allowed to do organic farming here.

The farmer's methods are unique and could serve as a sustainable model for the waterlogged lands of Kuttanad.

One of the basic premises of the farming in this region is the intensive weed accumulation in the paddy fields. In the conventional farming, a considerable amount of labour is spent on de-weeding the fields. Larger weeds are first removed. After draining off water using pumps, smaller weeds are plucked and the land is ploughed using tractors or tillers. Levelling of the field, building bunds, running channels are part of the ground preparation work. For about 1- 3 weeks the land is left to dry. A repeated process of de-weeding and water retention is again done in order to free the field of weeds. The land is readied for planting.



In contrast, K's strategy is very interesting. After the previous harvest, even before the month of June, he removes all the weeds before they begin to increase. He then segregates weeds into friendly and hostile weeds. As the larger hostile weeds are removed, allowances are made for the friendly weeds to grow. Those weeds, which grow underwater and the Mullan Payal (eutricularia – a bladderwort) are considered as friendly and larger weeds like Kora, Kavada, Vari, and the African Payal are considered as hostile. There is not much land preparation in his method. When the water is drained off, the friendly weeds decay into the soil. Planting is done at this stage. Within 10 - 20 days, the only onetime manuring is done. Bonemeal and castor oilseed cake and the gram oilseed cake are the main fertilisers. Pesticides are absolutely avoided and are not required. Yet, the yield equals that of the highest in this area; comparative cost of production is very low, thus making the venture an entirely profitable one. K's customers are mostly nature-cure health faddists and he has a regular clientele.

Farm Income Analysis – Farmer 'K'

Study period	April 1999 – March 2000
Agro-climatic zone	Problem area – Kuttanad
Area under study	2.00 acres
Main crops	Paddy

Labour Input

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Bund preparation	Varying rates	1170.00
Sowing	Flat rate	150.00
Manuring - lime & organic manure application Powdering Neem & groundnut cake	Varying rates	450.00 160.00
De-weeding	M – varying rates	
F- do-	1340.00	1415.00
Repairs to threshing ground	M- 2 x 120	240.00
Threshing charges		720.00
Harvesting	Food & wages	3247.00
Mud sluice		174.00
Total		9066.00

Manure input

Period	Type of manure	Quantity	Cost (Rs.)
Nov 1999	Bonemeal	50 kg	355.00
	Neem cake	50 kg	600.00
	Ground nut cake	50 kg	650.00
Dec -1999	Bone meal	25 kg	179.00
	Neem cake	50 kg	600.00
	Ground nut cake	30 kg	393.00
	Lime	200 kg	565.00
Total			3342.00

Crop input

Seed – 135 kg – Rs.1500.00

Total expenses = 13,908.00

Harvest output

Item	Quantity production	Value in Rs.
Paddy	3144 kg. @6.50 per kg	20437.00

Value of straw is not included. It is usually recycled as mulching material.

Total expenditure for paddy cultivation : Rs.13,908.00
Returns from harvest : Rs.20,437.00
Profit : Rs. 6,529.00

Note: Only the paddy cultivation of the farmer has been taken into account, primarily because his organic agricultural practices are limited to the paddy cultivation in the particular plot which belongs to him. The homestead and other paddy fields belonging to his family and maintained by the farmer could not be considered as organic plots.

iii. Onattukara sub - zone

Karunagappalli taluk in Kollam district and Karthikappalli and Mavelikkara taluks in Alappuzha district comes under this zone. The blocks covered are Karunagapalli and Oachira in Kollam district and Muthukulam, Haripad and Mavelikkara in Alappuzha district.

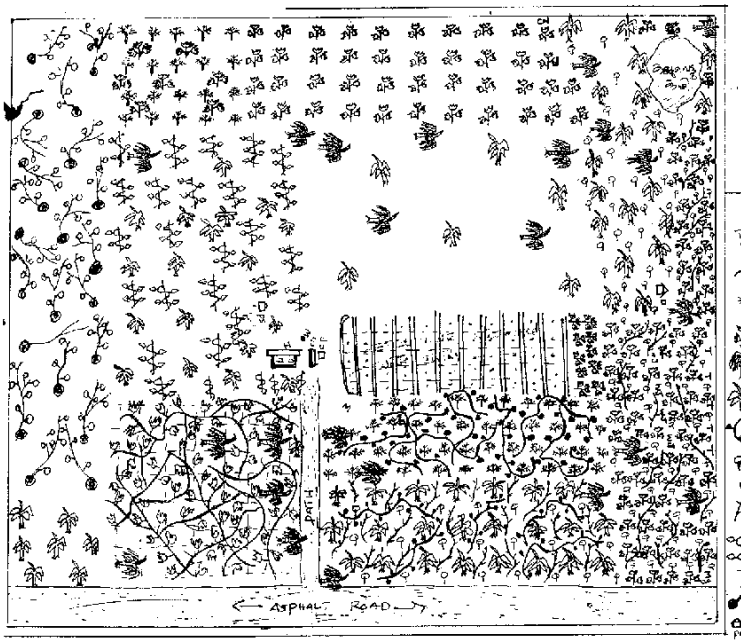
The Arabian Sea bound it on the southern side by Neendakara ‘azhi’ and Ashtamudi Lake, on the northern side by Thottappalli pozhi and Kuttanad region, on the eastern side by the midland laterite belt and on the west by? The topography is plain. The altitude goes up to 7.5 m above MSL. It has warm humid climate and the annual rainfall varies from 2000 - 3000 mm.

Farm Profile – Farmer O

Farmer O is a rather well known personality; he has won the State government award for the best farmer. But the fact that he is one of the best organic farmers is not much known. A farmer for the last 35 years, Farmer O, switched over to organic methods when his farming income began to diminish.

The farmer has a homestead plot of 2-odd acres. He also leases in 1 acre of land where he grows vegetables. He also manages a 6-acre plot of rubber plantation belonging to someone else, where he grows vegetables as intercrop among the saplings. For the study purpose, we selected only the homestead plot.

The major crops are vegetables, tubers, betel, banana and rice in Karappadam. Vegetables are cultivated twice a year and tubers, banana and rice once a year. Vegetable & tuber cultivation begins during January - February. Therefore, the study period has to be taken from January to December.



The soil is rather hard and laterite. The land is prepared by digging up and shaping basins for the vegetables. Pits are dug for banana. Seeds are sown after the early showers in March -April. If there are no rains, sufficient water is given. Vegetables are the mainstays of this farm. The major vegetables grown in this season are bitter gourd and snake gourds. The seeds are mixed with bonemeal and cowdung before sowing.

Other manure used are compost, Neem cake, coir pith compost, and green manure. Blood meal is used only for rice. In the paddy fields, bacteria like *acetobacter* and *phosphobacte*r are also experimented with to increase the health of the soil. No chemicals are used for pesticides. Pest control is through Pheromone trap, neem oil concoction, and friendly fungi like *Trichoderma* and *Pseudomonas fluriscence*.

One unique fact about the paddy cultivation here is the Karappadam. Paddy is not sown in the paddy field, but in the level ground. This is a traditional form of paddy cultivation in these areas but is facing extinction. There was a particular seed variety called 'Karavala'. The influx of rubber and the general trend of loss making in paddy cultivation ended the Karappadams. However, efforts are on to revive it. The land is just dug and shaken using picks and not ploughed. Seeds are sown by 'Pozhi ', a method in which seeds are scattered over the ground in a mixture of manure.

Betel is grown in about 15 cents of land. 'Edavakkodi', 'Kannikodi', and 'Thulakodi' are the main varieties grown. Betel is a major source of regular income for Farmer O. A net income of Rs.38, 000/- p.a. is received from betel alone. As an intercrop, green chili is cultivated here. Cassava is grown as a monocrop. There are 50 coconut palms in the plot of which 30 yield nuts. Since there are lot of intercrops, coconuts are not manured in particular. Daincha and the legume, Muthira are grown for nitrogen fixation.

Pepper such as Karilanchi, Karimunda, Panniyur and Kuthiravalan are grown on a small scale. Detailed cultivation methods of rice, coconut, betel, banana, cassava and other tubers have been recorded. As vegetables are the main crops, the detailed account of that too has been recorded.

In addition, Farmer O also had several hybrid cattle for which he had won the State award for the highest milk yield. However, now he has sold off all those cattle and says that it is a financial blunder to maintain the so- called high milk yielding hybrid cows. He has only a Vechoor cow with calf at present. Farmer O also has some poultry, rabbits and ducks, the sale of which supplements his income. Famer O is yet another farmer who was drawn to organic farming not through philosophical and spiritual compulsions but with the practical, prudent and shrewd perspective of an experienced farmer.

Farm Income Analysis –	**Farmer O**
Study period	Jan 1999– Dec 1999
Agro-climatic zone	Problem area – Onattukkara
Area under study	2.00 acres
Main crops	Banana, Paddy, Betel vine, Pepper, vegetables

Labour input

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Land preparation- paddy -Banana	m- 2 x 150 m – 10 x 150	300.00 1500.00
Land prep.& manuring for Cassava	M –20 x 150	3000.00
Harvesting coconut	Varying rate	800.00
Transportation for manure		500.00
Transportation for vegetables		750.00
Total		6850.00

Note: All the family members contribute their labour and external labour input is minimal.

Manure input

Type of manure	quantity	Cost (Rs.)
Cow dung	4800 kg (app.)	2400.00
Neem oil cake	300 kg	2100.00
Ground nut cake	50 kg	700.00
Wood ash	3000 kg	2500.00
Green manure	n.a.	1000.00
Lime	50 kg	125.00
Bone meal	500 kg	3500.00
Blood meal/ leather meal/ eco meal	200 kg	1600.00
Total		13925.00

Other expenses

Particulars	Rate	Amount (Rs.)
Cost of bio-pesticides – Neem oil Garlic Soap	 3 ltrs 6 Kg	 300.00 300.00
Chemical pesticides – Furidan [1]		100.00
Cost of materials for vegetable arcade		9275.00
Total		10015.00

1. Note: Most of the materials used to construct the arcade for the vegetables (climbers) is re-used for the consecutive years; hence the recurring expense is kept to a minimum.
2. Furidan is not used as a contact pesticide. It is used as part of the insect traps such as Chirattakeni (coconut shell trap), Pazahkeni (fruit trap), Sarkara Keni (raw sugar trap).

Crop input

Paddy seeds – 13 kg – Rs.65.00. Total expenses = 30855.00
Livestock Type – Cow

Owned at the beginning of the study – 3 cows (1 Vechoor & 2 country) – 1 Bull.	approx. value	Rs.15,000.00	
Bought during the period – 5 Vechoor cows and 1 cross-breed	.25,000+ 7,000/-	Rs.32,000.00	
Sold during the period:5 cows, bull and 1 calf			Rs.32,600.00
Cattle at hand: 3 cows, 1 bull, two calves.	approx. value		Rs.25,000.00
Cost of Cattle feed	36 sacks	Rs.10,800.00	
Straw bought from outside	23 qtls.	Rs. 9, 200.00	
Sale proceeds of milk	1277ltrs. @ Rs.10/-		Rs.12770.00
Total		67,000.00	70,370.00
Profit	3,370.00		

- The large amount of cow dung, which has been fully utilised for the farm, could not be quantified.

1. Poultry -9 nos. Giriraja & white leghorn Yield of eggs = 500 approx. value Rs.750/-
2. Rabbit -1 male and 8 female. Litter approx 400 nos. per year. Sold @Rs 25 for Rs.10,000.

Harvest output

Item	Quantity production	Value in Rs.
Coconut	1546 nos. - varying rates	7672.00
Pepper	Flat rate	17600.00
Betel leaf -do- planting material	3885 kettu – varying rates	47870.00 8500.00
Plantain	1000 kg x varying rates	6000.00
Diascoria	500 kg x @ 6/-	3000.00

Colocasia	300 kg x @ 15/-	4500.00
Vayana	10 kg x @40/-	400.00
Red cotton (elavu)	Flat rate	200.00
Elephant foot yam	850 kg @ 4/ -	3400.00
Cassava – dried - do – Raw	1500 kg x @ 9/ - 400 kg x @ 4/-	13500.00 1600.00
Green chilli	350 kg x varying rate	8750.00
Amaranthus	30 kg x @ 10/-	300.00
Cucumber	800 kg x @ 7/-	5600.00
Pumpkin	480 kg x @ 5/-	2400.00
Ash Gourd	450 kg x @ 4/-	1800.00
Bitter Gourd	350 kg x@ 15/-	5250.00
Snake gourd -do - seed	3000 kg x @ 5/- 2.4 kg x@ 1000/-	15000.00 2400.00
Banana - do- saplings	1000 kg x@ 10/- 500 nos. x @ 5/-	10000.00 2500.00
Paddy - seeds - do- grain - do - seedlings - do - straw	300 kg x@ 8/- 507 kg x @ 7.30 600 kg x@ 4/-	2400.00 3701.00 800.00 2400.00
Total		177543.00

Note: Many of the vegetables produced are used for own consumption. However, these constitute mostly of unsaleable produce. In addition, Lady's fingers, Brinjal, peas, etc., are grown for own consumption alone.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	6,850.00	Harvest	177,543.00	
Manure	13,925.00	Cattle	70,370.00	
Other expenses	10,015.00	Poultry	750.00	
Seeds	65.00	Rabbit	10,000.00	
Cattle	67,000.00			
Total	97,855.00		2,58,633.00	
Net profit				1,60,808.00

Note: - The actual profit could be higher since the items such as cow dung, saving in labour charges due to the participation of the family members, etc. have not been taken into account.

II. South Zone

Area

The southern agro - ecological zone comprises the districts of Thiruvananthapuram, Kollam, Pathanamthitta and Kottayam. On the basis of different factors such as land situation, altitude, soils and irrigation, certain sub-zones have been identified within the southern zone, viz.; the low land, the mid-land, the highland, and the high ranges. Our study area falls under the mid-land sub-zone.

The topography of this sub zone is characterized by level to gently sloping and to moderately steep areas. The elevation ranges from 7.5M to 75M MSL, gradually increasing from east to west. This is an undulating area of low hills, steep side slopes.

Climate & Rainfall

The zone has a warm humid tropical climate with a mean annual rainfall of 1875 mm. The temperature varies from 21^0C to 35^0C. Both Southwest and Northeast monsoons benefit the zone. Intense rain occurs during southwest monsoon in the months of June, July. March - May are the hottest months.

Soil

The soil is very deep, well - drained, clayey with rather shallow water table.

Important crops

Rice is the main crop in this area, closely followed by rubber and coconut. Coconut is intercropped with tapioca, banana, pepper, clove, cocoa, coffee, other tubers, ginger, etc. Miscellaneous fruit trees are also cultivated.

Farm Profile - Farmer S1

A philosopher of natural farming, Farmer S1 has been practicing organic farming (he prefers to call it natural farming) for more than a decade. His farming philosophy is based on one simple dictum: *A farm should be like a forest*. The facts follow: high diversity of species, natural regeneration, self - contained ecosystem with least external inputs, soil conservation and organic manure, organic/natural pesticides and extraction of resources without exploitation - and like the unseen hand of nature, the gentle but constant tendering by Farmer S1.

Farmer S1's farm comprises a total land holding of 6 acres, with major units being rubber-3.25 acres, rice - 90 cents, medicinal plants, coconuts and miscellaneous crops - 2 acres.

Rubber

The conventional rubber plantation is characterised by its monoculture. The instructions given by the Rubber Board rule out co-habitation with any other species, if the planter is to get any benefits from the Board. Farmer S1's plot shatters all such notions about a rubber plantation. Weeds are allowed to grow in the undergrowth. The other tree saplings and shrubs that sprout are allowed to come up naturally. Rubber is inter-cropped with coffee. Yet the design of the planting is not wild and free; it is controlled, with minimum disturbance of the natural vegetation, just enough to facilitate rubber tapping.

According to Farmer S1, this 'wild rubber' plantation is eco-friendly as well as profitable. By allowing other vegetation, manure for the rubber is produced naturally. The production cost is considerably reduced by the low human labour required for clearing the undergrowth and controlling shrubs and weeds. At the same time, the rubber production equals, or even exceeds the neighbouring conventional rubber plantations. The natural vegetation helps to increase pest resistance. Non-application of chemicals is also seen as a reason for low incidence of infestation. Another visible advantage is effective control of soil erosion in the plot. In addition to the ground cover, Farmer S1 has also dug trenches in different parts of the plantation, which, while retaining run-off in the plot, prevent soil erosion.

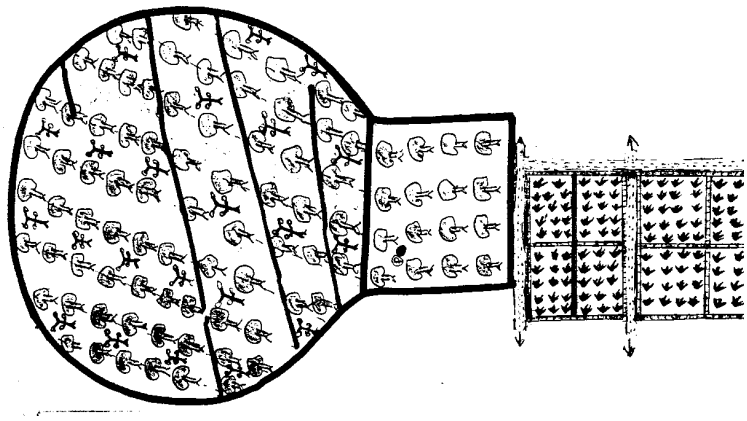
Rice

The 90 cents of paddy fields lie at slightly lower level adjacent to the rubber plantation. In spite of being among conventional paddy fields where chemical fertilizers and pesticides are used, it could be seen that Farmer S1's field is different. There is high incidence of earthworm in the area. It is also observable that the plot harbours notable number of insect life, which indicates absence of pesticides. There are no telltale signs of chemicals (the oil-based chemicals leave film on the surface water; also, on close observation. traces of chemicals can be noticed on the leaves/shoots). The organic farming practiced here for the last decade clearly sets this plot apart from its neighbours.

Medicinal plants

Farmer S1 is a full time farmer. But the lion's share of his income comes from his nursery of medicinal plants. The 2-acre plot around his residence has been developed into a medicinal plant nursery. The trees in the plot are mainly coconut, jack, mango and other fruit trees. The 2-acre plot was developed in 3 stages over a period of 10 years. Because of its abundant greenery, the plot has the ambience of a forest. The topsoil is not disturbed and humus has been allowed to accumulate and enrich the soil. The earnings from the sale of the medicinal plants are over Rs 40, 000 in a year. Pepper has been planted at the base of the coconut palms, which is yet to yield. As coconuts and pepper start to yield, Farmer S1's income from them is bound to increase.

This is an ideal example of successful natural farming. Through constant nurture and care, Farmer S1 has been able to maintain the pristine quality of the soil. The high biodiversity, non-application of chemicals, recycling of household wastes into compost manure, and total self-reliance of the farm for its inputs make Farmer S1's farm a model for the success of organic farming.



Farm Income Analysis – Farmer S.1

Study period	April 1999 – March 2000
Agro-climatic zone	South
Area under study	6.25 acres
Main crops	Rubber, paddy, coconut, pepper, medicinal plants, nutmeg, vegetables

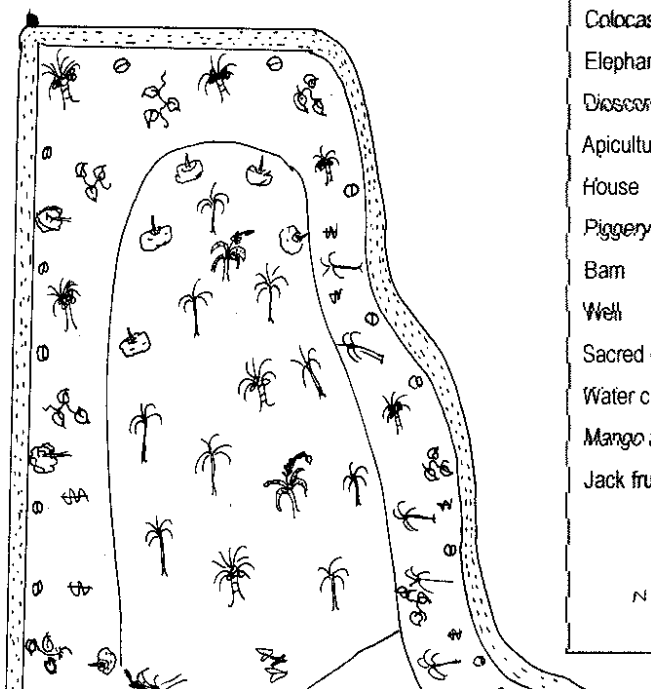
Labour input

1.Paddy

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Bund preparation	5 1/2 x150	825.00
Tilling	machine	1150.00
Levelling & sowing		350.00
Manuring		400.00
De-weeding		1050.00
Cooliage for paddy headloads	M (8x150) + 50	1250.00
Winnowing & drying in sunlight	M 8x150 F 3x70	1410.00
Harvesting	Food & wages	2455.00
Total		8890.00

Note:
ii. The expenses for both the 1st & 2nd crops are combined for each item.

Farm Profile - Farmer S1



2.Rubber

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Rubber tapping	Varying rate (av .Rs.140 x132)	18660.00
Drying & fumigation of		
rubber sheets		11151.00
Rain guarding		3825.00
Rubber processing		2476.00
transportation		150.00
Total	36262.00	

Note: i. Includes cost of material for rain guarding Rs.2025.00

3. Coconut cultivation

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Harvesting		240.00
Total		240.00

4. Other cultivation

(Pepper, Diascoria, medicinal plants, vegetables, etc.)	manuring, preparing nursery for med.plants, harvesting pepper, diascoria, etc	1625.00

Total labour input = Rs.47, 017.00

Manure input

Period	Type of manure	quantity	Cost (Rs.)
April 1999	Cow dung for homestead plot	40 barrels	200.00
May -1999	Bone meal for paddy	50 kg	250.00
Neem cake –do-	50 kg	250.00	
October - 1999	Bone meal +Neem cake for paddy	160 kg	800.00
Total			1500.00

Livestock

Type: Pig – nos.3.
Cost of feed & maintenance: Rs.2500.00
Sale proceeds of 3 pigs = Rs 7,500.00
Profit Rs.5, 000.00 + manure worth Rs.3000/- = Rs.8, 000/-

Harvest output

Item	Quantity production	Value in Rs.
Paddy	17.40 qt. @6.50 per kg	11310.00
Straw		4500.00
Rubber	4457 kg (varying rates)	134073.00
Coconut	795 nos.@Rs.5/-	3975.00
Medicinal plants	3300 saplings	9550.00
Pepper	10 kg	2250.00[1]
Coffee	75 kg	1350.00[2]
Nutmeg	25 kg	1750.00
Arecanut	5000 nos.	3500.00
Diascoria	850 kg	6800.00
Colocasia	80 kg	800.00
Chilly	20 kg	600.00
Plantain	1500 kg	9000.00
Honey	4 kg	400.00
Elephant foot Yam	400 kg	3200.00
Total		193058.00

Note: 1. Pepper has not been sold yet. It has been valued at current prices.
3. Coffee is also yet to be sold as its price had plummeted at the time of reporting.
4. Coconuts are for own consumption only.
5. Yield of Colocasia was low this year due to rodent attack.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	47,017.00	Harvest	1,93,058.00	
Manure	1,500.00			
Piggery	2,500.00	Piggery	8,000.00	
Total	51,017.00		2,01,058.00	
Net profit				1,50,041.00

ii. Farm Profile – Farmer S 2

The total land holding of farmer S2 is 10.35 acres, of which rubber accounts for 6.5 acre, rice 1 acres, banana, coconut, and fodder crop 1 acre and mixed crops such as coconut, pepper, coffee, arecanut, banana, tubers, nutmeg, fruit trees, vegetables and others account for 2 acres.

Rubber

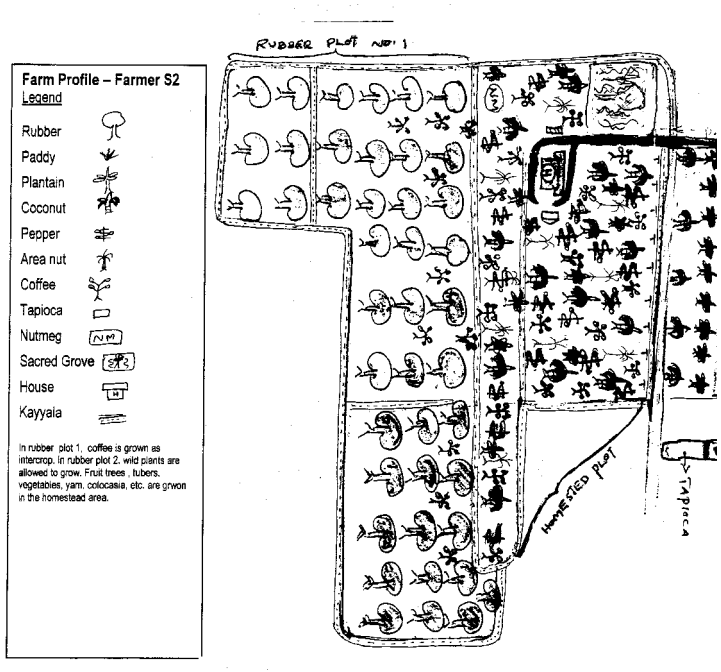
Even though rubber is planted as monoculture, for the last several years, the undergrowth has been retained, except for that around the trees, to facilitate tapping. Here also, maintenance of natural vegetation in contradiction to the common practice has not in any way affected the yield of rubber.

Rice

All chemical fertilizers and pesticides have been completely avoided in the paddy fields. Poultry excreta and solids after extraction of coconut oil are the main external manure inputs. According to Farmer S 2, the paddy yield is equal to the conventional fields nearby.

Banana

The fully organically grown banana (approx. 300 heads) in the farm looks very healthy. Furidan, a common pesticide used for banana has not been applied to these plants. Farmer S 2 expects very good returns from his banana cultivation.



Mixed crops

There are a huge variety of crops in the plot. Most of them are yet to yield. The soil is well covered by plant wastes to retain moisture. Slurry from the Gobar Gas plant is used as manure for the coconuts and other crops. Due to the adverse climatic conditions this year, Farmer S. 2 expects only a lower yield of 1500 nuts in comparison to 3500 last year from coconuts and 50kg.to last year's 150 kg.

Farmer S 2 is also maintaining a miniature grove modelled after the sacred groves of Kerala. He typifies the prudent and practical farmer of the central Travancore, who is well aware of the financial as well as environmental benefits of eco-friendly agriculture.

Farm Income Analysis – Farmer S2

Study period	April 1999 – March 2000
Agro-climatic zone	South
Area under study	10.35 acres
Main crops	Rubber, Paddy, Banana, Coconut, Pepper, , coffee, plantain, Pumpkin, Cassava, vegetables

Labour input

1. Banana.

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Land preparation	7 x 130	910.00
Manuring – transportation		200.00
Harvesting – transportation		1000.00
Total		2110.00

2. Rubber

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Rubber tapping	0.25 ps/ tree	34686.00
Rubber processing	Cost of acid	1850.00
Tree re-marking		2775.00
Rain guarding +	2.25 /tree	2081.00
cost of materials		4395.00
Total		45787.00

3. Paddy

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Bund preparation	M- 9 ½ x 130	1235.00
Tilling	Tractor	1450.00
De-weeding	F- 6 x 70	420.00
Harvesting ,Winnowing	M – 3 x 130	390.00
& drying in sunlight	F- 24x 70 (approx.)	1710.00
Total		5205.00

4. Other crops

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Shade control for pepper	M - 6 x 130	780.00
Harvesting coconut		750.00
Total		1530.00

Total labour input = Rs 54,632.00

Manure input

Period	Type of manure	quantity	Cost (Rs.)
April 1999	Poultry waste	3000 kg	1500.00
July –1999	Ground nut cake	50 kg	500.00
Nov -1999	- do -	50 kg	500.00
Total			2500.00

Note: In addition, wood ash, biogas slurry and cow dung are used which are produced in the farm itself. The costs of these inputs have not been included.

Crop input

Cost of banana saplings – 200 no.s = Rs. 800.00

Harvest output

Item	Quantity produced	Value in Rs.
Rubber	4586 kg (Varying rate)	131212.00
	scrap –754 kg	15084.00
Paddy	Paddy – 1380 kg @6.50/kg	8970.00
	Rice – 320 kg @ 20/-/kg.	6400.00
Banana	1904 kg	16826.00
Coconut	1500 nos.	7500.00
Pumpkin	530. kg	1943.00
Coffee	125 kg (kept as stock) @ 18/-p	2250.00
Plantain	1120 kg	5600.00
Cassava	250 kg	1250.00
Pepper	20 kg	4500.00
Elephant foot yam	75 kg	525.00
Colocasia	50 kg	400.00
Total		202460.00

Note: in addition, several crops such as Diascoria, ginger, turmeric, mango, jack, and Pappaya are grown for own consumption. 75 % of the vegetable requirements are met from the farm itself. The farmer also distributes the various organically grown vegetables freely to the neighbours as part of his commitment to the cause.

2. The yield of pepper is comparatively low this year. (100 kg in the previous year compared to 20 kg of this year)

Preparation of honeyed banana

The farmer has a small unit which prepares honeyed banana. Ripe banana is cut, dried and soaked in honey. This is bottled and is sold in the market. 350 bottles of 450 gm is sold at a price of Rs.68/- per bottle. The Banana is produced by the farmer while the honey and bottles are bought from outside. 70 kg of banana is used for the preparation. 87 kg of honey @ Rs.60/- was bought from outside. Bottles were bought at a cost of Rs.1, 500/-.

Cost of production: Banana – (Own produce): 70 kg x average Rs.9/- per kg = 630.00

Honey – 87 kg x Rs.60 = 5,220.00

Bottles = 1,500.00

Total = 7,350.00

Proceeds from sale - 350xRs.68/- = 23,800.00

Profit =16,450.00

livestock

Cows – nos.2
Cost of maintenance: Rs.24, 000/-
Wages for worker: Rs.6, 000/-
Yield of milk = 4339 liters @ 10 per ltr/ = Rs 43,390.00
Profit = Rs. 13,390.00

Cow dung, is used as manure and for the gobar gas plant. Its value has not been taken into account.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	54,632.00	Harvest	2,02,460.00	
Manure	2,500.00			
Seeds	800.00			
Honeyed banana	7,350.00		23,800.00	
Cattle	30,000.00		43,390.00	
Total	95,282.00		2,69,650.00	
Net profit				1,74,368.00

III. High Altitude Zone

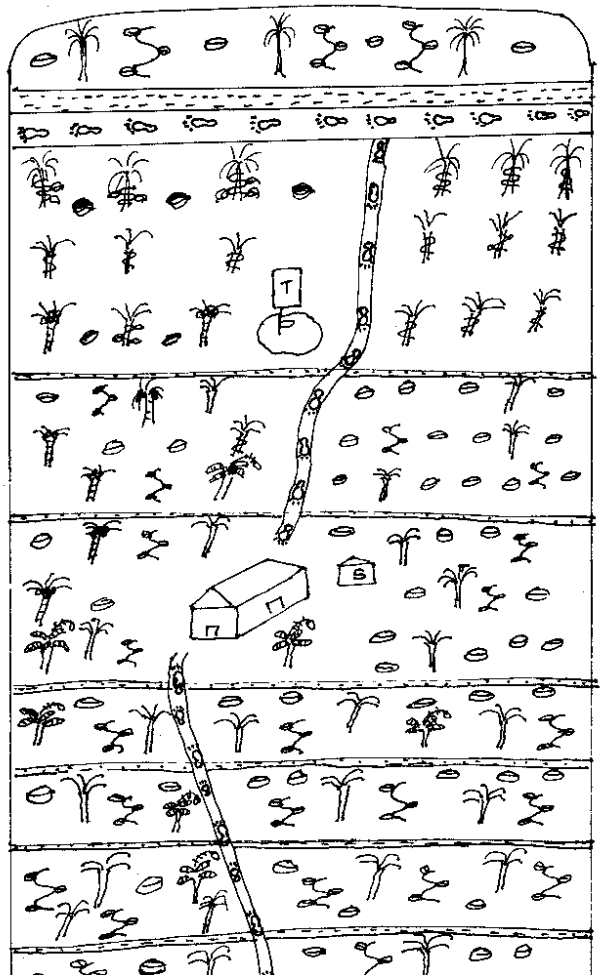
i. Attappadi sub - zone

The Attappady region falls in the 'High Altitude zone' of the NARP zones, along with districts of Wayanad, Idukki, and Nelliampathy hill ranges in Kerala. The altitude varies from 750 MSL to 1000 MSL. The Nilgiris and Coimbatore districts of Tamil Nadu in the north and east and Palakkad taluk in the south bind the Attappadi hill ranges. It lies between 10°15' north latitudes. The highest peak Maleeswara is 1664 above MSL. It lies between the low ranges of the Western Ghats and the general slope of the area is towards north - east. The terrain is undulating and the slope varies form gentle to very steep.

Climate & Rainfall
The Attappady ranges enjoy a cool humid climate during rainy season. The slopes facing west receive rainfall of about 3000mm annually, whereas areas closer to Tamil Nadu boundary, i.e., beyond Mukkali, receive only 1000 mm annually. The rainshadow effect in the eastern side is due to the high and steep hills on the western region.

The maximum and minimum temperature in Attappadi is 33°C and 23°C respectively.

Farm Profile – Farmer A



Legen

Pepper
Coffee
Arecan
Arecan
Arecan
Cocon
Cardan

Note:
Slope:

TAN
PON
SHE

Attappadi has a disreputable history of being one of the areas in Kerala which was subjected to wanton deforestation, most of which occurred in the last few decades.

In Attappadi hill ranges rubber is the most important crop followed by cassava and groundnut. The other important crops are cotton, coconut, paddy and cashew.

Deforestation has brought about dramatic changes in the Attappadi ecosystem affecting the cultivation. The soil is well drained; gravelly loam soils with ironstone layer at 100 to 150 cm on moderately steeply sloping medium hills with thin vegetation, moderate erosion and associated with rock outcrops.

Farm Profile- Farmer A

The total landholding of Farmer A is 3 acres. His parents had migrated to Attappadi 30 years ago from Amboori in Trivandrum District. In the early years, they practiced a kind of slash & burn cultivation, clearing the forests and shrubs and reed patches and grew cassava and other tubers. There was no need to apply fertilizers in those days. Since about 20 years ago, the system was developed into a multi-crop farm with the introduction of coffee, areca nut, coconut, pepper, banana, mango, jack, etc.

The farmland is situated on steep hill slopes. Soil erosion is severe in these areas. Landslides occur frequently. In order to control soil erosion, the farmer has prepared the land into terraces. Every sq. inch of the land is filled with one or the other crops or plant. The land is slightly raised at the edge of every terrace. He has also prepared percolation trenches to retain all the rainwater. It could be seen that constant effort of several years had gone into the development of the land.

The space utilization of Farmer A's land is something that should be seen to be believed. There are about 450 trees in the plot, over and above nearly 500 Glyricidia and 200-odd Erythrina. In the same plot you have another 950 areca palms, 800 pepper, 200 betel leaf and 650 coffee plants. In addition, there are many other plant species which co-habit the area. The plantation is so planned that all the species receive adequate sunlight. This careful design of the farm is the major strength in the successful organic agriculture practiced by Farmer A. It is noteworthy that he has received formal education only up to 5th standard and has not received any technical support from any agency.

All the manurial input is generated within the farm. Thrice a year, trees are combed for the foliage, which is used as green manure. The hill soil is by nature very rich in nutrients and by taking adequate measures to conserve the topsoil, the loss of nutrients is controlled to a great extent. Farmer A does not use any chemical pesticides except Bordeaux mix for fungal infection in areca palms.

Coffee
Coffee is mostly grown in the lower elevations of the plot. Total plants 650 approximate of

which 500 bear fruit. Last year' yield was 500 kg. and at a market rate of Rs.55/- per kg., the income came to Rs.27, 500. Robusta is the main variety. IR-2 and Arabi are also planted. Except during the harvest season, the farmer does himself all the labour himself.

Arecanut
Majority is the 'Kasargodan'variety. Soil at the base of the palm is not much disturbed, except for small pits to retain water. Before the onset of the north- east monsoons, the soil is slightly raked and cleared. All the farmyard manure is spread at the base of the palm. Mulching, water retention using the coconut husks, bought free of cost from the oil mill, etc., are the bare minimum care given. The nuts are sold in bulk to contractors. Last year, the earning was Rs.10, 000 and this year Rs.9, 000. Even though the arecanut is an indigenous variety, it has high yield and also the maintenance cost is nominal.

Coconut
There are only 25 palms; all are native breeds. All the wastes such as the palm leaves and other parts are left to mulch at the base of the palms. When land is cleared for pepper planting, some of the green manure is given to the coconut palms too. During the summer season, the heads of the palms are cleaned and serviced at a cost of Rs.10/- per palm.

Pepper
The following breeds are grown here. 1. Panniyur -1; 2. Karimunda; 3.Arakkalamunda; 4. Vellamunda 5. Kottanadan. The first two are hybrids. Arecanut, Mango tree, Jack, Manjium, Subabul, Teak, Rosewood, Cashew, Glyricidia, Chadachi (Grewia asiatica), Venga (Pterocarpus marsupium), Mulluvenga (Bridelia retusa), Mullumurikku (Erythrina stricta) Matti (Ailanthus malabarica) and several others support the pepper climbers.
The detailed cultivation methods for pepper have been taken down from Farmer A.

Betel
200-odd Betel vines are grown on areca and other trees. The yield is about 50 packs of betel leaves a month. At a rate of Rs.10/- per pack, the yearly return is Rs.6, 000/-. The manure consists of mostly mulch, FYM and occasional sprinkling of wood ash at the time of plucking leaves.

Mango
The branches are regularly trimmed for green manure; hence the yield is proportionately low. In the last season mangoes sold were for Rs.500/-.

Plantain
Mostly of three varieties, Kudumbavazha, Njali poovan, and Kali. The income from plantain last year was Rs. 5000/-

Farmer A grows about 15 types of vegetables, which are mostly used for his consumption only. There are about 50 species of medicinal plants, which he does not sell. In addition, Farmer A has a fishpond, rabbits, ducks, poultry, cattle, guinea pigs, and pigeons. An astonishing fact is that he knows each and every plant grown in his land. The diversity of species in the garden is not natural but cultivated. He grows all his food crops except rice.

Farmer A is the kind of organic farmer who is not a philosopher but one who has exploited the practical advantages of being organic.

Farm Income Analysis Farmer A

Study period	April 1999 – March 2000
Agro-climatic zone	Problem area - Attappadi
Area under study	3.00 acres
Main crops	Pepper, Coffee, Arecanut, Betel, Plantain, Colocasia, Diascoria

EXPENDITURE

Labour input

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Harvesting of Coconut	Varying	55.00
-do - Pepper	M – 15x Rs.160.	2400.00
- do - Coffee	F – 21/2 x 80	200.00
Total		2655.00

Note: 1. The areca nut contractors apply Bordeaux mixture to the areca palms. This is the only chemical input in the farm. The expenses are borne by the contractor.
2. The farmer and his wife spend on an average, 8 hours/day, 6 days/week in the farm. Their labour has not been valued.
3. Occasionally some relatives visit them and assist in the farm for a day or two. It is rewarded in kind by way of vegetables or some other produce.

INCOME

Harvest output

Item	Quantity produced	Value in Rs.
Pepper	312 kg	64332.00
coffee	550 kg (not sold) @ Rs.18/-/ kg	9900.00
Areca nut	Flat contract	8000.00
Coconut	605 no.s	3025.00
Plantain	385 kg	1350.00
Ginger -Green	100 kg	1000.00

Colocasia	200kg	1200.00
Diascoria	125.kg	450.00
Betel vine	Contract	1000.00
Mango	-do-	1500.00
Cashew nut	25 kg	975.00
Garcinia	25 kg	3000.00
Elephant foot yam	50 kg	400.00
Pineapple	50 kg	350.00
cardamom	1 kg (not sold)	———
Turmeric	25 kg	625.00
Total		97,107.00

Note: 1. There are in addition, Jack, Papaya and other vegetable grown on a small scale purely for own consumption. Any excess produce is shared with neighbours or relatives.
2. Most of the coconuts are used for own consumption. It has been valued at Rs.5/- per nut.
3. Cardamom is not sold; it is consumed. The current prices are not available.
4. Crops such as coconut are yet to yield fully. The total yield of the farm is expected rise sharply in the coming years.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	2,655.00	Harvest	97,107.00	
Total	2,655.00		97,107.00	
Net profit				94,452.00

ii. Wayanad sub - zone

Wayanad district lies between 11°26' and 11°59¢ north latitudes and 76°26'and 75°46' east longitudes. The mean average annual rainfall of Wayanad is 2322mm.

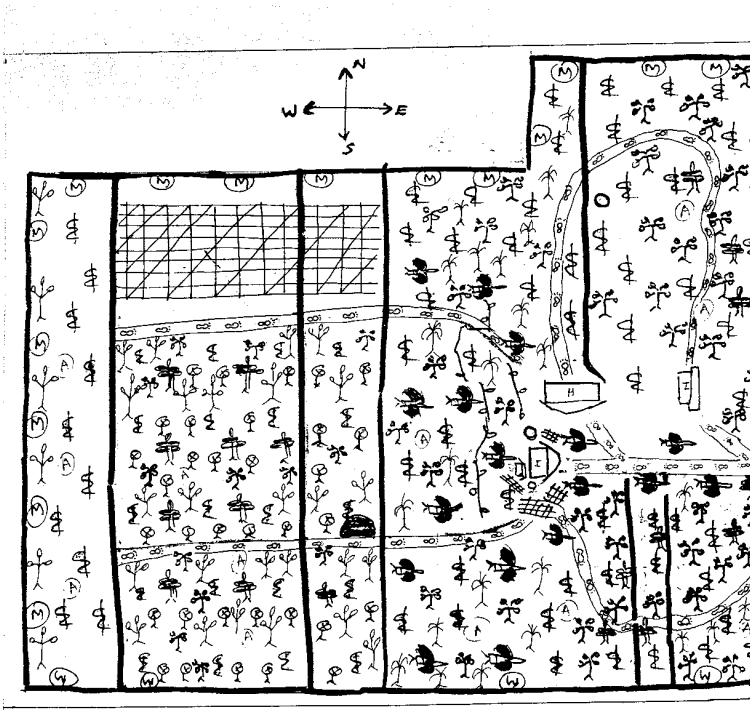
Coffee based farming system is a notable feature of agriculture in Wayanad. Coffee is grown both as a pure crop and in mixed form with pepper. Other major crops are tea, cardamom, rubber, coconut, cassava and ginger. Recently coconut cultivation is increasing in the lower elevations of Wayanad. Paddy has the second position in area under cultivation and only a single crop is taken. In recent years, a two-year rotation with paddy-banana, paddy-ginger and paddy-cassava/vegetables is being followed.

Like the other high altitude areas in Kerala, deforestation has brought about drastic changes in the ecological conditions of Wayanad.

Farm Profile – Farmer W

A native of Nedumangad, in Trivandrum District, Farmer W came to Wayanad as a schoolteacher. He bought the land of about 2.25 acres, in 1962. The land, which was originally forest land, had been converted into a plantation of *Panicum repens* (Aromatic oil plant). In 1965, Farmer W planted cassava. By 1967, the entire area was under ginger cultivation. Along with ginger, he planted pepper, coffee and elephant -foot Yam. In between banana was also cultivated. Over several years, the cyclical process of ginger - Yam - cassava -ginger continued, while coffee and pepper remained the mainstay crops. . By 1975, Farmer W started to plant coconuts of the TxD variety. 80-odd coconuts were planted. Chemical fertilisers were being used in those days. Around 15 years ago, when the price of coffee crashed, all the plants were cut off.

By the 90s, Farmer W's farm which used chemical fertilisers and pesticides in abundance began to show heavy losses. By 1992, the entire pepper was destroyed. About 250 jack trees which were supporting the pepper vines were also cut off. In 1995, he planted teak in this area. It was by sheer accident that Farmer W came across organic farming. He had given a part of his land to his son for cultivation. But, being an indifferent farmer, his son did not do any maintenance on his land. While the pepper in Farmer W's failed completely, he found that pepper on the land of his son remained healthy. This made him realise that the



crux of the problem was in his farming methods. Over the last 6 years, Farmer W gradually reduced application of chemicals and clearing of the ground in his farm. Since the last 3 years, the farm has gone fully organic. Irrigation is more or less nil.

In about 0.50 acre, coconut, banana and pepper are grown. The plot has been organic during the last two years. Mulching is done and ground preparation is avoided except for pepper. In another 0.50 acre plot, pepper alone is grown with a smattering of banana and coffee. Mulching is done extensively. The plot is organic since the last 6 years. In a 0.25 acre plot arecanut, pepper and banana are cultivated. The plot is organic since about 3 years. A small plot of 0.15 cents is left to grow wild. Mango, Jack, Mahogany, Manjium and medicinal plants are grown here. Another 0.50 acres is a teak plantation. Yam, cassava, ginger and banana are grown as intercrops.

Pepper is still the main crop followed by coffee, coconut, teak, manjium, and arecanut. There are several species of other wood, medicinal plants and vegetables. There are about 200 pepper plants, which yielded 150 kg. dry seeds last year. The farmer expects about 300kg this year. The yield of pepper is subject to the vagaries of the weather.

Coconuts look very healthy. There are 50 palms of which 30 give good yield. On an average the yield is 150 nuts. Arecanuts are yet to bear nuts.

Cowdung, castor oil cake, organic manure mixture and a little mussoorie phos are the main external manure inputs. Comparatively, Farmer W is able to save 70 - 80% of fertiliser cost since adaptation of organic methods. External labour is also used for planting yam, manuring, and for pruning pepper.

Farm Income Analysis – Farmer W

Study period	April 1999 – March 2000
Agro-climatic zone	High altitude
Area under study	2.25 acres
Main crops	Pepper, Coconut, Elephant foot yam , plantain Diascoria Cassava, Arecanut

Manure input

Period	Type of manure	quantity	Cost (Rs.)
April –June 1999	Cow dung Castor cake Organic manure mix. Musoorie phos	95 barrels 200 kg 50 kg	3000.00 1200.00 300.00 250.00
July 1999	Coir pith manure[1]		4000.00
September 1999	Poultry waste	½ truck load	2750.00
Total			11500.00

Labour input

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Planting	10 x 120	1200.00
Manuring	M- 9 x 120 F- 6 x 60(approx.)	1445.00
Weed control	Varying rates	3200.00
Shade control for pepper	9 x120 (approx.)	1085.00
Land preparation	9 x 120 (approx.)	1100.00
Preparation of areca seedlings	Varying rates	750.00
Harvesting	Varying rates	4705.00
Total		13485.00

Note: Preparation of areca seedlings includes cost of materials.

Crop input

Particulars	Rate	Amount (Rs.)
Seedlings of medicinal plants	Varying rates	300.00
Seeds of N2 fixing plants (pea & Horse gram)	Varying rates	40.00
Total		340.00

Total expenses = Rs.25, 325.00

Livestock Goat – 5 no.s

Cost of maintenance (Ground nut cake) : Rs.3,500.00
Average yield of milk: 700 ltrs.
per year @ Rs 10 per litre = Rs 7,000.00 (own consumption)
Sale proceeds : Rs.6,500.00
Net earnings : Rs 10,000

Note: - The value of the manure has not been taken into account. The price of milk is fixed at a low rate. The only external input is the ground nut cake feed. Rest of the food requirements is met from within the farm.

Harvest output

Item	Quantity produced	Value in Rs.
Pepper	185 kg	41083.00
Coconut	7050 nos.	40000.00
Elephant foot yam	325 kg	1300.00
Plantain	600 kg	2400.00
Diascoria	150 kg	1200.00
Cassava	150 kg	600.00
Garcinia	7 kg	840.00
Arecanut seedlings	750 nos.	3750.00
Vanila	2 kg	4000.00
Other crops		347.00
Total		95520.00

1. The yield of pepper dropped this year solely due to climatic changes. The yield in the previous year was 4.5.qtls. compared to 1.85 qtls. this year.
2. Other crops include a large variety such as, eucalyptus, turmeric, coffee, ginger, colocasia, etc. these are grown in small scale and used for own consumption as well as sale.

Net income from farm

Expenditure	Amount	Income	Amount
Labour	13,485.00	Harvest	95,520.00
Manure	11,500.00		
Seeds	340.00		
Goat	3,500.00	Goat	13,500.00
Total	28,825.00		1,09,020.00
Net profit			80,195.00

IV. The Central zone

The central zone of Kerala consists of the districts of Ernakulam, Thrissur and Palakkad. The Pokkali area of Ernakulam district, Kole areas of Thrissur district and Attappadi areas are excluded from this zone. The zone is bounded on the east by Coimbatore district of Tamil Nadu and Idukki district of Kerala, on the west by Arabian Sea and on the south by Kottayam and Alappuzha districts. The zone lies between north latitudes 9°47'and 11°16' and between east longitudes 75°52' and 76°50'.

The zone can be basically classified into three natural physiographic divisions viz., the high land, the midland and the low land. The two samples for case study from this zone are from the midland division. The midland region has an undulating topography with hills and valleys. The central zone, being situated on the windward side of the Western Ghats generally receives heavy rainfall. More than 75% of the annual precipitation is received during the three months of June, July and August. Both Ernakulam and Thrissur districts have typical humid climate with heavy rainfall.

The temperature varies between 31.4°C and 21.1°C.

In Thrissur district coconut occupies the first place in area under the crop in the zone. In Ernakulam District, Rubber has the first place. The central zone also assumes horticultural importance by the coverage of large areas under pineapple and mango. Fruit trees form an integral part of the homesteads of the zone. During peak season, large quantities of pineapple, mango, jack, banana, etc., are marketed to other states.

1. Farm Profile – Farmer C1

Out of a total land holding of 3.30 acres, about 2.40 acres are cultivated. The major crop is rice, followed by pepper, yam, colocasia, banana, arecanut, ginger, turmeric, coconut and vegetables. Farmer C1 has been practicing organic farming since the last 15 years, after having done modern farming for 35 years prior to the changeover. He does not use any chemicals whatsoever. For rice cultivation, tractor and thresher are used.

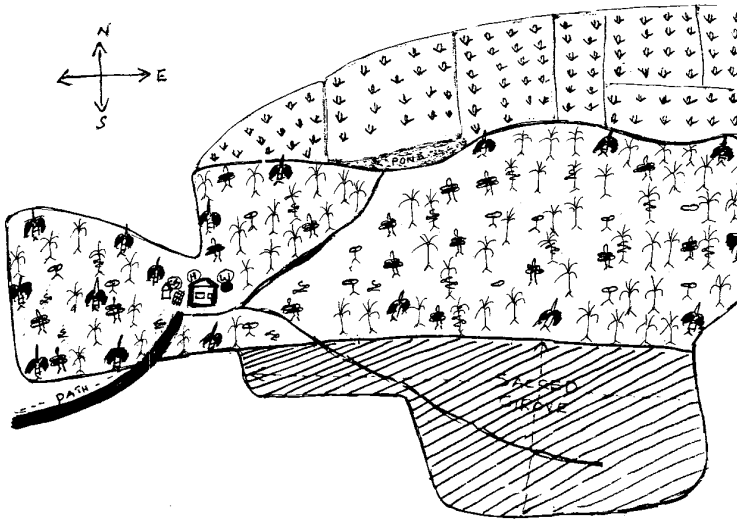
The land allocation for various crops is as follows:

Rice 1.25 acres

Homestead: 1.15 acres. All other crops mentioned above are grown in this homestead plot. Rice: The variety used is 'Chitteni'. Unlike the common practice of using 'Chitteni' for the Mundakan, Farmer C1 has used it for the 'Virippu'. This experiment is conducted only in 60 cents of the paddy fields. In another unconventional approach, he has planted legumes such as 'Muthira' (Dolichos biflorus) and 'Payar' (Vigna catjang) along with the paddy. This, in fact, is not for harvesting but aimed at increasing the Nitrogen fixation in the paddy field. After the legumes have achieved some growth, the fields are flooded and they decay to enrich the soil. In the rest of the paddy fields, he planted the legumes alone. During subsequent visit in July, it was observed that due to untimely rains the legumes were entirely lost. However, it has served the purpose of increasing the fertility of the land. After harvest in August -September, 'Chitteni' will be sown as the Mundakan crop. Only shallow ploughing is done in the paddy fields. Cowdung is the only manure used for paddy cultivation.

The soil is laterite in this area. The land has a gentle slope, but due to the density of plants, water retention seems to be very good. Arecanut is a major crop in the Thalappilly taluk. In Farmer C1's plot, there are about 500 areca palms. In 1998, they yielded nearly 1,00,000 nuts, which were sold for Rs.54, 000/-. The cost of production amounted to only Rs.600/

-which was incurred for labour to pull down the last nuts from the palm. Generally the nuts are allowed to fall by themselves. The neighbouring farmers had received more or less the same yield but their labour cost was very high. The entire manure requirement is met from within the farm. Farmyard manure and agricultural wastes form fertilisers. Colerago (Mahali) sometimes affect the areca, to prevent which which Bordeaux mixture is applied. There are 40 coconut palms in the plot which yielded 2,500 nuts last year. The palms are of local variety. The other crops used for consumption are grown only in a small scale.



Farm Income Analysis – Ashtamurti Nambuthiri (Code C.1)

Study period	Jan 1999 – Dec 1999
Agro-climatic zone	Central
Area under study	3.03 acres
Main crops	Areca, coconut, paddy, plantain, colocasia

Labour input

Paddy cultivation

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Bund preparation		970.00
Tilling	Mechanised	700.00
sowing		95.00
De-weeding & transplanting	f- 17 x 80	1360.00
Harvesting	F – 13 x 80 + 40	1080.00
Total		4205.00

Note: i. The wages for harvesting is given in cash alone. Winnowing is included in harvesting expenses. Threshing is by the Mechanical Thresher.

Homestead plot

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Mulching agricultural waste	2 x 120	240.00
Harvesting - ginger & turmeric	1 x 120	120.00
- do - coconut	Varying rate	280.00
-do- pepper	2.5 x 120	300.00
Total		940.00

Crop input

Cost of horse gram and pea seed = 16 kg value Rs.230.00
Total expenses = Rs 5,375.00

Livestock

Type: cow
The one cow and calf owned at the beginning of the study period died after two months. Another cow and calf were bought soon afterwards.
Cost of cow & calf – Rs 9,000
Cost of maintenance – Rs.12,000 (cattle feed)
Yield of milk – 2555 ltrs.
Milk sold to the Society – 300 ltrs. – Rs 3,000.00
Milk solids and products (valued at the rate of milk) - 1855 ltrs. – Rs 25,000
Own consumption – 400 ltrs. @13.50 – 5,400.00
Total = Rs.33,400/-
Value of cow dung has not been taken into account.

Harvest output

Item	Quantity produced	Value in Rs.
Paddy	360 kg	2340.00
Coconut	2944 nos.	14720.00
Pepper	17 kg (not sold)	3825.00
Turmeric	20 kg	300.00
Arecanut	Contract	63000.00

Colocasia	100 kg	700.00
Plantain	1100 kg	5500.00
Ginger	25 kg	625.00
Elephant foot Yam	20 kg	140.00
Total		91150.00

Note: 1. Pepper has not been sold yet. It has been valued at current prices.
2. Besides the above, several vegetables are grown in the homestead. No purchase from outside.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	5,145.00	Harvest	91,150.00	
Seed	230.00			
Cattle	21,000.00		33,400.00	
Total	26,375.00		1,24,550.00	
Net profit				93,030.00

2. Farm Profile – Farmer C2

The total land holding is about 3.80 acres. Areawise, the largest crop is coconut, followed by nutmeg, banana, arecanut, paddy, vegetables, tubers, yam, colocasia, pepper, mango and jack.

Coconut

Due to several diseases that have swept the coconut groves in the country, all the 180 odd palms in the plot have been affected. Now only 20 of them give nominal yield. Farmer C2 had been doing conventional farming since 1967 - 70. Since the last 11 years, no apparent care has been given to the palms. The palms enjoy part of the irrigation that is given to nutmeg. De-weeding around the shallow basin of the palms is done by hand or with sickle. Green manure, bonemeal, poultry excreta, cow dung etc. are used.

Arecanut

There are 150 arecanuts in the area. Just 15 of them have reached yielding stage. The rest are saplings. There is no special manuring done for the areca. But, being in mixed crop plantation, it might be sharing the manurial benefits of others.

Nutmeg

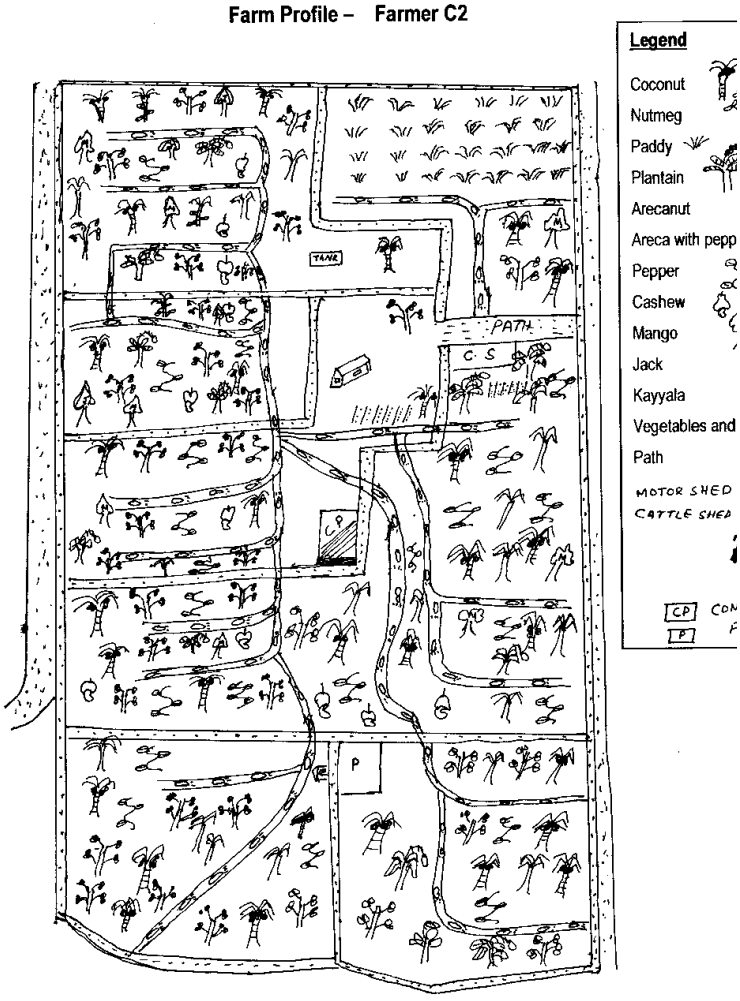
Nutmeg was planted as the main intercrop for coconut which used to be the numero uno crop here. Now, Nutmeg has surpassed coconut as the main source of income for Farmer C2.

There are about 100 trees including saplings of which 55 give yield. Among them only 5 are 15 years old. In another 7-10 years, most of the trees would start yielding. As the trees age, foliage would increase, resulting in increasing production of fruits. Mango trees are also planted as companion tree. They have a symbiotic relationship and mutually help to grow. Watering is done esp. during summer. Trees bear fruit by January- February. Harvesting is over by October -November. The peak of the harvesting season is June-July. Thrice a year, de-weeding is done at the base of the Nutmeg tree. Weeds are scraped off. Detailed account of tree care and returns from Nutmeg has been collected.

Cashew

There are 15 trees which give yield. There are no maintenance costs or any other expenses for the cashew. According to the farmer, he has sold nuts for Rs.8, 000/- in the summer of 1999.

Farm Profile – Farmer C2



Banana
Banana (Nentran), plantains like Palayamkodan, Padatti, madathipoovan, Njalipoovan, etc., are grown here. Compost and leftover manure are given to the plants. The family consumes the entire produce. The family eats rice only once a day and at all other times bananas are eaten.

Green chillies
Chillies earned the farmer Rs.500/- during the first half of this year. Other than Chillies, many vegetables, different tubers, yam, ginger, turmeric etc. are also grown here. Compost, bonemeal, wood ash, etc. are the main fertilisers.

Except for the mishap to the coconuts, this is a self-sufficient organic farm. One of the important factors that help such farms and families sustain is their lack of dependence on external agencies for survival. Most of the food requirements are met by themselves; the entire family take part in the agricultural operations and care of the farm; all the wastes are recycled within the unit - in fact, it cannot be called waste.
Farmer C2 is a former Engineer who came to organic farming through naturopathy. A firm believer in vegetarianism and nature cure, he relinquished his job to turn into a full time organic farmer.

Farm Income Analysis – Farmer C2

Study period	Jan 1999 – Dec 2000
Agro-climatic zone	Central
Area under study	3.90 acres
Main crops	Nutmeg, coconut, cashew nut , Paddy, Plantain

Labour input

Paddy

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Bund repair	M - 3 x 150/-	450.00
Tilling	Mechanized	550.00
Sowing		25.00
Transplanting	F – 15 x 60	900.00
De-weeding	F- 2 x 60	120.00
Manuring	Varying rate	100.00
Harvesting		880.00
Total		3025.00

Homestead plot

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Harvesting – coconut	Varying rate	1855.00
Harvesting - pepper	M 3 x 135/ -	405.00
Weed control & mulching	M – varying rates F- -do -	3140.00 3425.00
Manuring	M – varying rates F - -do -	1925.00 2465.00
Planting –Pepper & Areca nut	M – varying rates F- 4 x 60/-	755.00 240.00
Irrigation	M - 4 x 135	540.00
Total		14750.00

Total labour input = Rs. 17, 775.00

Manure input

Period	Type of manure	Quantity	Cost (Rs.)
May 1999	Bone meal	275 kg	2000.00
May 1999	Cow dung	200 barrels	2000.00
June 1999	Poultry waste	1 auto load	250.00
July 1999	-do -	2 auto load	500.00
August 1999	Bone meal waste	100 kg	300.00
Sept. 1999	Rice husk ash	1 mini truck load	700.00
Sept. 1999	Poultry waste	3 auto load	650.00
Do -	Bone meal	360 kg	2500.00
Total			8900.00

Harvest output

Item	Quantity Produced	Value in Rs.
Coconut	2464 kg 1250 nos. (Own consumption)	27733.00 6250.00
Pepper	25 kg (not sold)	5625.00

Nutmeg	Varying rates	29323.00
Areca nut	Flat rate	800.00
Cashew nut	66 kg	2662.00
Plantain	1550 kg	6200.00
Ginger	30kg @ 18/-	540.00
Turmeric dried	25 kg @ 33/-	825.00
Elephant foot yam	100 kg @ 6/-	600.00
Green chilli	31 kg varying rate	950.00
Colocasia	35 kg @ 8/-	280.00
Diascoria	100 kg @ 7/ -	700.00
Papaya	120 kg x @5/-	600.00
Vegetables	330 kg x 5/-	1650.00
Mango	250 kg @ 10/-	2500.00
Paddy	720 kg	4680.00
Total		91918.00

Livestock

Has one cow and a goat; both do not yield milk. Their feed requirements are met form the farm. The dung is used as manure for the crops.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	17,775.00	Harvest	91,918.00	
Manure	8,900.00			
Total	26,675.00		91,918.00	
Net profit				65,243.00

V. North zone

The northern zone consists of the four northern districts of Kerala State viz., Malappuram, Kozhikode, Kannur and Kasargod. It is a long strip of land located between 10°30'and 12°48' north latitudes and 74°52'and 76°30' east longitudes. It is sandwiched between the Western Ghats in the east and the Arabian Sea in the west.

The land is singularly diversified in its physical features. Undulating form the Western

Ghats, it has a series of hills and valleys intersected by rivers and streams. Numerous small lakes and backwaters are also seen in the narrow coastal belt. This zone is divided into four natural divisions; viz., the low lands, the midlands, the highlands and the high ranges on the basis of its altitude. The low land is almost level in its topography and has extensive paddy fields and thick groves of coconut. The highland lies mainly on the western slope of the Western Ghats with its upper reaches occupied by forests and lower sides by plantation crops like rubber. In between the above two lies the midland which occupies the larger area of the zone. Agriculturally, this tract assumes much importance as crops like coconut, arecanut, cashew, pepper, cassava, rubber, etc. are extensively grown on the slopes of hills and rice in the valleys.

Climate and rainfall

The zone enjoys a tropical climate. Though the zone has the highest rainfall in the State, the prolonged dry spell due to weak or absence of northeast monsoon adversely affects the growth of perennial crops. The mean annual rainfall of the zone is 3378 mm with minimum rainfall of 2800 mm in the south-eastern parts of Malappuram and 4000 mm maximum in the high ranges of Kozhikode and Kannur districts. The mean maximum and minimum temperature are 33^{o}C and 24^{o}C respectively. The entire zone is highly humid throughout the year.

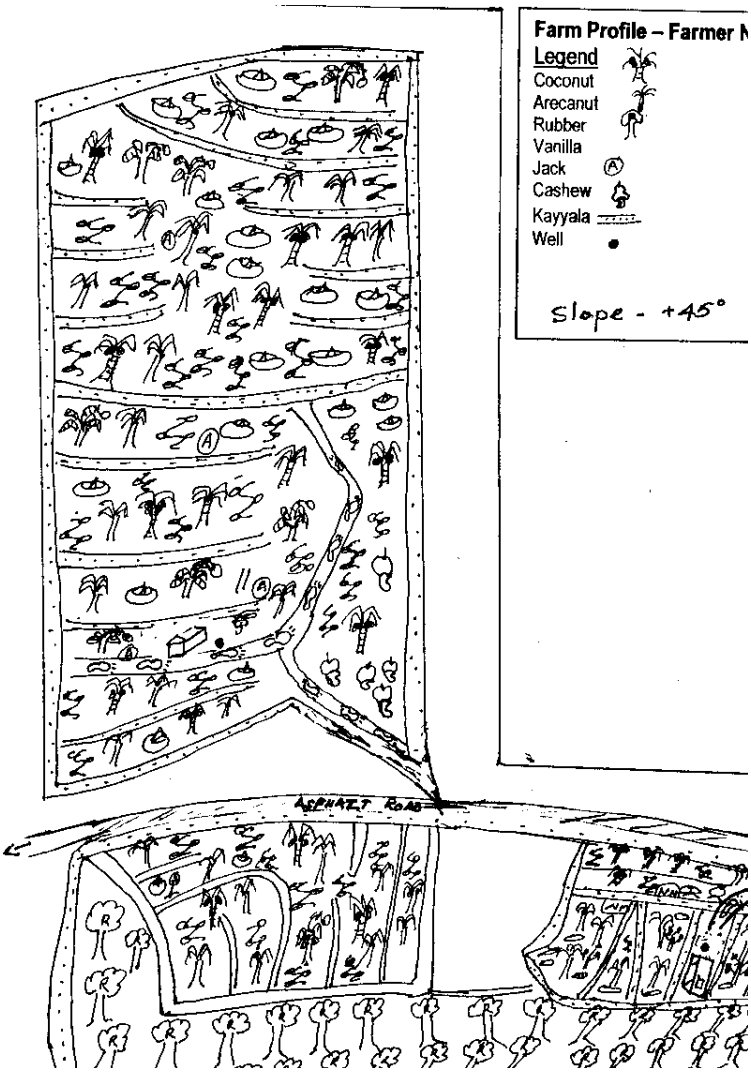
Kannur district has the highest representations of organic farmers in the state. However, most of them are in a transitory stage and could not be selected for our purpose. A concentration of organic farming practitioners was found in the Alacode-Therthalli area of the Taliparamba Taluk in Kannur district. From here, the organic farmer selected for detailed case study is Farmer N1. We were able to locate a good number of committed organic farmers in the Neeleswaram Block, Hosdurg Taluk of the Kasaragod district. The farmer selected from this area is Farmer N2.

i. Farm Profile – Farmer N1

Farmer N1is a typical example of the emigrant farmer in these areas. His forefathers migrated from the Kottayam, Alappuzha districts in the 50s and 60s and wrested sizable pieces of forestlands and converted them to arable farms.

Farmer N1has a total land holding of 23 acres, which is on a hill slope, with laterite soil. The major crops are coconut, arecanut, rubber, pepper, vanilla, plantain, yam, kacholam (Kaempferia galanga), ginger, turmeric, and cassava.

The soil is left mostly undisturbed. Since the last 8 years, soil has been left unturned. However, due to the prolonged drought period and shortage of material for mulching, the base of coconut palms has been cleared and soil is drawn and patted up. Water retention method is as follows: Pits are dug among every 4 palms and upturned husks are spread in them. The land has been terraced to slow down the water run-off. Weeding is generally not done except around the vanilla cultivation.


Farm Profile – Farmer
Legend
Coconut
Arecanut
Rubber
Vanilla
Jack
Cashew
Kayyala
Well
Slope - +45°

Rubber
Rubber is grown in 6 acres. There are 1200 trees. During the time of replanting chemical fertilisers were used sparingly. For the last 10 years, no chemicals have been used. Cowdung is the main fertiliser used for rubber. (Farmer N 6 cows.) . Cowdung is often bought from outside agencies. The yield is about 20 kg. of sheet per day, 600 kg. per month. The total yield is about 35-40 Qtl. sheets. Manure (cowdung), which is bought from outside, costs Rs12,000 @Rs12 per tin. 2 bacteria kits, costing Rs.450/- per kit, have also been bought.

Coconut
A mixture of crops is grown in 17 acres. This kind of mixed cropping is typical of homestead farms in the State. coconut, areca nut, pepper, yam, colocasia, plantain, kacholam, different tubers like cassava, papaya, vanilla and guava, vegetables etc., are grown here. There are other trees such as mango, jack, gooseberry, tamarind, teak, manjium, rosewood etc., in the same plot.

About 500 palms yield nuts, ranging from 50 to 125 nuts per palm. The nuts are dried and sold as copra. In the last year, 65 Qtls of copra was sold @Rs.33/- per qtl.

Pepper
There are 500 pepper vines of which only 300 have fruited. In the last season, 500 kg. of dried pepper was sold. This year the farmer expects 200-300kg.more yield.

Farmer N1 claims that he could save about 70% of labour costs after switching over to organic farming.

Management of a large area of 25 acres and the prolonged drought period have created certain problems. The soil is in a developing stage. Many crops have not started to yield fully. Even though the area is large, the emphasis is on cash crops, rather than food crops, which is not in accordance with the organic farming philosophy. Yet, the farm is definitely on the path of organic agriculture and in another few years would develop into an ideal example of successful organic farming.

As mentioned earlier, there is an enthusiastic group of organic farmers in this locality. They have formed an association, 'Grama' to exchange and propagate organic farming ideas. We believe that a healthy dialogue with these progressive organic farmers, giving them the right input and guiding them through the issue of organic farming would definitely give positive results in the near future.

Farm Income Analysis – Farmer N1

Study period	April 1999 – March 2000
Agro-climatic zone	North
Area under study	23.00 acres
Main crops	Rubber, Areca nut , coconut, pepper, cashew nut, plantain

Labour input

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Harvesting – coconut	Varying rate	4000.00
-do- areca nut		3700.00
Shelling & cleaning areca nut		3500.00
Harvesting - pepper		8355.00
- do- Cashew nut		1500.00
Land & Nursery preparation and other operations		18500.00
Planting seedlings, shade control & supporting trees for pepper		2000.00
Manuring&shade control		14500.00
De-weeding & ground clearing : Campferia, pepper vine support		9900.00
Ground clearing for coconut & areca nut, support for pepper vine		7900.00
Support for pepper vine & protection from heat		8125.00
Weed control - Coconut & Rubber		2540.00
Lime application for areca nut		1100.00
Copra		2000.00
Rubber tapping		22775.00
Rubber processing		2000.00
Total		112395.00

Manure input

Period	Type of manure	quantity	Cost (Rs.)
May 1999	Cow dung	850 barrels	10200.00
May 1999	Phosphorous Nitrogen bacteria kit	NA	900.00
Total			11100.00

Harvest output

Item	Quantity produced	Value in Rs.
Coconut	32500 nos.	188500.00
Pepper	650 kg (not sold)	14950.00
Rubber	4500 kg	135000.00
Scrap	700 kg	14000.00
areca nut	1200 kg (not sold)	120000.00
Cashew nut	300 kg	13000.00
Plantain	3000 kg	19500.00
Diascoria	200 kg	1400.00
Colocasia	100 kg	800.00
Elephant foot yam	300 kg	2100.00
Pine apple	100 kg	10000.00
Honey	60 kg (not sold)	6000.00
Total		525250.00

Note:

(a) The yield is mainly from an area of 5-6 acres. Crops in the rest of the area have not yet fully reached the harvesting level.

(b) There are several other crops such as ginger, turmeric, yams, mango, cassava, jack and vegetables which are grown in small scale and are used only for own consumption. These items have not been valued.

(c) Most of the crops are yet to be fully developed. Only 50% of the coconuts and areca nuts and pepper have started to yield.

(d) Campferia and vanilla are major crops but yet to start yielding.

(e) Items not sold are shown at current prices. The farmer has stocked up the crops to sell later at better prices.

(f) Products are generally bought by traders at the farm itself, thus transportation cost is minimal.

Livestock

Type: Cow. Nos. – 6

1. All feed requirements are met from the farm.
2. Average yield of milk is 4 ltrs. /per day valued at Rs.14, 600/- for a year.
3. However, it is not sold but used for own consumption and that of the farm labourers.
4. During the study period no other expenses has been incurred for the maintenance of the milch cows; the care of the animals is done by the labourers in the farm as part of their general labour.

5. The cow dung is used as manure for the crops and is of substantial worth. The quantity and cost price are not available.
6. Income from livestock is not taken into account.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	1,12,395.00	Harvest	5,25,250.00	
Manure	11,100.00			
Total	1,23,495.00		5,25,250.00	
Net profit				4,01,755.00

ii. Farm Profile – Farmer N2

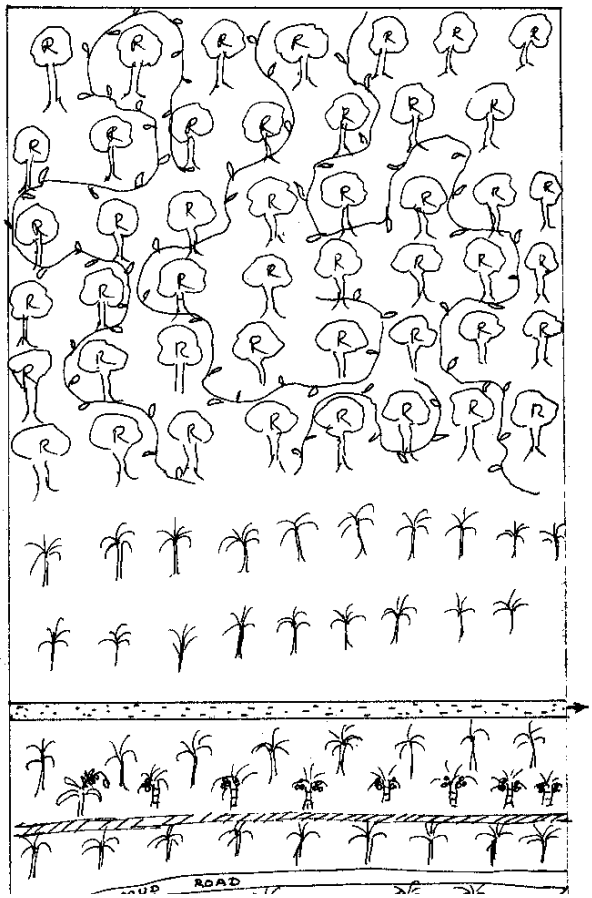
The total cultivable land holding is 5.50 acres, in which the major crops are coconut - 2.75, rubber - 2.00, and arecanut - 0.75 acres. All are mono-crops, except that recently the farmer has started to plant vegetables in the coconut grove.

Rubber
There are about 300 trees in the plot.105, GT-1, 253 are the breeds. Legume is grown as groundcover. Not even organic fertilisers are used here. Tapping is done on alternate days. The yield is about 10 -12 Qtls. This is definitely not less than the yield from a plantation which uses chemical fertilisers and pesticides; in addition, the extra costs of such inputs are also saved, thus reducing the production cost.

Arecanut
About 500 areca palms are planted very closely in the plot. All are the Mangala variety. There are no other crops amidst the palms. Sunlight does not reach the ground because of the closed canopy of the palms. The fern, *Nephrolepis* and *Pepromia pellucida* covers the ground like a carpet. The temperature is noticeably low and it is possible that a microclimate exists in the grove. The palms are watered using sprinklers. Soil is not raked or disturbed except when planting. Bonemeal and ash are being used as fertiliser for the last couple of years. The husks of the areca nuts are spread at the base of the palms. The palms have been fruiting since 3 years. In the first season the yield was about 15 Qtls, but in the last 2 years the yield has fallen to 5 Qtls. But this is common to the entire locality. Climatic changes and diseases have been cited as the reasons for low production. Bordeaux mix is used for the 'Mahali' disease.

Coconut
There are 200 palms of the 'Kuttiadi' variety in the 2.75 acres of land. Only about 50% of them are watered. Undergrowth is not cleared. The husk and other waste parts of the palms are left to mulch. Inedible legume is grown in about .75 acres. In addition to Bonemeal, each palm is given 2 kg. of salt. The yield is 90 nuts on an average. Fruit trees are planted in the grove. sitaphal, mangostein, gooseberry, butterfruit, mango, jack, guava, etc. are some of them.

Farm Profile - Farmer N2



Legen

Rubbe

Cover

Cocon

Planta

Pineap

Jack

Vegeta

House

Tank

Bund (

Note:-

plantati

Arecan

and oth

coconut

wild pla

naturall

Colocasia, yam, and other vegetables are grown for consumption only. Pineapple is grown aplenty. Farmer N2 gets about 100 -150 pineapples a year. There are several varieties of plantain such as Njali poovan, Mysore poovan, Kannan, Penang, Kali, Chundillakannan, Chengadali, etc. the farmer gets about 75-100 bunches (Kula) a year, with 8-10 kg. average weight. Pineapples and bananas are sold in the market. Medicinal plants are also planted in the area.

The land is still in a developing stage. Humus is building up on the soil. The abundant greenery is a visual treat. The high diversity, organic nature and apparent viability of the farm as well as the background of Farmer N2 make this an ideal sample for detailed case study.

Farm Income Analysis – Farmer N2

Study period	April 1999 – March 2000
Agro-climatic zone	North
Area under study	5.50 acres
Main crops	Rubber, Areca nut , coconut, plantain, pine apple

Labour input

Rubber cultivation

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Rubber tapping	86 x 90/-	7740.00
Rubber processing		575.00
Platform clearing	F- 7 x 25	525.00
Total		8840.00

Other labour

Particulars	Rate (Man-days x wage in Rs)	Amount (Rs.)
Harvesting – coconut	Varying rate	5800.00
-do- areca nut		5639.00
Shelling & cleaning areca nut	M – 45 x 120	5400.00
Manuring & mulching	M – 2 x 120 45 ½ x 75	240.00 3415.00
Application of Bordeaux mix		1500.00
Total		21994.00

Manure input

Period	Type of manure	quantity	Cost (Rs.)
Oct 1999	Wood ash & tea waste		1700.00
Dec -1999	Cow dung		4000.00
	Bone meal	600 kg	3000.00
Jan 2000	Sal	650 kg	700.00
Total			9400.00

Harvest output

Item	Quantity production	Value in Rs.
Coconut	19000 nos.	101880.00
Rubber	1104 kg	32304.00
Scrap	180 kg	3960.00
areca nut	1350 kg	141750.00
Plantain	1000 kg	5000.00
Turmeric	15 kg	465.00
Ginger	4 kg	72.00
Papaya	100 kg	500.00
Other vegetables	300 kg (av/price 6/-per kg)	1800.00
Pine apple	195 kg	1950.00
Total	289681.00	

2. Note: The yield in rubber is low this year. The no. of tapping days were only 85 due to the inclement weather, compared to 115 days the previous year.

Net income from farm

Expenditure	Amount	Income	Amount	
Labour	30,834.00	Harvest	2,89,681.00	
Manure	9,400.00			
Total	40,234.00		2,01,058.00	
Net profit				1,50,041.00

Appendix 2.

A list of some studies conducted in Kerala together with a note on each paper/article is given below. The studies pertain to related aspects of organic farming.

1. Abraham Varughese and P. Sushama Kumari (1990) Rice ecosystem in the sandy soils of Onattukara as influenced by organic manures and inorganic fertilisers. - *Proc. Nat.Symp. Rice in Wetland Ecosystem. December 1990, Kottayam* . Results of the Permanent Manurial trials at the KAU Rice Research Station at Kayamkulam show that organic manure is essential for rice production in Onattukara tract. Cattle manure acts as a buffer and helps to maintain soil pH. The water holding capacity, percentage pore space and absolute specific gravity are increased by cattle manure.

2. Ahamed P and Ramesan K K (1997) Farmers' characterisation of preferred rice cultivars - a group participatory analysis. *Proc.IX Kerala Science Congress, January 1997, Thiruvananthapuram pp 189-90*. Shows the preferences of attributes of rice seeds of the rice farmers of the small production system. Stability of yield, grain quality, good taste, high protein content, quick cooking quality, low input and cultivation cost, adaptability to less intensive management, adaptability to inferior fertile soil, etc., were the higher ranked preferences of the farmers. Interestingly, these qualities are inherent in the indigenous varieties rather than the HYVs.

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

4. Bridgit T K, Neelakantan Potti N and Kamalam Joseph (1991) Direct effect of weedicide chemicals on yield process of rice. *Proc.III.Ker.Sc.Con. March 1991 Kozhikode Pp.61 -62*. Certain chemicals depressed the yield. The study shows that recommending chemical weedicides for controlling weeds based on their weed killing property is not scientific and correct as it has got specific effect on plant. Judicious experimentation of these chemicals is essential before recommending them in order to ensure that they do not have a toxic effect.

5. Darley Jose and Shanmugaratnam N (1993). A conceptual overview of resource use

systems with special reference to the agricultural production system of Kerala. *Proc. V.Kerala Sc. Con. January 1993. Kottayam. Pp.5-9*. Given the complexity of our ecosystem any attempt to manipulate natural resources must take into account the entire systems or run the risk of breakdown in the not-so-long-run.

6. Elsamma Job, Balakrishnan Asan R and Prakash R (1991) Cost benefit analysis of rice cultivation in Kerala. *Proc.III Ker.Sc.Con.Kozhikode pp 90.91*. Cost and returns and factors affecting yield of rice crop were analysed. Cost of cultivation of local varieties was found to be less than that of HYVs. Due to the higher yield, the HYVs were found to be profitable. The benefit: cost ratio for local varieties and HYVs were found to be 1.28 and 1.31 for the Virippu season and 1.31 and 1.42 for the Mundakan respectively. The method of cultivation, details on the application of fertilisers and chemicals etc., for local varieties and HYVs in comparison are not available in the paper.

7. Geethakutty P S (1994) Alternative Fertiliser use behaviour of rice farmers in Thrissur district. *Proc. VI Ker.Sc.Con. January 1994, Thiruvananthapuram pp 212*. The study was conducted to identify the alternatives to chemical fertilisers by the rice farmers to overcome the recent price hike of chemical fertilisers and also to compare the constraints in the use of fertilisers before and after the price hike. The choices were: apply more organic manures and reduce the quantity of chemical fertilisers(97.5%) grow green manure crops during the third crop season (49.58%) skip application of K fertilisers (30.42%) ranked high among them. Majority of the farmers had adapted themselves to the situation by increasing the use of organic manures and reducing the quantity of chemical fertilisers to the extent possible. This projects the need for self-reliance on the part of farmers as in the past, when they were utilising cattle manure, green leaf manure, FYM, ash, etc. from their homestead as the nutrients for their crops without wasting them.

8. Gopimony R, Thomas Verghese, Kamalam N and Balakrishanan Asan (1996). Early impacts of organic farming on crop productivity. *Proc. VIII Ker. Sc. Con. January 1996, Kochi pp 135-136.* The comparative yields of bhindi vegetable in different organic plots with that of conventional plots were studied. The results showed that, even though the yield in the first season was only $1/7^{th}$ of that of conventional plot, in the subsequent years the yield increased and it is expected that yield equalisation can be achieved within 5-6 years.

9. Happy Mathew K and Achuthan Nair M. (1996) Sustainability of Homestead Farming system in Kerala based on Benefit: Cost analysis - a case study. *Proc.VIII Kerala Science Congress January 1996, Kochi pp194-196.* Results of an investigation on the sustainability of homestead farming system in the southern zone of Kerala, for a period of one year are discussed. The benefit: cost ratio of the farming activities, as a whole was 1.6. The family could meet all their needs from the homestead itself, by consumption of the produce and the money obtained from the sale of surplus farm produces, making the system a sustainable one.

10. Joseph K J, Radhakrishnan V and Rajendran D V (1990) Extent of resource use and economics of rice cultivation in Kuttanad, Kerala. *Proc. Nat.Sym. Rice in Wetland Ecosystem December 1990, Kottayam.* A cost-benefit analysis and extent of resource use in the rice cultivation of three selected areas in Kuttanad. The data collected was for one season, the *Puncha* crop of 1980-'81.

11. KAU Annual Report, -1992-93:

- Experiments on the suitability of cowpea and sunhemp as *in situ* sources of green manure for semi-dry rice indicated that growing cowpea as an intercrop can increase the grain yield of rice to the tune of about 500- 700 kg/ha and it was attributed to effective suppression of weeds and the addition of10-14 t/ha. of green manure.

- Results of the permanent manurial trials indicated that the productivity of dwarf indica genotypes could be sustained in the monoculture system through the application of large quantities of organic manures substituting 50% of the total N requirements. Application of organic and inorganic manures in the ratio 1:1 in rice resulted in increased seed viability. The organic component in the manurial schedule of rice should be enhanced two-fold from the present level of recommendation.

- Results from the permanent manurial experiments in rice indicated that continuous application of cattle manure alone is the best manurial practice for higher yield in tall indica genotypes than the combined application of cattle manure and fertilisers.

- Continuous application of cattle manure @ 36t/ha /yr. improved the organic carbon and available P2O5 content of the rice soils.

12. Mirchandani, T.J. (Compiled.) - Investigations into methods and practices of farming in various states. 1971. *ICAR, New Delhi*. A survey on the farming methods and practices prevalent in Kerala of major crops like rice, sugarcane, cotton, groundnut and ginger. Examples of 'progressive farmers' who have adopted modern farming methods are also given. The dates of the survey could not be verified from the report. It can be assumed that the survey was conducted in the early sixties.

13. Mohammed P.K. 'Vithakkathe Koyyunnavar - *Mathrbhumi Daily 26.4.1994* - About organic vegetable growers in Thalakkulathur Panchayat, Edasseri, & Annasseri Kozhikode dist.

14. Mohandas K and Thomas EK (1998) Economics of rice production in Kuttanad. *Proc.X.Ker.Sc.Con. January 1998, Kozhikode pp346-348*. The study was conducted in 1992-93 in Kuttanad area to analyse the cost and returns and to examine the resource use efficiency. The study recommends adoption of Integrated Pest Management approach and to restrict excessive use of plant protection chemicals due to economic and ecological considerations.

15. Narayanan, P.K. 'Mannira Compost: Mikacha Jaivavalam'. (1992) *Article in Mathrbhumi Daily, 22.12.1992*. About the advantages of Vermi compost and practical directions for the manufacture of vermi-compost at home -level.

16. Naripatta, Radhakrishnan. 'Keralamallathavunna Keralam'. (1995).-*Article in Mathrbhumi Weekly 17-28, Sept.1995*. About the decreasing coconut cultivation in the state. In 1960-61, 5,01,000 ha area was under coconut cultivation, which in 1993-94 stands at 8,81,600 ha. However, Kerala's share in the national production has come down from 69.41% in 1960-61 to 45.22% in 1993-94. This is mainly due to decrease in productivity. Poor manuring, fragmentation of land, poor and undiversified marketing and utilisation.

17. *National Symposium on 'Rice in Wetland Ecosystem, Kottayam, 1990. Plenary Session.* The recommendations of the plenary session of the National Symposium on 'Rice in Wetland Ecosystem' held at Kottayam during December 19-21, 1990 include the following:

- The present tendency of depending on fertiliser nutrients which will only add to the soil mining process is to be discouraged;

- We should switch over to regenerative agriculture and to a well planned soil breeding programme for sustaining the soil fertility level;

- Organic manures should form a major ingredient in the manurial recommendation – there is a need for intensification of work in germplasm collection and conservation to prevent loss.

- The present research results in general and past experience in particular have emphasised that high input use technology to intensify agricultural production has not given appropriate solution. Therefore, the symposium recommends the formation of a research agenda to develop agricultural practices for efficient resource use - to evolving greater interaction and group action among the farmers in various rice farming systems.

18. Padmakumar K G, Anuradha Krishnan and R R Nair. (1990) Rice -fish farming system for wetlands: A case study with special reference to Kuttanad, Kerala *Proc. Nat.Sym. Rice in Wetland Ecosystem. December 1990, Kottayam 19.2.91*. A Study on the compatibility of fish farming in rice fields and to assess the viability of integrated rice farming system. Statement: "The rice fields of Kuttanad used to support and contribute substantially to inland fish production in the state. The tremendous decline in wild fish catch from these areas during the past two decades has been attributed to modern rice production practices involving extensive use of pesticides and farming rice in quick succession, leaving practically no wet fallow period. The findings reveal that a sequential system involving farming of rice and fish in rotation is a viable alternative as a sustainable method". It can be assumed that an organic environment would suit best for higher productivity.

19. Padmakumar K G, Anuradha Krishnan, et al, (1993) Production maximisation through integrated farming - A sustainable farming approach for low lands of Kerala. *The Third Indian Fisheries Forum Proceedings. 11-14 October 1993, Pantnagar. pp 49-52* Rice-fish farming as an alternative to sustainable agriculture in Kuttanad area.

20. Pathiyoor Gopinathan and Parameswaran M P (1990). Locally adapted and sustainable agriculture - concepts and constraints. *Proc.II Kerala Sc. Con. February 1990 Thiruvananthapuram pp13-15.* To sustain productivity and profitability per unit of land area, a strategic shift from that of the present input investment practice to that of input generation through a variety of organic re-cycling, in-situ water harvest and integrated pest control is considered vital.

21. Pillai K G and Kundu D K (1990) Integrated Nutrient Management for Sustainable Rice Farming in Wetland Ecosystem. *Nat.Sym. Rice in Wetland Ecosystem, December 1990, Kottayam*. The paper discusses the components of integrated nutrient management in wetland rice ecosystems that are generally deficient in plant nutrients. 'Nutrient deficiencies could be rectified through chemical fertilisers. However, the ultimate productivity of soil can be built up only with regular application of organic manures. The concept of integrated nutrient application is a broad one embracing considerations of the nutrient cycle between the soil, the crop and livestock, the question of balancing the fertiliser use giving due emphasis to emerging multi-nutrient deficiencies, organic recycling and conjunctive use of organic manures and mineral fertilisers, exploiting biological nitrogen fixation potential and by matching the nutrient supply, taking a holistic view of the cropping system and not merely that of single crop like rice alone in isolation. The beginning of the fertiliser era 50-60 years ago, paved the way for a rapid abandoning of the use of organic manures in a much shorter time than anticipated. If current agricultural practices continue on the existing model, the prospects of total elimination of organics is not far away and our soils in many regions would soon turn to deserts. The merits of organic manuring should be assessed more on physical and physico-chemical properties of the soil than on their immediate nutrient supplying capacity. The long-term effects of organic manures on soil productivity are more significant than the immediate results. Unlike high analysis chemical fertilisers, organic manures contain almost all the essential plant -nutrients, although in smaller amounts that are released and made available to crop slowly and gradually. The sustained use of organic manures thus not only meets the N requirements of rice crop but also most other nutritional requirements'.

22. Prakash R, Nair GT and Ajithkumar CE (1993). Strategies for increasing productivity of rice in Kerala. *Proc V Kerala Science Congress, January 1993, Kottayam pp.145-147.* Identifies the major production constraints of rice and suggesting solution in different agro-climatic regions of Kerala. Conversion of paddy land into high value upland crops, Drought and lack of irrigation, small sized and fragmented holding, low adoption of HYVs, low adoption of organic manure etc., were listed out as the major constraints.

23. Pushpa S and Prabhakumari P. (1997). Vermicompost as a potential organic source for Tomato. *Proc.IX Kerala Sc.Con.January 1997, Thiruvananthapuram pp 191-192.* One

of the many new via media approaches to organic farming and related concepts - the study showed that the use of vermi-compost along with inorganic fertilisers on experimental plots of Tomato gave significant increase in yield, size, number of fruits per plant and plant height. This finding is supportive of the Integrated Nutrient Management System.

24. Sevichan P J and Madhusoodanan P V (1991) *Proc.III Kerala Sc.Con. /Feb-Mar. 1991. Kozhikikode pp74*. Application of chemical fertilisers in crop field is expensive and poses deterioration of agro-ecosystems. Application of Nitrogen fixing micro-organisms can abate pollution and production cost. A specie of *Azolla* was found to be the best suited bio-fertiliser for low -land paddy.

25. Sreedharan, E.V. 'Nelvayalukal Nilavilikkunnu'. 1997. *Article in Kalakaumudi Weekly No.1145 24.8.1997*. About the recent incidents in Kuttanad area related to the conversion of paddy fields for other crops or non-cultivation activities. Explores the background of the issue and points out that the environmental problems of Kuttanad have as their main cause the absence of a proper land ethic of the people.

26. Sreenath N and Joseph Antony (1994). Kuttnadinte Kanneer. *Article in Kalakaumudi Weekly 17.7.1994*. About the ecological problems of Kuttanad and its effect on the social, cultural and economic aspects when massive scale of fungal infection and disease was observed in the freshwater fish of Kuttanad and resulted in the death of hundreds of ducks in 1993.

27. Visalakshi A (1990). Pesticide contamination of the environment in Kerala *Proc.II Ker.Sc. Con. February 1990, Thiruvananthapuram pp120-122.* Pesticide residues were found in all the samples of cereals, vegetables, pulses, milk and egg taken from the markets. The wide spread use of pesticides for combating the pest and disease problems in agriculture has resulted in the contamination of the environment leading to pollution of the harvested produce, soil, water, air and ultimately the human beings.

Articles on organic farming and allied subjects appear regularly in the vernacular newspapers and periodicals. The sheer magnitude of the literature points to one thing; that organic farming has to be accepted as a possible alternative for conventional farming. But the problem is that the agricultural researchers are yet not fully convinced of its merits. During the literature survey, the principal investigator had the opportunity to meet several agricultural scientists, who were very sympathetic to the cause of organic farming but remained sceptical as to its viability as an alternative.

References

Abrol I P. *Sustaining Indian Agriculture - the challenges*. In Viswani S M, Katyal J C, Abrol I P. (Eds.) Stressed Ecosystems and Sustainable Agriculture. Oxford & IBH, New Delhi. 1994.

Altieri, Miguel A. *Agroecology: The science of sustainable agriculture*. Westview Press, Colorado, USA. 1995.

Alvarez, Claude. (Ed.) *The Organic Farming Source Book*. The Other India Press, Goa. 1996.

Alvarez, Claude et al, (ed.) *The Organic Farming Reader*. OIP, Goa, India. 1999.

Balachandran.V. *A Preliminary Survey on the Status of Organic Farming in Kerala***.** Swadeshi Science Congress, Alappuzha, Kerala. 1998.

Balachandran.V. *Organic Farming in Kerala*. Workshop on Agriculture. KRPLLD, CDS, Trivandrum. 2002.

Balachandran.V. *Spreading the Good Word: Strategy for Knowledge Development for Organic Farming in Kerala*. Agrecol, Bonn, Germany. 2002.

Blake, Francis. *Organic farming and growing* .The Crowood Press, UK.1987.

Dahama, A.K. *Organic Farming for Sustainable Agriculture*. Agra Botanica, Bikaner, India.. 1999.

Dwivedi O. P. *India's Environmental Policies, Programmes and Stewardship*. Macmillan Press. Ltd. UK. 1997.

Edwards, Clive. A et al, (Ed.). *Sustainable Agricultural Systems*. Proceedings of the International Conference on Sustainable Agriculture, Ohio, USA, September 1988.Soil and Water Conservation Society. USA.1990.

Food and Agriculture Organisation of the United Nations (FAO): Organic agriculture, environment and food security, Environment and Natural Resources, FAO, Rome. 2002.

Fukuoka, Masanobu. *One Straw Revolution*. Friends Rural Centre, Rasulia. 1984.

Fukuoka, Masanobu. *The Natural Way of Farming. Bookventure*, Madras. 1985.

George, Nimi. Various articles in '*Karshakashree*'. Vol.2.No.12.August 1997.

Goldsmith E and Hildeyard E. (Eds.) *The Earth Report 2*. Mitchell Beazley, UK.

Group of Authors. *Karshika vignanam*. State Institute of Languages, Thiruvananthapuram, Kerala. 2002.

Gupta A.K, Patel N T, and Shah R N. *Review of post-graduate research in agriculture (1973-1984): are we building appropriate skills for tomorrow*? Centre for Management in Agriculture, IIM, Ahmedabad. 1989.

Hague T. *Sustainability of Small Holder Agriculture in India*. Concept Publishing Co. New Delhi.1996.

Harendar Raj, M.L.Bhardwaj and N.K.Sharma. *Need for Eco-friendly Farming*. Employment

News Weekly 16.2.1996.

Hiemstra, Wim, et al. (Ed.) *Let Farmers Judge*. ILEIA-Intermediate Technology Publications, London. 1992.

IFOAM - India. National Standards Committee of IFOAM India Members. *Concepts Principles and Basic Standards of Organic Agriculture*. IFOAM India & IIRD, Aurangabad. 1996.

Janardhanan Nair, M. *Report of the One Man Commission on the problems of Paddy cultivators in Kerala*. Govt. of Kerala. 1981.

Kerala Land Use Board, Govt.of Kerala. Kerala State resource based Perspective Plan 2020 AD. 1997.

Khanna, Sulabha. Sustainable agricultural development: a comparison between commercial and traditional agricultural systems. in Sustainable Development. Gupta NC and Gujrar R. K (Ed.) Vikas Publications, New Delhi. 1993.

Kiley-worthington, Martha. Eco-agriculture: Food First Farming. 1993.

Kotschi J, Bayer W, Becker T & Schrimpf B (eds.). AlterOrganic: local agenda for organic agriculture in rural development: Proc. International Workshop at Bonn-Konigswinter, 21-24 October 2002. Marburg Agrecol e. V. Germany. 2003.

Lampkin, Nicholas. Organic Farming in U K. Farming Press, London. pp. 1-4. 1990.

Leopold, Aldo. A Sandcounty Almanac and Sketches from Here and There. OUP, London. 1994.

Madhusoodanan.G. Article in Mathrbhumi Weekly 13-19.8.1995.

Mahajan V.S. Article in the The Hindu, Aug 8 2000.

Mahale, Prabha. Organic Agriculture in India. In: The Organic Standard, Issue 19, November 2002, Torfolk, Sweden. In *The World of Organic Agriculture- Statistics & Future Prospects. IFOAM, Germany.* 2002.

Mahapatra, Richard. 'Suicide by Pesticide'. Article in 'Down to Earth'Vol. 116. No.17. 1998.

Margasagayam N and Norman, T Selvin Jebraj. *A study on the impact of organic farming in Pudukkottai District in Tamil Nadu*.J.Hum.Ecol.8 (3): 171-173 (1997)

Mirchandani, T.J. (Compiled.) - *Investigations into methods and practices of farming in various states*. ICAR, New Delhi. 1971.

Mohammed P.K. '*Vithakkathe Koyyunnavar* - Mathrbhumi Daily 26.4.1994.

Mollison, Bill. *Permaculture*- A designer's Manual. Deccan Development Society. 1990.

Narayanan, P.K. '*Mannira Compost: Mikacha Jaivavalam*'. Article in Mathrbhumi Daily, 22.12.1992.

Naripatta, Radhakrishnan, '*Keralamallathavunna Keralam*'. -Article in Mathrbhumi Weekly 17-28, Sept.1995.

Oelhaf, Robert. C. *Organic agriculture*. Allanheld, Osmun &Co. Publishers, Inc. USA. 1978.

Palaniappan SP & Annadurai K. *Organic Farming: Theory & Practice*. Scientific Publishers (India), Jodhpur. 1999.

Pereira, Winin. *Asking the Earth*. Earthcare Books, Bombay. 1993.

Pillai. Kerala's economy: *Institute of Planning and Applied Economics Research*, John Mathai Foundation, Thrissur: 1994.

Poate, C.D. and Daplyn, P.F. *Data for Agrarian Development*. Cambridge University Press, UK. 1993.

Pretty J.N. *Regenerating Agriculture*. Earthscan Publications Ltd. London. 1995.

Rajendra Prasad. *Cropping systems and sustainability of agriculture*. Indian Farming. November 1996.

Reijntjes, C. et al. (ed.). Farmong for the future. © ETC/ILEIA, The Macmillan Press Ltd. London. 1992.

Singh G B and Dwivedi BS. *Integrated nutrient management for sustainability*. Indian Farming. November 1996.

Somani, L.L, Totawat K.L, and Baser B.L. (Ed.). *Proceedings on National Seminar on Natural Farming*. RAU, Rajasthan. 1992.

Sreedharan, E.V. *Nelvayalukal Nilavilikkunnu*. Article in Kalakaumudi Weekly No.1145 24.8.1997.

Sreenath N and Joseph Antony. *Kuttnadinte Kanneer*. Article in Kalakaumudi Weekly 17.7.1994.

Srivastava S P, and Dhar N R. *Organically produced crops better than inorganically produced crops*. Proc. Natn. Acad.Sci.India. Section A.1980, 50(1) 17-24. 1982.

Suryavanshi.S.D, Lohar N.S and Killedar N.S. '*An Economic appraisal of Vermiculture Farming in Western Maharashtra. - Agricultural Situation in India'* Feb1997. Vol. III No.11

Sujit Kumar, C K. *Krishimalayalam.* Samskrti Publications, Kannur, Kerala. 1999.

Swaminathan M.S. Presidential Address. In: Proceedings of the Fifty fifth Indian Science Congress. Part II. Varanasi. India. 1968.

Swaminathan M.S. *Sustainable Agriculture: Towards Food Security*. Konark Publishers P.Ltd. Delhi. 1996.

Third World Network. *Return to the Good Earth: damaging effects of modern agriculture and the case for ecological farming*. 1990.

Thomas P M. *Agricultural Performance in Kerala in Kerala's economic development: Issues & Problems*. Sage Publications India, New Delhi. 1999.

Upton, Martin. *The Economics of Tropical Farming Systems*. Cambridge University Press, UK. 1996.

Verghese, Wilson K. '*Nelkrishiyude Anthyashwasam*'. Article in Mathrbhumi Weekly 14-20 May 1995.

Werf, E.van der and A.de jager. Ecological agriculture in *South India: an Agro-economic Comparison and Study of Transition* Leusden/The Hague, ETC-Foundation/Agricultural Economics Research Institute (LEI_DLO), The Netherlands. 1992.

Yussefi, Minon & Mike Mitscke. Introduction. In *The World of Organic Agriculture- Statistics & Future Prospects. IFOAM, Germany.* 2003.