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Assessment of Economic and Ecological Returns from Millet-based Bio-diverse Organic Farms vis-à-vis Conventional Farms

B. Suresh Reddy

RULNR

RESEARCH UNIT FOR LIVELIHOODS AND NATURAL RESOURCES

(Supported by Jamsetji Tata Trust)

In collaboration with Research Partner

TIMBAKTU COLLECTIVE, ANANTAPUR

CENTRE FOR ECONOMIC AND SOCIAL STUDIES

Begumpet, Hyderabad-500016

January, 2010

CENTRE FOR ECONOMIC AND SOCIAL STUDIES MONOGRAPH SERIES

Number - 1 January, 2010
ISBN 81-88793-09-4

Series Editor : S. Galab

Rs. 200/-

Published by :
Centre for Economic and Social Studies
Begumpet, Hyderabad-500 016
Ph : 040-23402789, 23416780, Fax : 040-23406808
Email : postmaster@cess.ac.in, www.cess.ac.in

Printed by :
Vidya Graphics
1-8-724/33, Padma Colony,
Nallakunta, Hyderabad - 44

Foreword

The Centre for Economic and Social Studies (CESS) was established in 1980 to undertake research in the field of economic and social development in India. The Centre recognizes that a comprehensive study of economic and social development issues requires an interdisciplinary approach and tries to involve researchers from various disciplines. The centre's focus has been on policy relevant research through empirical investigation with sound methodology. In keeping with the interests of the faculty, CESS has made important contributions to social science research in several areas; viz., economic growth and equity, agriculture and livestock development, food security, poverty measurement, evaluation of poverty reduction programmes, environment, district planning, resettlement and rehabilitation, state finances, education, health and demography. It is important to recognize the need to reorient the priorities of research taking into account the contemporary and emerging problems. Social science research needs to respond to the challenges posed by the shifts in the development paradigms like economic reforms and globalization as well as emerging issues such as optimal use of environmental and natural resources, role of new technology and inclusive growth.

Dissemination of research findings to fellow researchers and policy thinkers is an important dimension of policy relevant research which directly or indirectly contributes to policy formulation and evaluation. CESS has published several books, journal articles, working papers and monographs over the years. The monographs are basically research studies and project reports done at the centre. They provide an opportunity for CESS faculty, visiting scholars and students to disseminate their research findings in an elaborate form.

The CESS has established the Research Unit for Livelihoods and Natural Resources (RULNR) in the year 2008 with financial support of Jamsetji Tata Trust. The core objectives of the RULNR are to conduct theoretical and applied research on policy relevant issues on human livelihoods and natural resource management, especially in areas related to river basins, forest and dryland ecosystems and to provide an effective platform for debates on policy relevant aspects for academicians, policy makers, civil society organizations and development practitioners. RULNR intends to adopt a multi-disciplinary approach drawing on various disciplines such as ecology, economics, social anthropology, political science.

This RULNR-CESS monograph titled "Assessment of Economic and Ecological Returns from Millet-based Bio-diverse Organic Farms vis-à-vis Conventional Farms" by B.Suresh Reddy is an attempt to look at the various issues related to organic farming, especially

from the farmers' perspective. The field work of the study was facilitated by TIMBAKTU collective, CK.Palli, Anantapur. In the 1960s, the Green revolution model of agriculture swept India. With its focus on high yielding seed varieties and high external inputs, it resulted in monocrops and the chemicalisation of agriculture. Much of the native agricultural biodiversity in irrigated zones was destroyed. The modern agriculture farming practices and irrational use of chemical inputs over the last four decades resulted in loss of natural habitat balance and soil health. The emphasis on new technology has diverted the attention of policy makers away from the benefits of fertilization of the soils through organic manure. Given the perceived failure of chemical inputs in making the land productive over a long period of time "organic farming" has been recently introduced in agricultural policies.

Public fear of the irreversible damage done to the environment by practices that lead to soil and water pollution, the depletion of natural resources and destruction of delicate eco-systems has led to calls for more responsible attitude towards our natural heritage. Against this back ground, organic farming has assumed immense significance in the present context, especially in the dryland areas. Literature reveals that there is a strong consensus on organic farming's eco-friendly nature and inherent ability to protect human health. Questions about the yield and financial viability of organic farming are crucial and there are no empirical studies available in the Indian context comparing the economic and ecological returns of organic farms vis-à-vis conventional farms.

The present study tries to fill this gap and brings out major issues relevant to organic farming. Farmers perception about various aspects organic farming are clearly brought out in this study. The study highlights the importance of marketing support for the organic farmers. It brings out the livelihood, economic and ecological benefits of organic farming. The huge benefits of agro-biodiversity are clearly spelt out in the study and emphasize the need to bring back millets into the farming system. This study also underlines the immense importance of livestock for the stability of dryland agriculture and in particular for organic farming. The neglect of livestock has resulted in the decrease of cattle population in many dryland areas and a reorientation of policies in that respect appears highly desirable.

This monograph provides valuable suggestions to policy makers from the analysis of empirical data and review of policies. I hope it would be useful to the research community, policy makers, development practitioners and all those interested in the growth of organic farming.

Manoj Panda
Director, CESS

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Acknowledgements

This study would not have been possible without the contribution and cooperation of many individuals. First of all I would like to thank the hundreds of farmers, especially the small and marginal farmers and women from socially disadvantaged sections for shaping my understanding and enlightening me about the issues related to agriculture and livestock and the interconnectedness of various elements. Agriculture graduates, research scientists and policy makers will be awestruck to know the rich, in-depth and more importantly, holistic knowledge and perspective of the farmers. It is high time that these voices from the grass roots are seriously heard and acted upon.

I would like to thank Prof. Manoj Panda, Director, CESS, for his support and encouragement during the study. I am highly indebted to Prof. V. Ratna Reddy, CESS, for his encouragement to work in the area of organic farming. Thanks are due to Prof. M. Gopinath Reddy, Principal Coordinator-RULNR, who was highly supportive of me at various stages of this research study. I would like to thank Dr. Jyothis Sathyapalan, Coordinator-Dryland eco-systems, who gave valuable guidance while carrying out this study. My friend Dr. Uma Reddy (Soil Scientist, ANGRAU) was quite helpful in analyzing the soil samples. I sincerely thank Prof. Sukhpal Singh, CMA, IIM, Ahmedabad for reviewing this report and giving valuable comments.

My special thanks to Sri P.V. Satheesh, Director, Deccan Development Society, Dr. Michel Pimbert (IIED, U.K.), Dr. Venkat (Permaculture Association of India), Dr. Carine Pionetti (Freelance Consultant, France)and K. Raghavendra Rao (Freelance Consultant). All these people have constantly enriched my understanding of issues related to agriculture for the past one and half decade. This has placed me in a better situation while I carried out this research study. My sincere gratitude and thanks are due to Dr.M.Snehalatha, Country co-ordinator,WASH Cost India for her strong support and encouragement during the study.

My heartfelt thanks are due to many people working with our research partner TIMBAKTU COLLECTIVE, Anantapur, for their prominent help in fecilitation of the data collection. First of all I would like to thank Sri Bablu Ganguly (Director) and Smt. Mary (Director) for accepting to partner with RULNR for this research study and extending all-round support. Coordinator Pushpa's help was immense while carrying out this study. The smooth conduct of this study could not have been possible without her committed support. I would like to thank Brahmesh, Sanayyappa and other field staff for their help during the study. Field investigators Adhi Narayana, Srilatha, Gangadhar, Ramesh, Nagamani, Devaraju, Narsimhlu, and Nagaraju deserve a special

mention for their meticulous data collection from the farmers. Sri Dinesh was quite helpful during the initial stages of this research. I would also like to thank the administrative staff, cook and other staff of TIMBAKTU who extended their support while conducting this study.

The Department of Agriculture has been quite helpful and has provided the required secondary data. My special thanks to Sri K. Jaya Dev, Assistant Director of Agriculture and Swarna Vijaya, Assistant Director of Agriculture, Organic Farming and Chandra Kala (Agriculture Officer). I want to place on record the efforts of Mr. Narender Reddy who has done an exceptional job in entering the data of this study. Mr. Laxman Rao has analysed the data and provided the results in a short time. Smt.Ramadevi has typed the study questionnaire in Telugu. Mrs.Rajakumari has done exceptional job in editing this report. I want to thank them all for their help.

I am indebted to Dr.Pragnya Paramita Mishra, my colleague at RULNR-CESS, for her constant encouragement and guidance during the whole research. I want to thank her for this valuable support. I thank my other colleagues, Dr.Jeena and Dr.Sreenivas Reddy for their help at various stages of this research. I also acknowledge the support of Sri Krishna Murthy - Finance Officer, RULNR, Kumari Devi-Office Secretary, Sridhar and Nagaraj. I would like to acknowledge the support extended by our library staff. Thanks are due to WASH Cost India project colleagues Murthy, Dr.Jaya kumar, Dr.Ram Mohan Rao, Dr.Venkat swamy, Anita, Arun and Raju. I would like to thank finance Officer, CESS and other Administrative Staff for their support during this research.

My special thanks are due to the CESS faculty Prof. Samba Murthy, Dr. Padmanabha Rao, Dr. Deepitha Chakraborthy, Dr. Alivelu, Dr. Pruthvikar Reddy and Dr. Anil Kumar for their valuable comments and suggestions during the RULNR-CESS working paper seminar on “Organic Farming: Status, Issues and Prospects – A Review”.

This study has been funded by Jamsetji Tata Trust, Mumbai. I gratefully acknowledge this support. Dr. Bhaskar Mitra, Programme Officer, SDTT, has given valuable suggestions for capturing the critical issues involved in organic farming. I thank him for his valuable inputs which played a key role in enriching the study.

I also want to thank PhD Research Scholars Vishaka and Brijraj, Visiting Fellows Itishree Patnaik and Arun, working at RULNR-CESS. I thank one and all who have extended support for this study.

B. Suresh Reddy

Executive Summary

Background of the study

Green Revolution (GR) technologies, supported by policies, and fuelled by agrochemicals, machinery and irrigation, are well known to have enhanced agricultural production and productivity. While these technologies greatly helped to address food security and food sovereignty needs, farmers using these technologies, have to depend on external inputs which constitute the major cost of production for small-holder farmers. The manufacture of fertilizers and pesticides, the two major inputs of GR technologies, needs fossil fuels and/or expensive energy, and is associated with serious environmental and health issues. Modern agriculture farming practices and irrational use of chemical inputs over the last four decades resulted in loss of natural habitat balance and loss of soil health. Local indigenous farm techniques are being wiped out and are replaced by modern techniques that have resulted unviable and unsustainable farm enterprise. It is in this context that alternative farm techniques and strategies for growing crops were explored. Owing to its merits, organic cultivation attracted attention of the world. In this context, a study was taken up in collaboration with an NGO TIMBAKTU Collective to understand the "Economic and Ecological returns from Organic Farms vis-à-vis Conventional Farms" in Anantapur District of Andhra Pradesh.

Objectives, Data and Methodology

The primary objective of the study has been to identify and record the organic farming practices followed by farmers. A second objective is to examine the economic, ecological, social and livelihood significance of organic farming practices and conventional farming. Understanding the marketing methods of TIMBAKTU in organic farming and contributing to overall policy discourse on organic farming for better micro-level interventions were other objectives of the study.

The study used both qualitative and quantitative methods for assessment of economic and ecological returns from millet-based bio-diverse organic farms vis-à-vis conventional

farms. It used both primary and secondary sources of data. Quantitative information was collected using a semi-structured questionnaire and qualitative information was collected through focused group discussions. The State of Andhra Pradesh was chosen for the study. Out of the 23 districts of Andhra Pradesh, Anantapur District having arid and semi-arid regions was selected for the study. The study was carried out in 8 villages covering C.K.Palli, Ramagiri and Roddam mandals of Anantapur District. From the total number of organic farmers(350) a sample of 75 organic farmers was selected from 8 villages using proportionate random technique. Correspondingly, a number of conventional farmers were selected using proportionate random sampling method representing similar dry land conditions except that of their organic farming practices. A thorough review of organic farming policies was conducted through a study of secondary sources. The analysis was basically done by comparing between the various size classes of large, medium and small farmers, and also by comparing between the organic and conventional farmers. The results of the study are discussed at two levels - at the household level and at the plot level.

Status of Organic Farming

Organic farming has no doubt emerged from Asian countries such as India and China, where agriculture has been the mainstay of the people, and farmers have nurtured and groomed this art over several centuries. Organic agriculture is developing rapidly and today at least 141 countries produce organic food commercially in 32.2 million hectares managed by 1.2 million producers. Among the countries involved in organic farming, about 65% are developing countries. Currently, India ranks 33rd in terms of total land under organic cultivation and 88th for the ratio of agricultural land under organic cultivation to the total farming area. The cultivated land under certification is around 2.8 million hectares (2007-08), which includes one million hectares under cultivation, while the rest is under forest area (wild collection). An estimated 69 million hectares, however, are traditionally cultivated without using chemical fertilizers and could be eligible for certification under the current practices, or with small modifications.

Major findings

Socio-Economic aspects of Sample Farmers

The socio-economic features, age group, literacy level, livestock population, market distance, farming experience, social participation, caste composition, landholding, net income and borrowings are some of the important issues discussed in this study. The study indicated that most of the organic farming sample farmers were in the age group of 35-44 (37 percent) years, followed by those in 45-54years (31 percent), whereas a majority of the conventional farmers were in the age group of 45-54years (36 percent),

followed by 35-44 years (28 percent). Post stratification of the sample households of organic farming revealed that the majority belonged to Backward Classes (63 percent), followed by Scheduled Castes (31 percent). Even among the sample households adopting conventional agriculture, the majority belonged to Backward Class (69%) communities, followed by others (15 percent) which mostly include OCs.

The size-class-wise distribution revealed that the majority were small farmers both in case of organic farming (60 percent) and conventional farming (45 percent). Among the organic farming sample households, only 8 percent belonged to large farmers. Among the total sample of conventional farmers, 52 percent were non-literate, followed by informal education (14.67 per cent) and I –V (13.34 per cent). Among organic farmers too, the situation was the same, with the majority (64 percent) being non-literates, followed by informal education (16 percent). Among size classes, in both organic and conventional farming, small farmers had higher social participation followed by medium and large farmers. The reason for this was their membership in institutions such as Self-Help Groups and occupational-related institutions.

Quantity and quality of livestock is the most crucial aspect influencing the soil fertility management practice of both conventional and organic farmers. Among the sample households of organic farmers, the majority (43.85 percent) are seen to have bullocks followed by cows (30.01 percent), buffaloes (11.00 percent), sheep (5.25 percent) and goats (9.89 percent). In case of organic farming sample HHs, the bullocks were slightly (3.58 percent) higher than conventional farmers. Agriculture + Agricultural labour are seen to be the main livelihood activities of both conventional farmers (44 percent) and organic farmers (48 percent). Agriculture along with agricultural labour is the main livelihood for small farmers both in organic farming and conventional farming.

The majority (52 percent) of the sample households adopting organic farming grow at least 5-6 types of crops in the lands owned by them. In conventional farming, the majority (52 percent) grow 3-4 crops. Only 1-2 crops are grown by 33.33 percent of the conventional farmers whereas it is only 2.67 percent in organic farming. Varietal diversity of 4-6 varieties is seen in the lands of the majority (77.33 percent) of the organic farmers, whereas in case of conventional farmers, the majority (56 percent) had a varietal diversity ranging between only 1-3.

Majority (63.21 percent) of the soils owned by conventional farmers are red soils, followed by 18.87 percent red sandy soils. Among organic farmers, 57.61 percent had redsoils followed by 35.87 percent sandy soils. Black soil was more with conventional farmers (10.38 percent) as compared to organic farmers (3.26 percent). There were small

proportions of saline soils among conventional farmers (4.72 percent) and organic farmers (2.18 percent). In conventional farming, among all size-classes, 40.56 percent was mixed cropping followed by monocropping (29.25 percent) and intercropping. Among the sample households of organic farming, 66.30 percent are following mixed cropping followed by strip cropping(15.22), monocropping (11.96 percent) and intercropping (6.52 percent). The reasons given by farmers for crop diversity include access to diverse and nutritive food to the family members, availability of different kinds of fodder to feed the livestock, improvement in soil fertility, and effective utilization of farmland and to make sure that under no conditions of unfavorable environment and climate, the whole crop is lost.

Crop rotation is another tried and tested practice being followed by farmers. The decision of rotating the crops has a huge bearing on soil fertility management. crop rotation is more (53.26 percent) in organic farming as compared with conventional farming, where crop rotation is followed in only 25.47 percent of the total sampled plots. A soil sample analysis was taken up to assess the impact of organic manures on soil fertility after shifting from conventional farming to organic farming. Organic carbon of conventional farming plots ranged from 0.16 to 0.63% whereas in organic farming plots, it ranged between 0.40 and 0.81. This can be attributed to the application of organic manure for the past three years since their shift to organic farming. Similarly, the available soil nitrogen is more in case of organic farming plots ranging between 175.62 and 401.41(kg/ha), whereas this is lesser in conventional farming plots - ranging between 150.23 and 301.06 (kg/ha).

The average per acre agricultural expenditure of the sample households practicing conventional agriculture is Rs.6141 and for those practicing organic agriculture it is Rs.5122. It can be clearly seen that there was a significant decrease in the expenses related to pesticide use and chemical fertilizers. Per acre income during the year 2008-09 was quite less in both organic and conventional farms. The income was almost one-third of the expenditure incurred per acre. This is mainly due to poor yields due to excess rain.

It was clearly reported by farmers that though the yields were slightly lesser in organic farms, the input costs were also much lesser in organic farms as compared with conventional agriculture. Three years' experience of organic farmers revealed that despite slightly lesser yields in organic farms, the per acre net income was equal or more than conventional agriculture due to lesser input costs. This means that organic agriculture is more economically viable as compared to conventional agriculture. But it is difficult to conclude this with the empirical data obtained during the research period (2008-09).

However, a series of focused group discussions with several organic farmers in 8 study villages clearly brings out the fact that despite a yield reduction of 15-25% in the initial years of shifting to organic farming, lesser input costs in organic farming makes it economically more profitable than conventional agriculture. Though grain yield was less for organic farmers, the income from fodder, crop by-products and uncultivated foods was higher than in conventional agriculture. This could be due to the wider adoption of inter/mixed cropping systems by the organic farmers which resulted in higher availability of fodder, crop by-products and uncultivated foods.

Farmer's Perception

The present study, in addition to the quantitative data through household interviews, also tried to understand the farmers' perception - especially the women's - regarding the various aspects related to the organic farming. These include reasons for shift to organic farming, yield reduction during conversion, improved health due to organic farming, importance of livestock for organic farming, food habits of the organic farming families, access to uncultivated foods in organic farms, advantages of marketing by Dharani Cooperative and marketing issues involved and advantages of organic farming.

The major reasons for shift by farmers towards organic farming include increase in the input costs in green revolution model agriculture. Concern for soil health, human health and livestock health were the main reasons for shift to organic farming. Another very important aspect mentioned by them was the strong marketing support extended by TIMBAKTU NGO for the organically grown produce.

The major support extended to the farmers by TIMBAKTU included support for collection of cow urine; provided the sprayer; support for taking up soil and moisture conservation works; supply of neem oil; provision of neem cake; provided the seeds of the crops such as fox tail millet, cow pea, jowar and castor; financial support for crop harvesting; support for marketing organic produce and training through farmers' field school.

The practices followed by organic farmers include varietal diversity, seed treatment with non-chemical methods, diverse manuring techniques : farm yard manure, jeevamrutham, vermicompost, biofertilisers, green manuring, intercropping, mixed cropping, selection of crop rotations, non-pesticidal management of pests and soil and moisture conservation works.

There was a reduction of 25% yield during the shift to organic farming. However, the organic farmers could cope with this yield loss as the input costs have decreased

significantly, the net benefits were fine. Farmers strongly felt that stoppage of pesticide application had positive impact on their health. Lack of required type and number of livestock was an important constraint for organic farmers that affects manurial needs and timely agricultural operations. According to farmers, the multiple benefits provided by livestock include urine, dung, milk and milk products and timely ploughing of the land.

With the shift towards organic farming, there is a change in the food habits of many households, both in terms of type of food and its quantity. Millets have come back into their food basket. In fact, these foods used to find a prominent place in their food basket hitherto. A clear advantage was seen by the organic farmers with respect to soil fertility, food quantity and quality, human health and livestock health. The input costs on pest management have reduced substantially due to adoption of non-pesticidal management methods of pest control. In organic farms the availability of uncultivated foods has increased both in quality and quantity. The agricultural practices adopted by organic farmers influenced neighbouring farmers who tried to pick up few practices from these farmers. It was interesting to hear from the farmers of the study villages in a single voice, that they will continue to farm organically despite the withdrawl of input support by TIMBAKTU for organic farming. Farmers have suggested several measures for the growth of organic farming in their villages, the most important being the livestock development with the breeds that suit their local conditions.

Conclusion

Organic farmers have been using a range of agricultural practices that are based on local resources. As a result of this the input costs were lesser and more importantly farmers had control over the things they wanted to do. Organic practices related to seed treatment, soil fertility enhancement, pest management, and livestock care have provided employment to villagers and thereby supported their livelihoods. The soil sample analysis of organic farms has indicated that there is improvement in soil fertility due to increased organic carbon percent. This supports soil life contributing to the enhancement of soil fertility through biological process. During the research period (2008-09), the yields were affected both in organic and conventional farms. Hence, based on empirical evidence it becomes difficult to conclude about the economic viability of organic farming. However during FGDs, based on their three years experience with organic farming, farmers clearly brought out that the per acre economic benefits were more in organic farms. Despite slightly lesser yields, this was possible because there was a significant reduction in the input costs of organic farms. Each and every single farmer in the study area was appreciative of the marketing support extended to them, especially the accurate weighing procedure

adopted by Dharani Cooperative. This enabled them to save an amount ranging between Rs.2000-Rs.3000 per acre, which is a substantial gain for small and marginal farmers. Millets such as korra, jowar and bajra are back into farming system, enhancing the food and nutritional security of sampled households. Huge crop diversity and higher crop rotation was seen in the organic farms as compared with conventional farms. This has positive implications for soil fertility management, pest management and for withstanding risk of climate changes. It was argued by the organic farmers during the FGDs that there is a need for a strong support for livestock, especially bullocks and cows, for better results in organic farming. It can be summed up that organic farming is doing better compared to conventional farming on several fronts.

About Author

B.Suresh Reddy is currently working as Assistant professor at the Research Unit for Livelihoods and Natural Resources,CESS. He did his Ph.D in Development Sociology from Centre for Economic and Social Studies(CESS), Hyderabad. In addition to research articles, he has produced several publications for the farmers and grass root extension functionaries in telugu language, the local dialect of A.P. His research interests include Livelihoods, Ecological agriculture, participatory research and Access and Control of women over Natural Resources Management.

Chapter 1

Assessment of Economic and Ecological Returns from Millet-based Bio-diverse Organic Farms vis-à-vis Conventional Farms

Background of the Study

Green Revolution (GR) technologies, supported by policies, and fuelled by agrochemicals, machinery and irrigation, are well known to have enhanced agricultural production and productivity. While these technologies greatly helped to address food security and food sovereignty needs, farmers using these technologies, have to depend on external inputs which constitute the major cost of production for small-holder farmers. Most of these small farmers are challenged by shortage of cash resources and depend on family labour.

The manufacture of fertilizers and pesticides, the two major inputs of GR technologies, needs fossil fuels and/or expensive energy, and is associated with serious environmental and health issues. It is perhaps owing to these input issues and their negative impacts the Intergovernmental Panel on Climate Change (IPCC) has noted that agriculture as practiced today (conventional agriculture, modern agriculture or GR agriculture), accounts for about one fifth of the projected anthropogenic greenhouse effect, producing about 50% and 70%, respectively of overall anthropogenic CH_4 and N_2O emissions.

Modern agriculture farming practices and irrational use of chemical inputs over the last four decades resulted in loss of natural habitat balance, loss of soil health and caused many hazards such as soil erosion, decreased ground water level, soil salinisation, pollution due to fertilisers and pesticides, genetic erosion, ill effects on environment, reduced food quality and increased the cost of cultivation, making the farmer poorer from year to year (Balak Ram 2003; Rajendran, 2003). As a result of all these things, farmers find that agriculture is no more a viable proposition and in fact, a large number of farmers committed suicides (Deshpande, 2002). Perhaps shooting up of price of factory made external inputs and the government slow with drawl of investment as well as market intervention and more significantly, shifting of subsistence farming (mainly with homegrown inputs) to commercial farming (largely with purchased inputs) would have also contributed for the present crisis. In other words, the local indigenous farm techniques

are being wiped out and replaced by modern techniques that would have resulted unviable and unsustainable farm enterprise. It is in this context that alternative farm techniques and strategies for growing crops ought to be found in the larger interest. Owing to the merits of organic cultivation as compared to modern agricultural practices, such principle is attracted across the world. Organic agriculture is productive and sustainable (Reganold *et al.*, 1993; Drinkwater *et al.*, 1998; Mader *et al.* 2002; Murata and Goh, 1997; Letourneau and Goldstein, 2001; Patil, 2009). Many state supported agencies, Non-Governmental Organizations (NGOs) and individuals started experiments on organic methods of food production in the recent past.

The popular and most accepted definition of organic farming is, "organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system", (FAO, 1999). The term "conventional farming" refers to a production system which employs a full range of pre- and post-plant tillage practices (e.g., plough, disc plant, cultivate), synthetic fertilizers and pesticides. Conventional agriculture basically refers to a system of agriculture wherein chemicals are used in cultivation of crops. It is characterized by a high degree of crop specialization. In contrast, organic farming is characterized by a diversity of crops.

Against this background, organic farming has assumed immense significance in the present context, especially in the dry land areas. Organic farming follows the principles of nature, which are self-sustaining developing systems. It respects the environment's own systems for controlling pests and diseases in raising crops and livestock, and avoids the use of synthetic pesticides, herbicides, chemical fertilisers, growth hormones, antibiotics or gene manipulation. In this context, a study was taken up in collaboration with an NGO TIMBAKTU Collective to understand the "Economic and Ecological returns from Organic Farms vis-à-vis Conventional Farms" in Anantapur District of Andhra Pradesh with the following objectives:

Objectives of the Study

1. To identify and record the organic farming practices followed by farmers.
2. To examine the economic, ecological, social and livelihood significance of organic farming practices and conventional farming.
3. To understand the marketing methods in organic farming.

4. To contribute to the overall policy discourse on organic farming for better micro-level interventions.

Methodology

The study used both qualitative and quantitative methods for assessment of economic and ecological returns from millet-based bio-diverse organic farms vis-à-vis conventional farms. It used both primary and secondary sources of data. Quantitative information was collected using a semi-structured questionnaire and qualitative information was collected through focused group discussions. This research aims at uncovering the range of strategies adopted by farmers on their land, with a view to assess their socio-cultural, livelihood, economic and ecological significance. The study used an *ex post facto* research design, since the variables chosen have already occurred.

Locale of the Study

The State of Andhra Pradesh (AP) was chosen for the study which is the fifth largest state in India in terms of both surface area and population. Based on physiography, soil types, crops and cropping pattern, the state has been divided into nine agro-climatic zones namely, high altitude and tribal zone, Northern Coastal zone, Godavari zone, Krishna zone, Southern zone, Northern Telangana zone, Central Telangana zone, Southern Telangana zone and scarce rainfall zone.

The state is richly endowed with natural resources and has a geographical area of 274.40 lakh hectares and an estimated population of 8.16 crores, as on 1st March 2006. The population of SCs and STs works out to 16.19 and 6.59 percent respectively. The literacy rate in AP during 2001 Census was 60.47 percent as against the literacy rate of 64.84 percent at the all India level. The average landholding size in the state according to the quinquennial census of 2000-01 was 1.25 hectares. About 70 percent of the state's population is engaged in agriculture.

Over 80 percent of those involved in agriculture are small and marginal farmers and landless labourers who own a mere 35 percent (3.5 million hectares) of the total 10 million hectares of cultivated land. About 20 million bovines (cattle and buffaloes), 15 million sheep and goats, 0.75 million pigs and 65 million poultry are spread across some 10 million households engaged in agriculture. Andhra Pradesh has the distinction of much diversified livestock resources in nine agro-climatic zones with different production systems. Livestock farming is one of the most sustainable and dependable alternate livelihood in rural areas, especially for small and marginal farmers and agricultural labourers who hold 70 percent of livestock resources and 20 percent of landholdings.

Small ruminants and backyard poultry are reared primarily by the landless *Adivasis*, the traditional small-ruminant farming castes such as the *Kurmas* and the *Gollas*, and the dalits. The size of bovine herd is closely linked to private land ownership, with the number of bovines increasing with landholding size. In all agricultural settings across AP, women play a greater role than men in agricultural work and food preparation, looking after almost 80 percent of the day-to-day livestock management. During 2007-08, the net area sown was 108.45 lakh hectares, constituting about 39.4 percent of its geographical area. Similarly, the state has about 62 lakh hectares of forest area. The gross area irrigated in AP during the year 2007-08 was 52.74 lakh hectares. Wells account for a major share of 19.35 lakh hectares (48.4 percent) followed by canals, 13.75 lakh hectares (34.5 percent) and 5.31 lakh hectares under tanks (13.3 percent). Highest ever priority has been accorded for the development of irrigation infrastructure in backward and drought-prone regions of the state. The state government has initiated a historical mission named '*Jalayagnam*' with the aim of completing 30 ongoing and new projects in a record time. The state also had a project for encouraging micro irrigation for achieving water use efficiency. In 2005-06, the area under drip/sprinkler irrigation was 43,876 hectares.

The average rainfall of the state is 830 mm, the range being 690 mm (Rayalaseema Region) to 950 mm (Coastal Andhra). The average rainfall in the Telangana Region is 860 mm. Cereals take the lion's share among crops (46.5 percent of total area), followed by oil seeds crops (24.1 percent), pulses (12.4 percent) and commercial crops (11 percent). Rice in cereals, groundnut and castor among oil seed crops, cotton, chillies and sugar cane in commercial crops and black gram, red gram and green gram among pulses are the major crops grown in the state. An area of 15.80 lakh hectares is under various horticultural crops. Mango and sweet orange occupy predominant position in acreage under fruits besides vegetables and flowers.

In Andhra Pradesh, agriculture has been undergoing many changes over the past two to three decades. The increasing intervention of the state in agriculture, and the Green and Yellow revolutions, have prompted agricultural changes throughout the semi-arid regions, especially in land ownership, cropping patterns, irrigation, credit and extension, agricultural productivity and prices, and marketing. In rainfed areas, the shift to commercial crops such as groundnut, cotton and chillies is resulting in the use of modern inputs like hybrid seeds, chemical fertilizers and pesticides, all of which are produced through industrial methods and marketed through networks of public and private dealers. The widespread cultivation of commercial crops is accompanied by a decline in food crops. Traditional crop rotation practices and the use of organic manures have largely been replaced by mono-cropping and the intensive use of chemical fertilizers. Though such new cropping practices have led to an initial rise in productivity, they also translate

into significant increases in costs of production and severe environmental and health problems, including pollution of water bodies.

Agricultural development is set in motion by institutions ranging from government bodies to local agents who carry an inherent bias in favour of well-off and large farmers. The combination of technology and institutional bias towards 'progressive' farmers places non-literate and socially marginalized small cultivators at a great disadvantage. The current trend towards a reduction of government extension services and the introduction of private paid services may further increase small farmers' technological and financial dependence on profit-driven agencies.

Farmers' increased dependency on the state on the one hand and the market on the other are the major causes for the 'agrarian crisis' highlighted by a citizens' report prepared by a group of social scientists in Warangal District (Citizens' Report, 2004). Agriculture in the semi-arid regions has to be understood not only in the context of vulnerability and resource scarcity, but also resilience and adaptations. Industrial and technological transformations are reshaping the agrarian relations and rural livelihoods.

AP is one of the highest pesticide consuming states in India with an intake of 1541 metric tons (technical grade) in 2007-08. Similar is the case with fertilizer consumption. The use of fertilizers too was high in AP in the year 2007-08, 15.60, 6.9 and 4.12 lakh metric tons of Nitrogen (N), Phosphorus (P) and Potassium (K) was used respectively. In 2004-05, the total NPK per hectare consumption was 158.80 kg (CMIE, 2006) as against the India's 88.11 kg/hect (Fertiliser Association of India). The state has 2.03 lakh *Rythu Mithra* Groups (RMGs). It also has a programme called *Polambadi* (Farmer Field School) emphasising on the adoption of eco-friendly measures for pest management which helps in strengthening the natural eco-system. There are several private companies promoting their technology and business regarding seeds, pesticides, fertilizers and farm machinery. All the above-mentioned aspects have a huge bearing on organic farming. In this context, Andhra Pradesh was selected for the study on "Assessment of Economic and Ecological Returns from Millet-based Bio-diverse Organic Farms vis-à-vis Conventional Farms", focusing on the socio-economic, ecological and livelihood dimensions of organic farming practices in dry land regions of Andhra Pradesh.

Profile of Selected District

Out of the 23 districts of Andhra Pradesh, Anantapur District having arid and semi-arid regions was selected for the study. The district represents one of the important socio-economic and ecological regions of Andhra Pradesh.

Table 1.1: Basic Features of Anantapur District

Particulars	Anantapur
Area in sq. km.	19130
Normal Rainfall (mm)	552
Population in Lakhs	36.4
a) Male	18.6
b) Female	17.8
Literacy Percent	56.1
a) Male	68.4
b) Female	43.3
Operation Holding in hectares	2.0
Gross cropped area (04-05) '000 hectares	1136.0
Gross irrigated area (04-05) '000 hectares	142.0
Percentage of net irrigated area	12.27
Food grains production in '000 tons (04-05)	188.0
Food grain yield in kg per hectare (04-05)	1102.3
Total livestock population	2316329

Source: CMIE 2006 and Government of AP, 2004

Anantapur District has high inter-annual variations in precipitation. Most of the rain is received during June to September, although recently rainfall has become unreliable and distribution highly erratic. The soils are mainly shallow, barren, sandy and only marginally fertile. The district is primarily characterised by rainfed agriculture. Most farmers are 'small and marginal' and grow a large diversity of both food and commercial crops (oil seeds, pulses, millets and fibre crops) using dry land farming practices. Agriculture in Anantapur District of Rayalaseema is practiced on degraded and infertile soils with a majority of them being sandy soils. A large percentage of area is under groundnut cultivation. Erratic and deficient rainfall, rising cost of cultivation coupled with low market prices has led to severe indebtedness of farmers.

Interestingly, Anantapur has least area under irrigated rice and highest rural livestock population in Rayalaseema Region. Large flocks of goat and sheep are managed extensively in the district. Certain parts of the district have a significant population of *Adivasis* (known as Scheduled Tribes), who are among the most marginalised sections of Indian society.

Table 1.2: Land Utilisation in AP and Selected District in 2007-08 (percentage)

Land Use	Andhra Pradesh	Anantapur
Forests	22.60	10.28
Barren and uncultivable land	7.50	10.28
Cultivable waste	2.40	2.70
Pastures and other grazing land	2.10	1.79
Tree crops	1.01	1.98
Current fallows	9.8	2.44
Other fallows	5.50	6.05
Net area sown	39.40	55.98

Source: Statistical Abstract, AP, 2008, Directorate of Economics and Statistics, GoAP, Hyderabad.

Study Area

The study was carried out in 8 villages covering C.K.Palli, Ramagiri and Roddam mandals of Anantapur District (Table 1.3) with the help of TIMBAKTU (NGO) working in Anantapur District of Andhra Pradesh. From the total number of organic farmers (350) a sample of 75 organic farmers was selected from 8 villages using proportionate random technique. Correspondingly, a number of conventional farmers were selected using proportionate random sampling method representing similar dry land conditions except that of their organic farming practices. Along with personal interviews, focused group discussions were used to acquire an in-depth understanding of issues relevant to organic farming. A thorough review of organic farming policies was conducted through a study of secondary sources. The data gathered was analysed using both qualitative and quantitative methods.

Methods of Data Collection

Secondary data on rainfall, net irrigated area and demographic features of the villages were collected from the mandal revenue office and village panchayat records. A thorough review of past and current trends in agricultural policies was conducted through a study of secondary sources. Structured questionnaire was used to collect the data from the selected sample households of the eight selected villages. The interview schedule, comprising the measurement of variables was prepared in consultation with experts, keeping in view the objectives of the study. The interview schedule was pre-tested in an identical village outside the present study. In the light of the experience gained in the pre-testing, suitable modifications were made before finalizing the interview schedule. Enumerators were used for collecting the information through individual questionnaire.

Table1.3: Study Area in Anantapur District of Andhra Pradesh

S. No.	Mandal	Village	No. of Sample Households	
			Organic Farmers	Inorganic Farmers
1	Roddam	Rachur	15	16
2	Roddam	Beedanpalli	5	4
3	Roddam	Shapuram	11	11
4	C.K.Palli	Venkatampalli	12	10
5	C.K.Palli	Chinnapalli	5	9
6	Ramagiri	Kondapuram	13	9
7	Ramagiri	Venkatapuram	7	6
8	Ramagiri	Gantimarri	11	10

The questionnaire was divided into five sections. The first section contained general information about the households family particulars (family members, age, sex, social category, education, role in household activity and occupation), membership in organizations, farming experience and sources of income. The second section was about landholding details regarding total operational land, grazing land, fallows and land use in *Kharif* 2007-08; and details of organic farming practices. The third section focused on crops grown, livestock details and input used in both conventional and organic farming 2007-08. The fourth section was about details of inputs used. Section five discussed the problems in marketing of organic products, credit sources of farmers, migration details, sources of farming information, constraints in organic farming and suggestion for the growth of organic farming.

Basic information regarding the village was obtained using a questionnaire administered to the village *panchayat* secretary of the selected villages and the mandal revenue office of the respective mandal.

Individual Questionnaire

Structured questionnaire was used to collect data from the selected sample households of the eight selected villages. The interview schedule, comprising the measurement of variables was prepared keeping in view the objectives of the study. The interview schedule was pre-tested in an identical village outside the present study.

Enumerators were used for collecting the information through individual questionnaire. In the beginning, enumerators were given three days training on how to canvas the questionnaire and aiding them in understanding general issues of organic farming. After

the training exercises, a trial short field visit was undertaken to provide hands on training to the enumerators. This was useful for enumerators as they got to know the local conditions and could clarify further doubts on the concepts used in the questionnaire.

Focused Group Discussions (FGDs)

FGDs were conducted among both organic and inorganic farmers of all size classes. The objective of these discussions was to form a general idea on organic farming related issues, irrespective of farm size. FGDs helped to understand the livelihoods, ecological and marketing issues in organic farming, different organic farming practices and their advantages and disadvantages. This helped to bring out the perspectives of various categories of people with reference to issues related to organic farming.

Methods for Data Analysis

Both quantitative and qualitative information on the details of organic farming and its determinants was gathered. The analysis was basically done in two ways. The first was by comparing between the various size classes of large, medium and small farmers, and the second analysis was done by comparing between the organic and conventional farmers. The results of the study are discussed at two levels - at the household level and at the plot level. The data gathered was analysed using different statistical tools. Averages, frequency and percentages were used to analyse the various information related to organic farming

Scheme of Presentation

The report is organised into 6 chapters. The present chapter is an introduction to this work. In this chapter, the importance of organic farming is discussed. This is followed by objectives and methodology. The second chapter traces the history of organic farming. The third chapter is a thorough review of the literature on the issues related to organic farming. The fourth chapter is on the socio-economics of soil fertility management; data on demographic features, land use patterns, livelihoods, socio-economic aspects of sample house holds. The fifth chapter presents the farmers' perception about the various issues in organic farming and also their suggestions for the strengthening of the same. The sixth chapter makes some concluding observations.

Chapter 2

History of Organic Farming

Organic farming has no doubt emerged from Asian countries such as India and China, where agriculture has been the mainstay of the people, and farmers have nurtured and groomed this art over several centuries. However, the organic movement as such began as a reaction of agricultural scientists and farmers against the industrialization of agriculture. Advances in biochemistry (nitrogen fertilizers) and engineering (the internal combustion engine) in the early 20th century led to profound changes in farming. Research in plant breeding resulted in the production of hybrid seeds. Fields grew in size, and cropping became specialized to make efficient use of machinery and reap the benefits of the green revolution. Technological advances during World War II spurred post-war innovation in all aspects of agriculture, resulting in such advances as large-scale irrigation, fertilization, and the use of pesticides. Ammonium nitrate, used in munitions, became an abundantly cheap source of nitrogen. DDT, originally developed by the military to control disease-carrying insects among troops was applied to crops, launching the era of widespread pesticide usage.

Gustav Simons (1903) wrote an important book on the relationship between the health of soils, growth of plants and the health of mankind. In Germany, Rudolf Steiner's Spiritual *Foundations for the Renewal of Agriculture*, (Steiner, 1924) led to the popularization of biodynamic agriculture. The term organic farming was first used by Lord Northbourne. The term is derived from his concept of "the farm as organism", which he expounded in his book, *Look to the Land* (1940), wherein he described a holistic, ecologically balanced approach to farming. The British botanist, Sir Albert Howard, often referred to as the father of modern organic agriculture, worked as an agriculture advisor during 1905-1924 in Pusa, Samastipur, India, where he documented the traditional Indian farming practices. He came to regard such practices as superior to modern agricultural science. His research and further developments of these methods was recorded in his book, *An Agricultural Testament* (1940), which influenced many scientists and farmers of the day. He adopted Northbourne's terminology in his book, *The Soil and Health: A Study of Organic Agriculture*, in 1947.

In 1939, Lady Eve Balfour established the pioneering Haughley Experiment on her Suffolk farmland in England and continued it for more than 40 years. It was the first scientific comparison of organic and conventional farming. Lady Eve Balfour shared some of her experiences in a book called the *Organics Classic: The Living Soil*. Japanese farmer and writer, Masanobu Fukuoka, invented a no-till system for small-scale grain production in the early 1940s and called it "natural farming". In the post world war era, the Green Revolution launched in Mexico with private funding from the US, encouraged the development of hybrid plants, chemical controls, large-scale irrigation and heavy mechanization around the world. Although science tended to concentrate on new chemical approaches, sustainable agriculture was the topic of interest. In the US, J.I. Rodale (1950) began to popularize the term and methods of organic growing, particularly through promotion of organic gardening. Carson (1962), a prominent scientist and naturalist, published *Silent Spring*, describing the adverse effects of DDT and other pesticides on the environment, launching a worldwide environmental movement. By the 1970s, global movements concerned with pollution and the environment increased their focus on organic farming.

In 1972, the International Federation of Organic Agriculture Movements (IFOAM) was founded in Versailles, France. It is the umbrella organisation for organic agriculture which developed international basic standards for organic agriculture and went on to establish IFOAM Accreditation Programme (1992) to accommodate certifying agencies and set up international organic accreditation service (2001). IFOAM is dedicated to the diffusion of information on the principles and practices of organic agriculture across national and linguistic boundaries. Fukuoka released his first book, *One Straw Revolution* (1975), with a wide-ranging impact on the agricultural world. In the 1980s, various farming and consumer groups worldwide began pressing for government regulation on organic production. This led to legislation and certification standards being enacted, beginning in the 1990s. In the year 1991, the European Union regulations gave guidelines for the production of organic crops in the European community. Similarly, in the year 1999, a joint FAO/WHO intergovernmental body produced a set of guidelines for organic production. Since the early 1990s, the retail market for organic farming in developed economies has grown by about 20 percent annually due to increasing consumer demand. Though small independent producers and consumers initially drove the rise of organic farming, as the volume and variety of "organic" products grows, production will increasingly be in the large-scale.

Global Status of Organic Farming

Organic agriculture is developing rapidly and today at least 141 countries produce organic food commercially. As per the estimates in the year 2007, organic food is produced in

about 32.2 million hectares globally, managed by more than 1.2 million producers including smallholders. In addition to agricultural land, there are 0.4 million hectares of certified organic aquaculture. Among the countries involved in organic farming, about 65% are developing countries. The regions with the largest areas of organically managed agricultural land are Oceania, Europe and Latin America (Figure 1). Australia, Argentina and Brazil are the countries with the largest organically managed land areas. About one-third of the world's organically managed land – almost 11 million hectares - is located in developing countries. Most of this land is in Latin American countries, while Asia and Africa take the second and third place, respectively.

Figure 1: Land under Organic Management by Region 2007

Source: FiBL/IFOAM (2007)

On a global level, in the year 2008, organic land area increased by almost 1.5 million hectares compared to the data from the year 2006. About 28 percent (or 1.4 million hectares) more land under organic management was reported for Latin America (including 0.9 million hectares of in-conversion land in Brazil for which no data was available previously). In Europe, organically managed land increased by 0.33 million hectares (+4 percent) and by 0.18 million hectares (+27 percent) in Africa (Willer and Klicher, 2009).

Table 2.1: Percentage of Area under Organic Farming in the Total Cultivated Area in 2004

Country	Percent of Area under Organic Farming
USA	0.23
UK	4.22
Germany	4.10
Argentina	1.70
Austria	8.40
Australia	2.20
Japan	0.10
Switzerland	7.94
South Africa	0.05
Italy	3.70
India	0.03
Pakistan	0.08
Srilanka	0.05

Source: SOEL Survey (2004).

It can be seen from Table 2.1 that Austria has the highest percentage (8.40%) of area under organic farming, followed by Switzerland, UK and Germany with 7.94, 4.22 and 4.10 percent, respectively. In India, only 0.03% of the area is under organic farming, though there is huge scope for bringing more and more land under organic farming.

Organic Farming in India

India has traditionally practiced organic agriculture, but the process of modernization, particularly the Green Revolution, has led to the increased use of chemicals. In recent years, however, limitations of agriculture based on chemical use and intensive irrigation have become apparent and there has been a resurgence of interest in organic agriculture. Renewed interest in organic agriculture is mainly due to two concerns: falling agricultural yield in certain areas as a result of, *inter alia* excessive use of chemical inputs, decreased soil fertility and environmental concerns. Exports also played a role but perhaps lesser than in other countries.

The 10th Five Year Plan encouraged the promotion and encouragement of organic farming using organic waste, Integrated Pest Management (IPM) and Integrated Nutrient Management (INM). Even the 9th Five Year Plan had emphasized the promotion of organic produce in plantation crops, spices and condiments using organic and bio-

inputs for the protection of environment and promotion of sustainable agriculture (GOI, 2001). There are many state and private agencies involved in promotion of organic farming in India. These include several ministries and government departments at both central and state levels, universities and research centres, NGOs like Navadanya, Deccan Development Society, Key Stone Foundation, Agriculture Man Ecology(AME), Centre for Sustainable Agriculture (CSA),TIMBAKTU Collective and Organic Farming Association of India, producers' organizations and certification bodies, besides various processors and traders.

The Government of India has also launched the National Programme for Organic Production (NPOP, 2001). The national programme involves the accreditation programme for certification bodies, norms for organic production, promotion of organic farming, etc. The NPOP standards for production and accreditation system have been recognized by the European Commission and Switzerland as equivalent to their country standards. Similarly, the United States Department of Agriculture (USDA) has recognized NPOP conformity assessment procedures of accreditation as equivalent to those in the US. With these recognitions, the Indian organic products duly certified by the accredited certification bodies of India are accepted by the importing countries.

Currently, India ranks 33rd in terms of total land under organic cultivation and 88th for the ratio of agricultural land under organic cultivation to the total farming area. According to the Agricultural and Processed Food Product Export Development Authority (APEDA), the cultivated land under certification is around 2.8 million hectares (2007-08), which includes one million hectares under cultivation, while the rest is under forest area (wild collection). An estimated 69 million hectares, however, are traditionally cultivated without using chemical fertilizers and could be eligible for certification under the current practices, or with small modifications. Certifying these farms remains a challenge, however, as many of these farms are smallholdings (nearly 60% of all farms in India are less than one ha). Small-scale, poor farmers may be unable to afford the cost of certification; they may be illiterate and unable to maintain the necessary records; or may be using indigenous cultivation systems not recognized in organic certification systems. These farms mainly produce for home consumption, and to supply the local markets in case of irregular surpluses. Such barriers pose difficulties for farms to reap the potential benefits of organic certification.

India produced around 5,85,970 MT (Table 2.2) of certified organic products including all varieties of food products namely Basmati rice, pulses, honey, tea, spices, coffee, oil seeds, fruits, processed food, cereals, herbal medicines and their value added products. This production is not just limited to the edible sector; it includes organic cotton fiber,

garments, cosmetics, functional food products, body care products, etc. India exported 86 items last year (2007-08) - a total volume of 37533 MT. The export realization was around US$ 100.4 million, registering a 30 percent growth over the previous year. Organic products are mainly exported to EU, US, Australia, Canada, Japan, Switzerland, South Africa and the Middle East. Cotton leads among the products exported (16503 MT).

Table 2.2: Present Status of Organic Production in India during 2006-2007

Total area under certified organic cultivation	2.8 million hectares.
Total production	585970 MT
Total quantity exported	19456 MT
Value of total export	Rs.30124 Lakhs
Number of farmers	141904

Source: APEDA (2008)

The states of Uttaranchal and Sikkim have declared their states as organic states. In Maharashtra, since 2003, about 5,00,000 hectares has been under organic farming (of the 1.8 crore ha of cultivable land in the state). Organic cotton production was concentrated in low productivity and high uncertainty areas such as Vidarbha, since the early 1990s. The Vidarbha Cotton Growers' Association, set up in 1994 with 135 members, has tied up with international agencies for exports (GOI, 2001). In Gujarat, organic production of chickoo, banana and coconut was found to be more profitable, though field crops and mango had both lower input costs as well as yields. In Karnataka, by the year 2005, 1513.25 hectares was under certified organic farming, while 4750 hectares was under non-certified organic farming. Groundnut, jowar, cotton, coconut and banana are being grown under organic conditions - the major reasons for shift include sustained soil fertility, reduced cost of cultivation, higher quality of produce, sustained yields, easy availability of farm inputs and reduced pest and disease attacks. The Government of Karnataka released a state organic farming policy in 2004. Most of the area in the northeastern states is being used for organic farming. In Nagaland, 3000 hectares are under organic farming with crops like ginger, Soya bean, *kholer*, maize, large cardamom, passion fruit and chilli. The state of Rajasthan has more than 6000 hectares under organic farming. States like Tamil Nadu, Kerala, Madhya Pradesh, Himachal Pradesh and Gujarat are promoting organic farming vigorously.

Farmers' organizations such as *Chetana* have been established for marketing organic products. This programme was implemented in three states: Andhra Pradesh (Asifabad and Karimnagar), Maharashtra (Vidarbha, Akola and Yavatmal) and Tamil Nadu (Dindigul and Tuticorin). The programme was started in the year 2004 with 240 farmers

and by the year 2007, more than 5500 farmers were participating in the program. A total of about 20,000 acres and total raw cotton yield of 5000 tons was expected, which means about 1700 tons of lint. Food crop yield was 8000 metric tons, mainly pulses. The farmers have to face several problems while converting from conventional farming to organic. Lanting (2007) identified some of them as follows: premium price is not paid for these products because they are in the transition stage; storage facility is needed, with cash paid (preferably 70 percent of the crop value) for the stored products. Rural banking should be strengthened and loaning process should be made simpler. Hence, the government could give a helping hand in the first three years of changing over to organic farming by providing preferred access to organic farmers. This could help reduce the dropout rate.

Table 2.3: Export of Organic Products by APEDA for the Year 2007-08

Particulars	Quantity in Metric	Tons Value in Lakhs
Floriculture	46397.84	48226.71
Fresh fruits and vegetables	1724573.58	243711.57
Processed fruits and vegetables	774849.13	245144.82
Animal products	1932855.99	512926.94
Other processed foods	3220200.63	652314.73
Cereals	9752245.58	1484735.94

Source: Govt. of India (2008).

Sanghi (2007) argues that organic farming is an intensive process, mostly limited to resource-rich farmers and the export market, and depends heavily on external support systems for price, market intelligence and certification of produce, among others. Hence he says that the scope of coverage and social relevance of the organic farming is also limited. Instead, he proposes ecological farming, whose main objectives are maintenance of high productivity, reduction in production cost and enhancement in self reliance. It caters to both the resource-poor and the resource-rich; the process is simple, addresses local market and the scope of coverage and social relevance is also high. There are four main steps in ecological farming: the first is the adoption of non-chemical pest management methods; the second step is to focus on selling pesticide-free produce in the local market; the next step is to establish community managed seed banks; and finally the fourth step is to adopt non-chemical methods of nutrient management. It has been argued that the ecological method is indigenous, but is gradually disappearing due to constraints in labour availability. Sanghi sees a great scope for its revival by utilizing the incentives of labour under the National Rural Employment Guarantee (NREG) act.

Organic Agriculture in Andhra Pradesh

In AP, in the early 1980's, the Permaculture Association of India popularized the concept of 'Permaculture' (permanent agriculture). Permaculture is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people, providing their food, energy, shelter and other material and non-material needs in a sustainable way. The philosophy behind Permaculture is one of working with, rather than against, nature; of protracted and thoughtful observation rather than protracted and thoughtless action; of looking at the systems in all their functions, rather than asking only one yield of them; and of allowing systems to demonstrate their own evolutions (Mollison, 1990). The Deccan Development Society (DDS), an internationally well-known NGO working with dalit women groups, has developed a farm on the principles of Permaculture in Zaheerabad region of Deccan area. DDS encouraged sustainable agricultural practices in a big way and has been a pioneer in the country. More than 5000 women farmers in an area of more than 20,000 acres adopt sustainable agricultural practices, which are environment friendly, and are based on the traditional knowledge. Similarly, the Centre for Sustainable Agriculture (CSA) based at Hyderabad, through several NGOs in the state, has promoted non-pesticidal management of pests in the state, wherein the use of pesticides and chemical fertilizers is discouraged, while the use of local resources is encouraged. The small success from few villages could be scaled up into more than 7 lakh acres in last three years in 1500 villages benefiting more than 3 lakh farmers. The Community Managed Sustainable Agriculture program is being implemented by the Society for Elimination of Rural Poverty, the Government of Andhra Pradesh and the Sustainable Agriculture Network of NGOs, with technical support from the Centre for Sustainable Agriculture. Today there are 50 villages which have become pesticide free and 7 villages which have become completely organic. The concept of non-pesticidal management of pests is being promoted among the farming community through the *Indira Kranthi Pathakam* of the Government of Andhra Pradesh. The TIMBAKTU Collective is another organization which has been promoting organic farming practices since a long time in Anantapur District. TIMBAKTU Organic was initiated in 2005 by TIMBAKTU Collective in association with *Adisakthi, Ananthasakthi* and *Mahilasakthi* Mutually-aided Thrift Co-operative Societies (MATCS) promoted by the Collective, with financial support from Sir Dorabji Tata Trust, Mumbai. The goal of this venture is to improve the livelihood of the small and marginal farmers of the area on a sustainable basis using organic farming.

The Government of Andhra Pradesh has initiated programmes related to organic farming through the Department of Agriculture and Horticulture. The Agriculture Department

is proposing to take up promotion of organic farming in the state during the year 2008-09 by implementing several schemes with an outlay of Rs.18.29 crores. These schemes include organization of vermicompost units, establishment of vermi-hatchery units, distribution of green manure seed on subsidy, supply of bio-fertilizers on subsidy and certification of organic farming. The Andhra Pradesh State's policy on organic farming is yet to be finalized and the draft developed in this regard is being discussed at various levels.

Similarly, the Horticulture Department of AP is implementing the organic farming scheme under the State Horticulture Mission (SHM) from the financial year 2008-09. To get the certification, the organic farming scheme is proposed to be implemented in 12 districts of AP in the coming three years. These include Ranga Reddy, Medak, Mahbubnagar, Nalgonda, Warangal, Khammam, Kurnool, Kadapa, Guntur, Prakasam, Chittoor and Paderu ITDA and Visakhapatnam. The organic farming scheme is being implemented in an area of 6567 hectares by selecting clusters of 50 hectares in compact blocks. The crops covered under the scheme include chilli, ginger, mangoes, cashew and vegetables. As per the SHM guidelines, the assistance per cluster is Rs.9 lakhs. Over a period of three years, all the farmers will be formed into groups, and trainings will be provided by experienced persons and personnel of the certification agency. The NGOs are actively participating in the scheme; they are responsible for obtaining certification by the accredited certification agency with whom the agreement is entered. All the NGOs except *Pilupu* (in Ranga Reddy District) have entered into an agreement with M/s Vedic Organic Certification Agency. The SHM is providing an assistance of up to Rs.15,000 per hectare over a period of three years. An amount of Rs.7000 is given in the initial year followed by Rs.4000 each in the second and third years to each farmer up to a maximum of 4 hectares per farmer. A technical support group member is allotted to one or two districts for monitoring the scheme periodically. The NGO shall identify the traders to market the organic produce at a higher price. Acharya N.G. Ranga Agricultural University has also been conducting comparative research between organic farming and conventional farming since 2007 *Rabi* (last three crops) in all its research stations in the state. Each research station is conducting trials on the predominant crop grown in that area.

History of Organic Farming clearly reveals that several people have worked with passion and strong commitment for the progress of it. In India too, several initiatives are being taken by central and state governments and NGOs for supporting farmers in the adoption of organic practices.

Chapter 3

Organic Farming: A Review

Keeping the research objectives in mind, this review aims to span issues relating to the organic farming with an emphasis on comparing the conventional agriculture vis-à-vis organic agriculture. In India little research has been done on the socio-economic, ecological, cultural and livelihood dimensions of organic agriculture vis-à-vis conventional farming. Experiences are often drawn from global studies where off late, considerable research related to issues of soil fertility is being done. In this chapter, an attempt has been made to critically review different views, which have a direct and indirect bearing on the study. The issues covered in the review include: a) Yield During Conversion to Organic Farming; b) Soil Fertility; c) Importance of Livestock; d) Institution/Certification; e) Ecological Significance of Organic Farming vis-à-vis Conventional Farming; f) Marketing and Policy Support with respect to Organic Farming.

Can Organic Farming Feed the World?

A common question asked of the organic movement relates to its yield (Trewavas, 2004). Can organic agriculture feed the world? In answer to this question, one may ask, is conventional agriculture successfully feeding the world? High input-high yielding systems are currently failing to feed the world, not because of problems with productivity, but because of problems with food distribution, social organization and serious concerns for poverty, racism and gender (Woodward, 1996). If land area is shifted from inorganic to organic farming, less food will be available due to yield losses during conversion. Such organically produced food goes to the rich who can afford to the buy it. As a consequence, the amount of food available to the poor decreases, while the cost increases. This gives rise to equity issues. Organic agriculture is productive and sustainable (Reganold *et al.*, 1993; Drinkwater *et al.*, 1998; Mader *et al.,* 2002; Murata and Goh, 1997; Letourneau and Goldstein, 2001). Some of the major issues involved in organic farming are discussed below.

Yield during Conversion to Organic Farming

Farmers convert to organic farming because of their uneasiness with the existing agriculture system, which is predominantly based on chemicals. A number of farmers perceive chemical agriculture as a health hazard to themselves. However, personal health is not the only reason to convert to organic. Farmers in Punjab, Harayana and eastern Uttar Pradesh are able to keep their yields only through a drastic increase in chemical inputs. Yields in irrigated farms may go down during conversion period because these yields are boosted by artificial fertilizers and it takes time for the soil fertility to increase. However, after that, yields will be equal if not higher than the yield during the conventional farming. In rainfed farming, the situation is different; yields here are significantly lower and thus, the difference in yields between the conventional and conversion period is less. Though comparative yield studies are less both at global and national levels, we do find that certain studies give a broad indication of the productivity of organic farms vis-à-vis conventional farms. Conversion from a traditional low-external input system of cultivation rarely results in lower yields. However, while switching from external-input-intensive forms of agriculture, the yields may decline significantly, at least during the initial years of conversion, until the natural soil tilth and fertility are sufficiently restored. But, after that, they may stabilize at comparably lower or even higher levels, depending on the efficacy of organic management and the quality of organic fertilizers applied (Kasturi Das, 2007). The wide range of organic fertilizers that are based on local resources and farmers' knowledge (Butterworth *et al.*, 2003) will take care of manurial needs of farmers. Organic farming can compete economically with conventional farming when particular attention is given to optimum approaches while conversion. Information needs of organic farmers should be surveyed and information delivery systems should be tailored to meet those needs (Cacek, 2009). In case of crops like rice, organic cultivation appears to be less economical as compared to other crops. However, there is more scope for minimizing the economic cost and environmental loss, under organic farming system in the long run (Rajendran, 2002). Besides these, environmental balance is maintained such that crops, trees, animals and man can live more harmoniously. Reducing the use of pesticide can provide growers with direct economic benefits by decreasing the cost of inputs, thereby increasing net returns (Brenner, 1991). It was reported by researcher Cacek (1984), that crop diversity in organic farms can have other economic benefits as diversity provides some protection from adverse price changes in a single commodity. Diversified farming also provides a better seasonal distribution of inputs (e.g., labour). However, organic farms require more intensive management than specialized conventional farms. Most organic farm practitioners have reported that it was not the premium price of the organic produce but the reduced expenditure on inputs and similar yields to their neighboring conventional farmers that was attracting them (Sharma, 2005).

More recently, experiments going on for 25 years in Switzerland (Maeder *et al.* 2002) and USA have reported sustainable yields (though marginally reduced in some years) without agrochemicals in temperate climatic conditions. On the other extreme, most agricultural scientists believe that without chemical fertilizers, large quantities of Farm Yard Manure (FYM) and other biomass that will be needed to compensate for the fertilizers will not be available. They also believe that different crops cannot produce high yield without agrochemicals - fertilizers in particular - and therefore, practicing organic farming means food insecurity for the country (Chhonkar, 2003).

Organic farmers need to borrow lesser money than conventional farmers for two reasons: firstly, organic farmers need to buy fewer inputs such as fertilizer and pesticides; and secondly, costs and income are more evenly distributed throughout the year on diversified organic farms. Organic farmers, however complain that they face discrimination (Cacek, 1984) by lenders - a possible economic disadvantage of organic farming. However, Blobaum (1983) concluded that this problem is more perceived than real.

Income and profitability from organic farms is equal or higher when compared to conventional and traditional farms (Van der and Dejager, 1992). In the long run, organic farming offers more advantages compared to conventional farming, because it not only promises higher yields but also ensures higher yield security and reduces dependence on external inputs, thus making poor households less crisis-prone. These are weighty arguments, especially in marginal locations (Julia and *et al*., 2008)

Lockeretz *et al*. (1978) compared the economic performance of 14 organic crop/livestock farms in the Midwest to that of 14 conventional farms. The farms under study were paired based on the physical characteristics and types of farm enterprises. The market value of crops produced per unit area was 11 percent lesser on the organic farms. But since the cost of production was also less, the net income per unit area was comparable for both systems. A study by Roberts *et al.* (1979) compared data from 15 organic farms in the western corn belt with the USDA data on representative conventional farms in the same area. In most cases, the net returns were greater on the organic farms. Both studies showed that production costs were longer on the organic farms.

Two studies were conducted comparing cash grain farms in the state of Washington. In the first study, Eberle and Holland (1979) compared three organic and three conventional farms and found that net incomes per unit area were 38 percent higher on the conventional farms. However, the author of a follow-up study of six organic farms found that net returns on these farms were 22 percent higher than on the representative conventional farms (Kraten, 1979). Berardi (1979) compared 10 organic and 10 conventional farms

in New York and Pennsylvania for returns from wheat production only. When cash operating costs alone were included, the returns were higher on the organic farms. However, when the costs of land and unpaid family labour were included, the conventional farms had a higher average net return. However, the above studies had several limitations. The most obvious was the small sample sizes, which made it difficult to conduct any statistical tests of differences. The averages did not reflect the high variability that occurred in both yields and net returns on both types of farms. Pairing farms for the studies also caused problems, especially in the works by Eberle and Holland (1979) and Berardi (1978). Finally, none of the studies included the livestock enterprise, which may be essential for optimum economic performance of organic farms.

A 1984 survey of the members of the Regenerative Agriculture Association (Brusko *et al.*, 1985) offered further information on the economic performance of organic methods compared to conventional methods. Of 213 respondents, 88 percent said that their net income either stayed the same or increased when they began farming with fewer purchased inputs, while 12 percent said that their net income declined. The sample may not have been a representative sample of organic farmers, and many of the responses may have been based on perceptions rather than on well-kept records. The survey seems to indicate a high level of satisfaction with the economic performance of low input farming.

Soil Fertility

We have had two decades of large-scale and rapid destruction of fertile agricultural soils in India as a result of the very processes which attempted to increase agricultural productivity (Economic Survey, GOI, 2008). The Green Revolution paradigm substituted the nutrients cycle with linear flows of purchase inputs of chemical fertilizers from factories and focused on the production of chemical marketable agricultural commodities. Yet, as the Punjab experience has shown, the fertility of soils cannot be reduced to NPK from factories, and agricultural productivity necessarily includes returning to the soil, part of the biological products that the soil yields. Technologies cannot substitute nature and work outside nature's ecological processes without destroying the very basis of production nor can markets provide the only measure of 'output' and 'yields' (Shiva, 1992).

The Green Revolution created the perception that soil fertility is produced in chemical factories, and agricultural yields are measured only through marketed commodities. Nitrogen-fixing crops like pulses were displaced. Millets which have high yields from the perspective of returning organic matter to the soil were rejected as 'marginal' crops. Biological products not sold in the market but used as internal inputs for maintaining soil fertility were totally ignored in the cost-benefit equations of the Green Revolution

miracle. They did not appear in the list of inputs because they were not purchased, and they did not appear as outputs because they were not sold (Shiva, 1992).

FYM has always been one of the principal means of replenishing soil losses (Albert Howard, 2000). It supplies Soil Organic Matter (SOM) which is an indicator of life, soil health and even its production capacity. Plant biomass is the only 'input' needed for enhancing SOM (Rupela, 2007). Organic manures not only supply nutrients to crops and improve the soil texture in dry lands, but also act as mulches. Furthermore, they protect against adverse temperature effects, improve seed germination, increase the water retention capacity of the soil and create the right micro-climate for the development of beneficial soil microbes (Pradeep Sharma 1991, Reddy 2010)). Organically cultivated soils are relatively better attuned to withstand water stress and nutrient loss. Their potential to counter soil degradation is high and several experiments in arid areas reveal that organic farming may help combat desertification (Alam and Wani, 2003).

Farmers have treated soils as mother earth and revered her as their own mother. This spiritual and emotional understanding of soil and agriculture is not understood by most of the administrators and scientists, for whom soils are nothing but a tool for production. The vision of farmers makes it possible for them to harmonise their agriculture with ecological imperatives, while most of the agriculture policies end up being ecologically destructive (NBSAP, 2001).

In our modern agricultural system, we have forgotten how to feed the soil. We just feed the plants. If we feed the soil, it is necessary to only compensate for the elements that have been exported with the seed. This need can, to some extent, be fulfilled by growing nitrogen-fixing plants such as Soya bean. It is possible, in such a manner to develop an organic system with extremely low inputs of fertilizers in the soil (Alvares *et al.*, 1999).

Butterworth *et al.* (2002) as per the study conducted in AP on the farmers' soil fertility management practices and how it helps improve the livelihoods of the people, have found that farmers are usually rational decision makers, who weigh the costs of any practice against the potential benefits that are likely to be derived, attempting to make a net gain. The aspects like opportunity costs, risk and insecurity, likely future trends and long term versus short term gains are considered by farmers in assessing the costs and benefits of adopting a Soil Fertility Management (SFM) practice.

what is 'unproductive' and 'waste' in the commercial context of the Green Revolution is now emerging as productive in the ecological context and as the only route to sustainable agriculture (Shiva, 1992). The solution to the crisis of dying soils cannot lie in the hands

of those who created the problem - who look only at the market, not at the life of the soil. The healing and recovery of soils will not emerge by continuing to cling to the market as an organizing principle for agriculture. Recovery lies in rediscovering natural ways of renewing and learning, once again, to see that the soil has a right to a share of its produce in order to renew itself. Respecting that right is critical to satisfy our needs (Alvares *et al*., 1999)

Livestock

Livestock is an integral part of agriculture and has profound influence on sustainability. Apart from generating higher incomes, livestock generates employment and produces organic manure. The quantity and quality of livestock influences SFM both directly and indirectly. It contributes directly by influencing the availability of organic manure. It contributes indirectly through its influence on incomes of the households. Integration of livestock and crop production, i.e., mixed farming, allows the use of animal manure to increase soil fertility. Farmers recognize the benefits of using manure, and with the relatively high costs of mineral fertilizers, manuring could play a greater role in maintaining soil fertility (Powell and Williams, 1995). The livestock component of the farming system is crucial to help maintain soil fertility, supply of draught power and food for the family (Reddy, 2001). The nutrient management system has rather become more closed with the weakened traditional linkages between forest and livestock (Turton *et al*., 1997).

Increased income through livestock increases the capacity of the household to invest on productivity-enhancing methods through purchase of off-farm inputs (George, 1996). Earnings from the landholdings of majority of marginal, small and semi-medium farms alone are not adequately sufficient for the household round the year; livestock rearing provides an alternative to the small farmers (Joshi and Jha, 1981).

Livestock economy is changing very rapidly in Andhra Pradesh. The growth of draught animal stock has slowed down compared to the milch animal stock which is growing relatively fast; and the proportion of cross breeds among milch animals is also growing rapidly (Conroy *et al*, 2001; Reddy, 2001; Adolph and Butterworth, 2002). The reasons for this include reduction in farm size, increased mechanization, declining area of Common Property Resource (CPR) lands and changing patterns in labour availability (Conroy *et al*., 2001). This has important implications for the availability of manure. Local animal breeds important for livelihoods and sustainable agriculture should be conserved *in situ* by strengthening integrated farming and indigenous systems of land use in which livestock plays a key role in nutrient cycles and the maintenance of soil fertility. Jurors of '*Prajateerpu*' believed that the erosion of livestock biodiversity would increase with the corporate agriculture proposed under vision 2020 (Pimbert and

Wakeford, 2002). They specifically called for appropriate training and research as well as for government support to re-introduce livestock. Declining fodder and water resources combined with blanket animal-breeding policies fuel a downward spiral of loss in livestock genetic diversity, draught power, natural fertilizers, livelihoods and household assets.

Agricultural productivity can be improved by better integrated crop and livestock systems, recycling crop residues, and the careful use of other available nutrients (Hilhorst and Muchena, 2000). Swaminathan (1990) opined that a farming system that aims to optimize the income and employment potential of the small farm through concurrent attention to crop and animal husbandry and post-harvest technologies, needs to be more widely fostered. No major research programme in agriculture should be started without a fair understanding of the existing farming systems (Ruthenberg, 1980).

There is inadequacy of the draught (animal power, in particular) in rainfed ecosystems. We also need to identify critical and timely requirements of the draught in the production systems besides extended use of the available draught power during the less critical periods. Thus, livestock production, being a self-income-generating enterprise, reduces the irregularity and uncertainty in income from farm business (Anonymous, undated). Combining agriculture with dairy and poultry farming fetches the small farmers more average net income than other enterprises (Rao, 1992).

With the weakening of forest and livestock linkages, the nutrient management system has become closed. Also, the reduction in common property resource areas will reduce the availability of nutrients. It is very clear from the review that livestock is crucial not only to help maintain soil fertility, supply of draught power and food for the family, but also to increase the agricultural productivity in dry lands.

Institution/Certification

The organizational structures supporting smallholder organic agriculture in India fall into four categories. These include farmers organized by a company; farmers operating under NGO initiatives; farmers organized or facilitated by government; and farmers who have formed their own organizations like cooperatives, associations, self-help groups, etc. Organic farming has been successful under a number of institutional arrangements and hence it is hardly possible to prescribe a particular framework for its further development (Kasturi Das, 2007). However, Santacolama (2007) argues that farmers in developing and transition countries still face institutional and economic constraints to reach the stage of being certified organic producers, making it particularly costly for smallholders to participate in this market. In states like Chhattisgarh, unclear standards and tedious documentation process, along with the lack of a single window certifying

agency and expensive certification have so far not enthused the farmers. Added to this, the export volume of the state is fairly low and neither the farmers nor the consumers find it worthwhile to go for certification (Rao and Larja, 2005). Thus, a large segment of the organic community remains marginalized and is unable to get the premium on their produce. Some kind of support structure is needed, especially for the resource-poor small farmers to successfully venture into organic farming. The main reason for this is the financial and other obstacles confronting farmers in the initial 'conversion' phase of a switchover from non-organic to organic farming.

In order to qualify for the "certified organic" label, a farm must not only confirm to the stipulations laid down in organic standards, but also acquire a certificate from an independent certification body to establish the authenticity of its produce. The conversion period is basically the time between the start of organic management and the certification of crops or animals husbandry. It is the time taken to neutralize chemical residues, if any, left behind in the soil by practiced agricultural techniques. Unlike conventional agriculture where standardized chemical inputs are used, organic farm management does not depend on a uniform strategy. Instead, appropriate field management practices have to be developed and improvised depending on the particular case and nature of locally available inputs, because organic farming aims at creating a closed system wherein most of the inputs are generated either from within the farm or from locally available resources, preferably renewable.

The standard duration of the conversion period for annual crops is 24 months, and for perennials it extends up to 36 months. However, the certification authority has the discretion to extend or reduce the duration of the conversion period depending upon the ecological conditions on the farm undergoing conversion. This often is contingent upon the agricultural technology followed during the pre-conversion phase. Since organic techniques are often more labour-intensive, wage costs may increase. Costs may also arise from information and knowledge gathering and in acquiring certification and labelling from an established certification agency. The latter could be prohibitive for small farmers unless alternatives like small farmers' group certification and internal control systems for farmers exist (Kasturi Das, 2007).

There are three certification schemes operating in developing and transition economies. The first is the third-party certification for individuals, a well-known and internationally-recognized certification system. The second scheme is also third-party certification in which small scale farmers may be certified in groups under an Internal Control System (ICS). The third scheme corresponds to participatory certification called the Participatory Guarantee System (PGS), which targets local or national markets and involves the

participation of small farmers, small enterprises, traders and consumers in the certification process. PGS is an initiative largely coming from the developing world wherein the systems of quality assurance are directly managed and controlled by organic producers. PGS complements the organic movement as it is setup and managed by the very farmers and consumers that it serves. Importantly, there is no universal model for PGS. Each variant is adapted and specific to the individual communities, geographies, politics and markets of their origin.

Strong organizational support is a pre-requisite for further penetration of organic agriculture into India. The areas which warrant appropriate institutional support include a low-cost, hassle-free certification process and technical assistance for record keeping and an enabling scenario for small farmers, group certification, internal control system, etc., wherever necessary.

Ecology

Organic bio-diverse farming and food production is the way out for the ecological and livelihood security of millions of small farmers in this country (Satheesh 2008, Reddy 2010). Organic farming benefits the society substantially by reducing pollution and flooding, conserving energy, soil nutrients, fish, wildlife and insuring the supply of food for future generations. However, virtually no credible data are available to policy makers on the magnitude of these benefits: they are unable to compare organic farming with other policy alternatives. In areas where organic farming is known to be economically feasible, policy barriers to conversion should be identified and evaluated. Organic farming is an attractive alternative for both farmers and policy makers (Cacek *et al.*, 2009).

The new bio-chemical technology in agriculture, however, has many negative impacts on the environment. There has been significant increase in the use of chemicals like fertilizers and pesticides since the 1960s. There is enough cause for worry on the environmental consequences of these chemicals. Particularly in the 1980's, it was realized that for sustainable development, alternative farming practices are needed (Dev and Painuly, 1994). Pesticide usage has increased manifold, obviously due to many complex factors. Pesticide residues present in the environment affect the soil, water, agricultural products, animals and plants. Continuous application of pesticides has led to diseases like cancer and epilepsy with which the people are being made to suffer for years. Alternatives to pesticides are to be found viable in the long run and hence, a concerted effort needs to be put by all concerned for promoting sustainable agriculture development in the broader framework of environment and health (Rajendran, 2003). The economic and environmental impact of our farm policies on pesticide reduction also deserve scrutiny

and policies that encourage adoption of ecologically sound farming practices need to be implemented (Brenner, 1991).

Although many trained farmers realize the importance of ecological agriculture, it was not always possible for them to put the training into practice, especially on their major farming land which provides them with most of their livelihood security (Datta and Kar, 2006). However, farmers have adopted this technique to a greater extent on their homestead land, which is less controlled by market forces and is free from other external factors. This perhaps reflects their belief in the need for such an approach. The above findings clearly indicate that the level of awareness among farmers is rising significantly, though there is still a long way to go before there is a total shift from inorganic to organic farming. Despite this fact, the behavioural changes are very encouraging. It is mainly women who are bringing about this change. NGO training programmes encourage women to bring fallow homestead land under vegetable/fruit cultivation, which is now an alternative income source for the family. In most cases, women are solely responsible for collecting ingredients, preparing organic manure and applying it. While women are not involved in cropland management, they always encourage their husbands to use organic manure on their croplands.

It has been found that in places like Chhattisgarh where organic agriculture is popular, the farmers who try to practice organic agriculture suffer, as the upstream farmers may be using chemicals which permeate into the fields of the farmers practicing organic cultivation and the produce would be found contaminated during chemical analysis due to the residual effect between fields. This is more so in case of medicinal plants, where the sensitivity index is much higher owing to their use in the life-saving drugs or health products. It has been found that the organic cultivation movement can become a success only when the farming communities are jointly sensitized and mobilized to give up inorganic practices (Rao and Larja, 2005).

Field crops generally add phytotoxins or allelochemicals to the soils mainly through crop residues and partially through root exudates. Allelochemicals generally have suppressive effects on germination/establishment of crops, often with an added stimulatory effect. The deleterious effects of allellochemicals are more pronounced in monoculture due to accumulation in soil while the effect is very low in crop rotations (Acharya *et al.*, 2001). It has been found that in places where the inorganic agriculture has been popular, the farmers who try to practice organic cultivation suffer, as the upstream farmers may be using chemicals which permeate into the fields of the farmers practicing organic cultivation (Rao and Larja, 2005).

The major factors that lead to growing interest in alternate forms of agriculture in the world are: increasing consciousness about conservation of environment as well as health hazards associated with agrochemicals; and consumers' preference to safe and hazard-free food. Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment. The demand for organic food is steadily increasing both in the developed and developing countries at an annual average growth rate of 20-25% (Ramesh *et al.*, 2005). Considering the potential environmental benefits of organic production and its compatibility with integrated agricultural approaches to rural development, organic agriculture may be considered as a development vehicle for developing countries such as India.

Comparative economics of crop production under Organic Farming System (OFS) and Inorganic Farming System (IFS) showed that production cost was gradually declining in OFS. Further, it is not easy to assign economic values for soil health, reduced pollution and improved resilience and reduced Green House Gas emissions (Venkateshwarlu, 2007). Changes in soil structure coupled with improved ground cover, decreased runoff by about 10 to 50 percent and increased infiltration by about 10 to 25 percent, all these factors combine to reduce soil erosion on organic fields by at least two-fifths, and sometimes over four-fifths (Cacek, 1984). It is difficult to place a monetary value on the water lost as runoff and the nutrients contained in the eroded soil. In part, they are just displaced to other locations on the farm, where they remain available for crop production.

Marketing

The mechanism of organic marketing is quite different from that of regular marketing. Careful selection and development of large markets and distribution channels are of utmost importance. Such marketing not only requires additional costs but also specialized skills, know-how and experience, all of which unorganized individual farmers are usually incapable of developing (Kasturi Das, 2007). About 85% of the total organic production in the country heads for the export market. The domestic market for organics is thus undeveloped in India. Lack of domestic marketing channels adds to the difficulties faced by farmers converting to organic methods in accessing export markets.

Market access for small producers depends on: a) understanding the markets; b) organization of the firm or operations; c) communication and transport links; and d) an appropriate policy environment. In this changing scenario, small farmers mainly need better access to capital and education. Management capacity, which is as important as physical capital, is the most difficult thing to provide. Further, collective action to deal with scale requirements needs to be designed in order to satisfy new products, process standards and to avoid exclusion from the supply chain. Collective action through

cooperatives or associations is important not only to be able to buy and sell at a better price, but also to help small farmers adapt to new patterns and much greater levels of competition. Small farmers require professional training in marketing and in the technical aspects of production. There is also the need to strengthen small farmer organizations and provide them with the technical assistance to increase productivity for the cost-competitive market and to provide help in improving the quality of produce in order to capture value added in the supply chain (Singh, 2006).

Policy Support

Policies have long focused on generating external solutions to farmers' needs. This has encouraged dependencies on external inputs, though they are more costly, environmentally damaging, and therefore, economically inefficient when compared to the resource-conserving options (Pretty, 1995). Modern agriculture is like a cracked earthen pot, which cannot be put to good use any more. New policies must be able to create the conditions for development based more on locally-available resources and local skills and knowledge. Policy makers will have to find ways to establish dialogues and alliances with other actors; the farmers' own analyses could be facilitated and their organized needs articulated. Dialogue and interaction would give rapid feedback, allowing policies to be adapted alternatively. Agricultural policies could then focus on enabling people and professionals to make the most of the available social and biological resources.

Despite the serious efforts of some NGOs, it appears that India is lagging far behind in the adoption of organic farming. So far, the only achievement seems to be the laying down of the National Standards for Organic Production (NSOP) and the approval of a few accreditation agencies, whose expertise is limited to a few crops. For laying the spadework for the spread of organic agriculture in the country, certain issues require attention at the government policy making levels. These include: a) substantial financial support by the governments which is absolutely necessary to promote organic farming; b) market development for the organic products which is a crucial factor to promote domestic sales; c) government support to the producer and consumer associations to market the organic products; d) the simplification of the process of certification; and e) reduction in its cost. A vigorous campaign to highlight the benefits of organic farming against the conventional system is essential to increase the awareness of the farmers and consumers (Narayanan, 2005).

There is no mention of organic farming in the National Agricultural Policy. Organic farming offers an alternative method for production that can be suitably exploited to benefit some segments of farmers (Chand, 2003). However, certification of organic products becomes dubious if it is linked with high documentation, controlling,

organizational and bureaucratic effort (Julia *et al.*, 2008). Chhattisgarh, through various initiatives, has been promoting the cultivation of medicinal, aromatic and dye plants apart from agricultural and horticultural produce. Being a herbal state, there is a lot of scope for promoting organic farming. The Chhattisgarh *Vanoushadhi* Board or the Medicinal Plants Board, the Department of Horticulture, Agriculture, and Chhattisgarh State Minor Forest Produce federation are some of the State Government agencies promoting organic cultivation of agricultural, horticultural, medicinal and aromatic crops (Rao and Larja, 2005).

Even in places where organic farming is facilitated without any direct government initiative, the state may still have some important roles to play for the following reasons:

(1) NGOs may not always have the necessary business skills to succeed in marketing. In such situations, collaboration between NGOs and governments may be effective.

(2) Companies involved in contract farming arrangements with organic farmers need to be extremely effective and skilful at reaching organic markets. However, there may be a trade-off involved between the profit motives of the private companies and the best interests of the farmers. Hence, it is extremely important for the state to create an appropriate legal framework that enforces contracts and provides for trustworthy and effective arbitration in the best interests of the poor and unorganised farmers.

(3) Formation of farmers' organizations has been found to be extremely beneficial for upholding the farmers' interests. However, it requires considerable support on a number of levels, including start-up costs, operational expenses, training and marketing. The state government or the NGO sector may assist in these respects.

(4) Organic agriculture may also flourish under direct government involvement. While it has suffered downright neglect by the Central Government, a number of state governments have already made significant strides in organic farming. For e.g., the governments of the mountainous states of Sikkim, Mizoram and Uttarakhand have undertaken significant initiatives to make their states completely organic. State Government initiatives in some form have also been taken in Karnataka, Madhya Pradesh, Arunachal Pradesh, Meghalaya, Punjab, etc. In the "Uttarakhand Organic" initiative, a multi-pronged strategy - the organic model - has been promoted not only as an agricultural technology, but also as an integral part of several rural development projects. Moreover, while export is not outside the purview of this initiative, significant emphasis has been placed on domestic market

development as well. Although it is too early to comment on this programme, it seems that if implemented successfully, the project could become a role model for state-driven organic development in India (Kasturi Das, 2007).

Conclusion

Based on the literature review, it can be summed up that opinions about organic farming are divided, especially among the experts. Disagreements about the profitability and yield increase in organic farming are acute, but there is a strong consensus on its eco-friendly nature and inherent ability to protect human health. There are strong views against organic farming, mainly on the grounds of practicability of feeding a billion people, its financial and economic viability, availability of organic inputs and the know-how. However, many studies revealed that organic agriculture is productive and sustainable (Reganold *et al.*, 1993; Drinkwater *et al.*, 1998; Mader *et al.*, 2002; Murata and Goh, 1997; Letourneau and Goldstein, 2001). There are also many people, who, while approving organic agriculture, advocate a careful conversion of farms into organic, so that yield loss is taken care of to the greatest extent possible. Presently, there is a lack of government subsidies or support to make the conversion to organic easier or cheaper. Questions about the yield and financial viability of organic farming are crucial and there are no empirical studies available in the Indian context comparing the economic and ecological returns of organic farms vis-à-vis conventional farms. Keeping such research gaps in view, this study on "Assessment of Economic and Ecological Returns from Millet-based Bio-diverse Organic Farms vis-à-vis Conventional Farms", was taken up in Anantapur District of Andhra Pradesh.

Chapter 4

Socio-Economic Aspects of Sample Farmers

In this chapter, an attempt is made to understand the socio-economic profile of the sample villages and sample farmers following organic and conventional agriculture. The demographic features of the sample villages and livelihood patterns seen in the selected villages are discussed in Section I. The socio-economic features, age group, literacy level, livestock population, market distance, farming experience, social participation, caste composition, landholding, net income and borrowings are some of the important issues discussed in the latter part of this chapter. This analysis is expected not only to provide information about the representativeness of the sample villages, but also to help in getting an insight into the organic farming practices of the sample farmers as against the practices of conventional farmers. Results of the soil sample analysis are also discussed in detail in this chapter.

Profile of the Sample Villages

The study is based on eight villages belonging to Roddam, Ramagiri and C.K.Palli mandals in Anantapur District of Andhra Pradesh. Venkatampalli is the village with the maximum number of households (450) with a population of 2100; Beedanpalli is the village with minimum number of households (90) with a population of 540. Scheduled Caste families are seen in all villages and only one Scheduled Tribe family was seen in Rachur Village. The study indicated that most of the organic farming sample farmers were in the age group of 35-44 (37 percent) years, followed by those in 45-54years (31 percent), whereas a majority of the conventional farmers were in the age group of 45-54years (36 percent), followed by 35-44 years (28 percent). In both conventional and organic agriculture, 19 percent were in the age group of 25-34 years. The basic features of the villages such as land use pattern, social composition of sample villages are presented in Table 4.1. Agriculture, agricultural labour and animal husbandry are the main livelihoods of the population in the sample villages.

Table 4.1 : Key Features of Sample Villages and Households

Features	Beedan-palli	C.K.Palli	Ganti-marri	P.Konda puram	Rachur	Shapuram	Venkatam palli	Venkata puram
No. of Households (HHs)	90	110	250	170	179	154	450	170
Total Population	540	660	1552	839	856	616	2100	629
Scheduled Caste Population (percent)	8.88	2.34	9.66	31.47	4.67	3.40	6.19	33.38
Social Composition	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed
Land Value/acre in Rs.000's								
Irrigated	60,000	65,000	30,000	30,000	50,000	50,000	80,000	35,000
Dry Land	30,000	70,000	25,000	25,000	35,000	30,000	70,000	65000
Livestock								
a) Large Ruminants (LR)	270	78	158	340	130	95	650	330
b) Small Ruminants(SR)	900	1,230	3,650	1,300	6,500	1,300	10,500	170
Crops Grown under Rainfed Conditions	Ground-nut Redgram, Maize, Cow pea	Ground-nut, Redgram, Cow pea, Jowar, Bajra, *Korra*	Ground-nut, Red gram Green gram Cow pea, Field bean, Bajra Maize, *Korra*	Ground-nut, Red gram *Korra Jonna*	Ground-nut, Red gram Cow pea, Green gram House gram *Korra*, *Sama*, Bajra, Jowar, Gingelly	Redgram, Ground-nut, Cow pea, Jowar, Bajra, *Korra*	Ground-nut, Red gram, *Alasanda*, Green gram, Maize, *Sajja*	Ground nut, Redgram, rice, sunflo-wer *jonna*,
Crops Grown under Irrigated Conditions	Sunflower, Maize, Chilli, *Ragi*, Paddy	Paddy, *Kusuma*, Maize, Wheat	Paddy, Maize, Kusuma. Chilli	Ground-nut, Paddy, Sunflower Maize, Cucumber	Ragi, Maize, Sunflo-wer, Chilli, *Mulberry*, Waterm-elon, Ground-nut, paddy	Paddy, *Kusuma*, Chilli, Wheat, Maize, Tomato, Brinjal	Paddy, Kusuma, Chilli, Wheat, Maize, Tomato, Brinjal	Ground-nut, Redgram, *korra*, jonna
Net Area Sown (percent)	64.51 (1,200 acres)	69.25 (856 acres)	16.19 (860 acres)	47.46 (2,900 acres)	84.21 (2,000 acres)	60.71 (425 acres)	90.90 (5,000 acres)	71.42 (500 acres)

Contd..

Table 4.1 contd...

No. of Tractors	2	1	3	5	4	5	8	20
No. of Tanks	2	1	1	8	2	4	1	2
No. of Bore Wells	75	52	80	65	20	8	130	10
No. of Self-Help Groups (SHGs)	6	15	8	3	14	10	8	5
No. of *Rythu Mithra* Groups (RMGs)	-	-	1	2	3	-	1	1
Electricity	Available	Available	Available	Available	Available	Available	Available	Available
Distance to Nearest Market	60	0	0	10	50	30	0	2
Availability of Animal Shandy	No	No	No	No	No	No	No	No
No. of HHs Migrating in 2008	3	1	5	4	7	2	30	5
Government Schemes Implemented		Watersheds, EGS	EGS, NPT, CLDP	EGS, NPM, *Indiramma* Housing, Watershed, CLDP, Sericulture, RDT	IKP, RYS, IRDP,	NREGS, Watersheds CLDP	EGS, NPM, CLDP, Watershed Plantation	NPM, Watershed, EGS, RDT

Source: Village records and Field survey

Dry land villages hosted higher crop diversity including traditional millet crops such as *korra,* jowar, bajra, and *sama*. Crop genetic diversity is an essential dimension of agricultural production in low-input farming systems; a reduction in diversity often leaves small cultivators more vulnerable (Cleveland *et al.*, 1994; Poinetti and Reddy 2002; Reddy, 2009a and Reddy 2010). The soils of sample villages have been predominantly red sandy and sandy loams. The predominant source of irrigation in the sample villages has been only tube well irrigation.

The population of cows and bullocks is seen in good numbers in all the sample villages. The role of bullocks has been taken over by the tractors to a certain extent in Venkatapuram, venkatampalli and P.Kondapuram, and this has significant implications for the fertility of soils. With uncertainty of rain and non-availability of irrigation facilities, few households of Venkatampalli (30HHs), Rachur (7HHs) and Venkatapuram (5HHs) migrate seasonally to distant places in search of employment.

Abnormal Rainfall in Study Villages

In the study villages, during the first year (2006-07) of organic farming project implementation, there were delayed rains. Due to this, the groundnut seed (that was meant for sowing) was sold and farmers had to take up alternate crops such as horse gram (*vulvalu*), jowar (*jonna*) and sunflower (*kusalu*). During the second year (2007-08) of the organic farming project, rainfall was normal and the majority of the farmers harvested on an average a yield of 15-16 bags/acre (43-45 kg/bag). In the third year (2008-09) again the yield was less due to excess rain as a result of which flowering did not take place. Heavy rains and lack of proper drainage affected peg penetration and reduced the yield. On an average, a very poor yield of 3-5 bags/acre (43-45 kg/bag) was reported by organic farmers. The situation was no different for the conventional farmers. The crop of pigeon pea also got affected due to excess moisture ("*Kandi kooda moddulu marinayi*"). The crop of foxtail millet (*korra*) was also affected partly due to rains and birds (*guvvalu*).

Socio-Economic Profile of the Sample Farmers

The description of the socio-economic background of the sample farmers helps us assess the capabilities of the sample farmers in adopting organic farming practices.

Social Composition

In order to understand the social and economic dynamics of sample villages, one has to look into the social system, which largely determines people's perceptions, values and knowledge. The size-class wise caste composition of the sample households is presented in Table 4.2. It is evident from the table that the sample farmers were from all social groups. Post stratification of the sample households of organic farming revealed that the majority belonged to Backward Classes (63 percent), followed by Scheduled Castes (31 percent). Village-wise analysis of data revealed that the population of Scheduled Tribes was not found in any of the villages except for one household in Rachur. In all the eight study villages, and across all the size-classes, the percentage of Backward Classes was high, followed by Scheduled Castes in small and medium size-classes and others (OCs) in the large size category. Even among the sample households adopting conventional agriculture, the majority belonged to Backward Class (69%) communities, followed by others (15 percent) which mostly include OCs.

Size-Class

The size-class-wise distribution revealed that the majority were small farmers both in case of organic farming (60 percent) and conventional farming (45 percent). Among the organic farming sample households, only 8 percent belonged to large farmers (Table

4.2). Most of the organic farmers belonged to Scheduled Caste communities and were organized into groups to take up organic farming. Obviously the percentage of small farmers was high in this category.

Table 4.2: Distribution of Sample Households according to their Social Composition (percent)

Social Category	Conventional Farming (N=75)				Organic Farming (N=75)			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Scheduled Caste	15.00 (5)	6.00 (1)	4.00 (1)	9.00 (7)	44.00 (20)	13.00 (3)	0.00 (0)	31.00 (23)
Scheduled Tribe	9.00 (3)	6.00 (1)	4.00 (1)	7.00 (5)	2.00 (1)	8.00 (2)	0.00 (0)	4.00 (3)
Backward Classes	64.00 (22)	82.00 (14)	67.00 (16)	69.00 (52)	53.00 (24)	75.00 (18)	83.00 (5)	63.00 (47)
Others	12.00 (4)	6.00 (1)	25.00 (6)	15.00 (11)	0.00 (0)	4.00 (1)	17.00 (1)	3.00 (2)
Total	100.00 (34)	100,00 (17)	100.00 (24)	100.00 (75)	100.00 (45)	100.00 (24)	100.00 (6)	100.00 (75)

Source: Based on primary survey

Note: Figures in the parentheses show the actual number of farmers in that respective category.

Table 4.3: Size-class-wise Distribution of Sample Households (percent)

Method of Farming	Category of Farmer			
	Small	Medium	Large	Total
Conventional Farming (N=75)	34 (45.00)	17 (23.00)	24 (32.00)	75 (100.00)
Organic Farming (N=75)	45 (60.00)	24 (32.00)	6 (8.00)	(75) 100.00

Source: Based on primary survey

Literacy

Education was operationalised as the number of years of formal schooling attended by the sample farmers. For the purpose of distribution of farmers, six categories were evolved

as “not literate”, class I-V, VI-VII, VIII-X, Intermediate, Graduation and above. It is presumed that if a farmer is educated he can be made aware of organic farming methods and the marketing issues involved so that he can take advantage of the situation. More importantly, it might be relatively easier to communicate the message by the extension agencies on recent advances in organic farming to a literate farmer. An attempt has been made to enquire into the educational background of the respondents. Analysis was done by calculating the percentage of farmers in various educational levels in the respective size class and also total sample households.

It can be seen from Table 4.4 that among the total sample of conventional farmers, 52 percent were non-literate, followed by informal education (14.67 per cent) and I –V (13.34 per cent). Among organic farmers too, the situation was the same, with the majority (64 per cent) being non-literates, followed by informal education (16 per cent). The sample HHs above intermediate level education in conventional farming were 5.33 per cent and in organic farming, the figure was 2.67 per cent. This could be due to lack of proper educational infrastructure in these villages. Another reason could be financial constraints and the need to work for the sustenance of their families. Hence there is a need to strengthen the educational institutions at the village level so that farmers can have better access and capacity to make full use of the developments taking place with regard to organic agriculture management. As the majority of the respondents were not literate, they depended on their neighbours and peers for the useful knowledge and updated information related to organic farming.

Social Participation

Social participation was operationalised as the degree of participation made by the respondents in formal organizations either as a member, an office bearer or a public leader. The sample farmers were categorised into those with "no social participation", "membership in one organization", "membership in two organizations", "membership in three or more organisations". Table 4.5 shows the distribution of respondents based on their social participation.

It can be observed from the table that the majority of the sample households belonging to conventional farming (60 per cent) had membership in two organizations, followed by membership in one group (21.33 per cent). Similarly 2.67 per cent of the sample households had membership in more than three groups. In organic farming, the majority of the sample households (58.67 per cent) had membership in three groups. Among size classes, in both organic and conventional farming, small farmers had higher social participation followed by medium and large farmers. The reason for this was their membership in institutions such as Self-Help Groups (SHGs) and occupational-related

institutions. Among conventional farmers, 4 percent had no membership in any group at all.

Table 4.4: Distribution of Sample Farmers according to their Literacy Level

Social Category	Conventional Farming				Organic Farming			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Illiterate	67.65 (23)	55.85 (10)	25.00 (6)	52.00 (39)	73.34 (33)	54.17 (13)	33.33 (2)	64.00 (48)
Informal Education	14.70 (5)	17.65 (3)	12.50 (3)	14.67 (11)	17.78 (8)	12.50 (3)	16.67 (1)	16.00 (12)
Class I-V	8.83 (3)	6.00 (1)	25.00 (6)	13.00 (10)	2.00 (1)	13.00 (3)	50.00 (3)	9.00 (7)
Class VI-VII	6.00 (2)	5.88 (1)	16.67 (4)	9.33 (7)	4.44 (2)	12.50 (3)	0.00 (0)	6.67 (5)
Class VIII-X	2.94 (1)	11.76 (2)	4.16 (1)	5.33 (4)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
Intermediate	0.00 (0)	0. 00 (0)	16.67 (4)	5.33 (4)	0.00 (0)	8.33 (2)	0.00 (0)	2.67 (2)
Degree and Above	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	2.22 (1)	0.00 (0)	0.00 (0)	1.33 (1)
	34	17	24	75	45	24	6	75

Source: Based on primary survey

Livestock

This is the most crucial aspect influencing the soil fertility management practice of both conventional and organic farmers. Both quantity and quality of livestock directly or indirectly influences soil fertility management. Higher the quantity of livestock, more is the access to organic manures. The livestock component of the farming system is crucial to help maintain soil fertility, supply of draught power and food for the family (Reddy, 2001; Reddy, 2009b and Reddy 2010).

It can be seen from Table 4.6 that among organic farmers the percentage of bullocks was less with small farmers. Livestock population has reduced because of the fodder and drinking water shortages caused due to recurring drought (Ranjitha, 2004). Especially, bullock population is coming down more with large farmers. The reasons for this are reduction in farm size, increased mechanization, declining area under common lands and changing patterns in labour availability (Conroy, *et al.*, 2001). Another reason is

Table 4.5: Distribution of Sample Households according to their Social Participation

Membership in Groups	Conventional Farming (N=75)				Organic Farming (N=75)			
	Small	Medium	Large	Total	Small	Medium	Large	Total
No Membership	2.94 (1)	5.88 (1)	8.33 (2)	5.33 (4)	0.00 (0)	0.00 (0)	0.00 (0)	1.33 (1)
One Group	17.65 (6)	17.65 (3)	29.17 (7)	21.33 (16)	4.44 (2)	8.33 (2)	16.67 (1)	4.00 (3)
Two Groups	64.71 (22)	58.82 (10)	54.16 (13)	60.00 (45)	22.22 (10)	12.50 (3)	33.33 (2)	20.00 (15)
Three Groups	11.76 (4)	17.65 (3)	4.17 (1)	10.67 (8)	62.22 (28)	58.33 (14)	33.33 (2)	58.67 (44)
Four Groups	2.94 (1)	0.00 (0)	4.17 (1)	2.67 (2)	11.12 (5)	20.84 (5)	16.67 (1)	16.00 (12)
Total	100.00 (34)	100.00 (17)	100.00 (24)	100.00 (75)	100.00 (45)	100.00 (24)	100.00 (6)	100.00 (75)

Source: Based on primary survey
Note: Figures in parentheses indicate actual number of farmers in that particular size-class category.

that earlier, children from SC and BC communities worked for the landlords, but they are now going to school due to the awareness created by voluntary organizations and the emphasis given by government on primary education. Among the sample households of conventional farmers, the majority (40.27 percent) are seen to have bullocks followed by cows (26.14 percent), buffaloes (15.80 percent), sheep (10.62 percent) and goats (7.17 percent). In case of organic farming sample HHs, the majority (43.85 percent) are bullocks. This is slightly (3.58 percent) higher than conventional farmers.

Farming Experience

It was operationalised as the number of years the sample farmer completed in farming at the time of investigation. The sample farmers were categorized into three groups of those having experience of 1-15 years, 16-30 years, 31-45 years and above. Table 4.7 reveals that the majority (60 percent) of the conventional farmers are in the 16-30 years category and the majority of the organic farmers (70.67 percent) range between 16-30 years. Among the total sample of conventional farmers, 22.67 percent had least farming

Table 4.6: Size-class-wise Distribution of Sample HHs according to their Livestock (percent)

Livestock Category	Conventional				Organic			
	Small	Medium	Large	All	Small	Medium	Large	All
Bullocks (Oxen)	47.00	28.43	41.92	40.27	35.42	39.43	54.54	43.85
Buffaloes	14.50	19.86	13.50	15.80	13.50	11.57	7.10	11.00
Cows	22 .00	20.86	35.25	26.14	26.67	27.00	36.36	30.01
Sheep	9.50	13.71	9.33	10.62	8.16	7.72	2.00	5.25
Goat	7.00	17.14	0.00	7.17	16.25	14.28	0.00	9.89
Grand Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Based on primary survey

experience and 17.33 percent had highest farming experience of more than 31 years. Similarly, among organic farmers, 18.67 percent had least farming experience and 10.66 percent had highest farming experience. Experienced farmers had rich knowledge of agricultural practices which are suitable to locally-specific conditions and can do well under constraints (Adolph and Butterworth, 2002).

Table 4.7: Distribution of Sample Households according to their Farming Experience (percent)

	Conventional Farming				Organic Farming			
	Small	Medium	Large	Total	Small	Medium	Large	Total
1-15 Years	26.47 (9)	29.41 (5)	12.50 (3)	22.67 (17)	15.56 (7)	29.16 (7)	0.00 (0)	18.67 (14)
16-30 Years	73.53 (25)	41.18 (7)	54.17 (13)	60.00 (45)	71.11 (32)	54.17 (13)	100.00 (6)	70.67 (53)
31-45 Years and above	0.00 (0)	29.41 (5)	33.33 (8)	17.33 (13)	13.33 (6)	16.67 (4)	0.00 (0)	10.66 (8)
Total	100.00 (34)	100.00 (17)	100.00 (24)	100.00 (75)	100.00 (45)	100.00 (24)	100.00 (6)	100.00 (75)

Source: Based on primary survey

The farmers manage soil properties and fertility through a wide range of practices, and significant inputs of time, knowledge and capital. However, dynamic soil fertility management practices which are based on farmers' long experience are largely unknown and undocumented by the official research and extension system. Several indigenous SFM practices still exist in the farming community (Acharya *et al.*, 2001; Adolph and Butterworth, 2002 and Reddy 2010).

Livelihoods

Livelihood, in its simplest sense, is a means of gaining a living and comprises the capabilities, assets and activities required for a means of living. A livelihood which can cope with and recover from stress and shocks, maintain or enhance capabilities and assets, and provide sustainable livelihood opportunities for the next generation and which contributes net benefits to other livelihoods at the local and global levels in the short and long term can be termed as a sustainable livelihood (Chambers and Conways, 1992). Ellis (2000) defines livelihood as that which comprises "…the assets (natural, physical, human, social and financial capital), the activities, and the access to these that together determine the living gained by the individual or household". This definition stresses the means rather than the ends.

Table 4.8: Distribution of Sample Households according to their Livelihoods (percent)

	Conventional Farming				Organic Farming			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Agriculture	11.76 (4)	47.06 (8)	50.00 (12)	32.00 (24)	31.11 (14)	29.17 (7)	50.00 (3)	32.00 (24)
Agriculture + Draught animals	17.65 (6)	5.88 (1)	16.67 (4)	14.66 (11)	8.89 (4)	16.66 (4)	33.33 (2)	13.33 (10)
Agriculture + Draught animals + Dairying	2.94 (1)	5.88 (1)	12.50 (3)	6.67 (5)	0.00 (0)	12.50 (3)	0.00 (0)	4.00 (3)
Agriculture + Agricultural labour	64.71 (22)	35.30 (6)	20.83 (5)	44.00 (33)	57.78 (26)	37.50 (9)	16.67 (1)	48.00 (36)
Agriculture + Sheep/Goat rearing	2.94 (1)	5.88 (1)	0.00 (0)	2.67 (2)	2.22 (1)	4.17 (1)	0.00 (0)	2.67 (2)
Total	100.00 (34)	100.00 (17)	100.00 (24)	100.00 (75)	100.00 (45)	100.00 (24)	100.00 (6)	100.00 (75)

Source: Based on primary survey

Agriculture, animal husbandry and allied activities generally constitute the livelihood activities of the farmers in the village. According to Table 4.8 Agriculture +Agricultural labour are seen to be the main livelihood activities of both conventional farmers (44 percent) and organic farmers (48 percent), followed by agriculture. Agriculture along with agricultural labour is the main livelihood for small farmers both in organic farming and conventional farming. Even today, farming and livestock rearing is one of the predominant livelihoods of the rural people (Reddy and Reddy, 2007; Reddy, 2009b).

Agro-Biodiversity

Farmers of dry land regions developed diversified cropping systems to ensure that the most essential natural resources such as sunlight, wind, rainfall and soil are optimally utilized throughout the year. Crops that were developed over centuries were specifically bred to suit local soils, nutritional needs of people, livestock needs and climatic conditions. A large number of farmers, especially the women have been nurturing the agro-biodiversity and soil fertility without any sort of support from the government (Satheesh, 2000; Pionette and Reddy, 2002; Reddy, 2009a). The lands of sample farmers of the study villages have hosted a wide range of crops (Table 4.9).

Table 4.9: Predominant Crops Grown by Organic Farmers in the Study Villages

Village	Just Prior to Organic Farming	After Taking up Organic Farming
Venkatampalli	Groundnut, red gram	Groundnut, red gram, cow pea, field bean, Korra, Little millet, Bajra, jowar and ragi
Chinnapalli	Groundnut, red gram	Groundnut, red gram, korra, Bajra and jowar
Gantimarri	Groundnut, red gram, cow pea	Groundnut, Korra, Bajra, cow pea, red gram and green gram.
Shapuram	Groundnut, red gram, cow pea	Groundnut, red gram, Korra, Jowar, Bajra and cow pea
Beedanpalli	Groundnut , red gram	Korra, Bajra, Jowar, groundnut and red gram
Rachur	Groundnut, red gram	Groundnut, redgram, korra, Bajra, Horsegram
Venkatapuram	Groundnut, red gram	Groundnut, redgram, horsegram, cowpea, greengram, bajra, castor, sesame and field bean.
Kondapuram	Groundnut, redgram, cow pea	Groundnut, Redgram, korra, bajra, castor, cowpea, horsegram, greengram, jowar, little millet

Source: Based on primary survey

Table 4.10 shows that crop diversity is more in the fields of organic farmers as compared with conventional farmers. The majority (52 percent) of the sample households adopting organic farming grow at least 5-6 types of crops in the lands owned by them. As much as 44 percent grow 3-4 crops in organic farms. Diversity provides some protection from adverse price changes in a single commodity and also better seasonal distribution of inputs (Cacek and Langer, 1986). In conventional farming, the majority (52 percent) grow 3-4 crops. Only 1-2 crops are grown by 33.33 percent of the conventional farmers whereas it is only 2.67 percent in organic farming.

Table 4.10: Percentage of Total No. of Crops grown by Sample Households in their Lands during the Year 2008-09 (percent)

Number of crops	Conventional Farming	Organic Farming
1-2 Crops	33.33 (25)	2.67 (2)
3-4 Crops	52.00 (39)	44.00 (33)
5-6 Crops	14.67 (11)	52.00 (39)
7-8 Crops	0.00 (0)	1.33 (1)
9-10 Crops	0.00 (0)	0.00 (0)
Total	100.00 (75)	100.00 (75)

Source: Based on primary survey

Varietal diversity of 4-6 varieties is seen in the lands of the majority (77.33 percent) of the organic farmers, whereas in case of conventional farmers, the majority (56 percent) had a varietal diversity ranging between only 1-3. Only 6.67 percent of the organic farmers and 5.33 percent of the conventional farmers had a varietal diversity of seven and above (Table 4.11).

Table 4.11: Varietal Diversity Adopted by Sample Households in their Lands during the Year 2008-09 (in one hectare)

Varietal Diversity	Conventional Farming	Organic Farming
1-3 Varieties	56.00 (42)	16.00 (12)
4-6 Varieties	38.67 (29)	77.33 (58)
7 and Above	5.33 (4)	6.67 (5)
Total	100.00 (75)	100.00 (75)

Source: Based on primary survey

In conventional farming, most of the (76.10 percent) land was dry land; in the case of organic farming, 69.92 percent of the land constituted dry lands. Irrigated land was high (16.10 percent) with conventional farmers, whereas current (8.24 percent) and permanent fallows (9.82 percent) were high in organic farming (Table 4.12).

Table 4.12: Land use Details of Sample Households (percent)

Land use	Conventional Farming				Organic Farming			
	Small	Medium	Large	All	Small	Medium	Large	All
Irrigated Land	2.70 (1.0)	11.60 (9.5)	18.30 (65.3)	16.10 (75.8)	12.53 (7.9)	13.04 (15.0)	4.14 (5.0)	11.85 (27.9)
Dry Land	84.05 (31.07)	83.80 (68.95)	72.60 (258.11)	76.10 (358.13)	74.46 (46.94)	74.08 (85.2)	76.98 (93)	69.92 (164.64)
Grazing Land	7.85 (2.9)	1.50 (1.2)	0.10 (0.3)	0.04 (0.2)	2.54 (1.6)	0.80 (0.9)	0.66 (0.8)	0.17 (0.4)
Current Fallows	0.00 (0)	0.00 (0)	2.50 (9)	1.91 (9)	3.97 (2.5)	9.48 (10.9)	4.97 (6)	8.24 (19.4)
Permanent Fallow	5.40 (2)	3.00 (2.5)	6.50 (23)	5.84 (27.5)	6.50 (4.1)	2.60 (3)	13.24 (16)	9.82 (23.1)
Total	100.00 (36.97)	100.00 (82.15)	100.00 (355.71)	100.00 (470.63)	100.00 (63.04)	100.00 (115.00)	100.00 (120.8)	100.00 (235.44)

Based on primary survey

Note: Figures in the parantheses is the land area in acres.

Land ownership was mostly with men. In the case of conventional farmers, in 70.66 percent of the households, men had land ownership and among organic farmers, it was 74.66 percent. Land ownership for women was seen mostly in case of small farmers

(17.78 percent) in organic farming, whereas in conventional farming it was seen in both small (20.59 percent) and medium (23.53 percent). In case of 14.67 percent of the sample HHs of organic farmers, there was joint ownership whereas it was 13.34 percent in case of conventional farmers (Table 4.13).

Table 4.13: Land Ownership of the Sample Households (percent)

	Conventional Farming				Organic Farming			
	Small	Medium	Large	All	Small	Medium	Large	All
Owned by Men	70.59 (24)	70.59 (12)	69.57 (17)	70.66 (53)	75.55 (34)	79.20 (19)	50.00 (3)	74.66 (56)
Owned by Women	20.59 (7)	23.53 (4)	4.35 (1)	16.00 (12)	17.78 (8)	0.00 (0)	0.00 (0)	10.67 (8)
Owned by Both	8.82 (3)	5.88 (1)	26.08 (6)	13.34 (10)	6.67 (3)	20.80 (5)	50.00 (3)	14.67 (11)
Total	100.00 (34)	100.00 (17)	100.00 (24)	100.00 (75)	100.00 (45)	100.00 (24)	100.00 (6)	100.00 (75)

Source: Based on primary survey

Soil Type

The soils of the study area varied from deep black cotton soils to light sandy soils. It is observed that not only the kind, but also the depth of soils influences soil fertility. Generally, it is seen that soils with greater depth are more fertile than shallow soils. It is evident from Table 4.14 that the majority (63.21 percent) of the soils owned by conventional farmers are red soils (yerra nela), followed by 18.87 percent red sandy soils (thella nela). Among organic farmers, 57.61 percent had yerra nela followed by 35.87 percent thella nela. Black soil was more with conventional farmers (10.38 percent) as compared to organic farmers (3.26 percent). There were small proportions of saline soils among conventional farmers (4.72 percent) and organic farmers (2.18 percent).

Cropping System

Farmers of dry lands have developed diversified cropping systems. Crops that were developed over centuries were specifically bred to suit the changes in rainfall pattern from year to year. The short and long duration varieties, water tolerant and drought resistant varieties, etc., that were developed were the result of this careful planning over centuries by farming communities. Intercropping, mixed cropping, relay cropping and

multi-tiered cropping were the strategies adopted by the sample farmers and were highly relevant. By doing so the farmers could balance food and cash crops, along with the fodder needs of their animals and simultaneously manage the fertility of their marginal soils (Pionetti and Reddy, 2002).

Table 4.14: Size-class-wise Distribution of Sample Households according to their Soil (percent)

Type of Soil	Conventional N=106 Plots				Organic N= 92 Plots			
	Small	Medium	Large	All	Small	Medium	Large	All
Red Soil (*Yerra Nela*)	82.86 (29)	54.17 (13)	53.19 (25)	63.21 (67)	60.00 (30)	55.17 (16)	53.85 (7)	57.61 (53)
Red Sandy Soil (*Thella Nela*)	11.44 (4)	29.17 (7)	19.15 (9)	18.87 (20)	32.00 (16)	44.83 (13)	30.77 (4)	35.87 (33)
Sandy Soil (*Isuka*)	2.85 (1)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
Black Soil (*Nallaregadi*)	0.00 (0)	4.16 (1)	21.28 (10)	10.38 (11)	6.00 (3)	0.00 (0)	0.00 (0)	3.26 (3)
Saline Soil (*Chowdu*)	0.00 (0)	8.34 (2)	6.38 (3)	4.72 (5)	0.00 (0)	0.00 (0)	15.38 (2)	2.18 (2)
Soils with Seepage (*Jowyku*)	2.85 (1)	0.00 (0)	0.00 (0)	0.94 (1)	2.00 (1)	0.00 (0)	0.00 (0)	1.08 (1)
Others	0.00 (0)	4.16 (1)	0.00 (0)	1.88 (2)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
Grand Total	100.00 (35)	100.00 (24)	100.00 (47)	100.00 (106)	100.00 (50)	100.00 (29)	100.00 (13)	100.00 (92)

Source: Based on primary survey

Table 4.15: Cropping System adopted by Sample Households (percent)

Cropping system	Conventional N=106 Plots				Organic N= 92 Plots			
	Small	Medium	Large	All	Small	Medium	Large	All
Dry Sown Paddy	0.00 (0)	0.00 (0)	21.28 (10)	9.43 (10)	4.00 (2)	0.00 (0)	23.08 (3)	5.40 (5)
Groundnut	11.43 (4)	8.32 (2)	10.64 (5)	9.43 (10)	2.00 (1)	0.00 (0)	0.00 (0)	1.10 (1)
Groundnut + red gram	62.86 (22)	25.00 (6)	27.66 (13)	38.68 (41)	16.00 (8)	10.34 (3)	30.77 (4)	16.30 (15)
Groundnut + red Gram + Cow pea + border crop of jowar/Bajra/korra	11.43 (4)	4.17 (1)	17.02 (8)	12.27 (13)	52.00 (26)	51.72 (15)	7.69 (1)	45.70 (42)
Groundnut + red gram with strip cropping of *korra*	0.00 (0)	4.17 (1)	0.00 (0)	0.94 (1)	0. 00 (0)	0.00 (0)	0. 00 (0)	0. 00 (0)
Groundnut + Bajra	0.00 (0)	4.17 (1)	0.00 (0)	0.94 (1)	2.00 (1)	6.89 (2)	7.69 (1)	4.30 (4)
Red gram + Green gram	0.00 (0)	4.17 (1)	2.12 (1)	1.89 (2)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
Green gram	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	3.45 (1)	0.00 (0)	1.10 (1)
Jowar	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	2.00 (1)	0.00 (0)	0.00 (0)	1.10 (1)
Others	14.28 (5)	50.00 (12)	21.28 (10)	26.42 (28)	22.00 (11)	27.59 (8)	30.77 (4)	25.00 (23)
Grand Total	100.00 (35)	100.00 (24)	100.00 (47)	100.00 (106)	100.00 (50)	100.00 (29)	100.00 (13)	100.00 (92)

Source: Based on primary survey

Despite the constant encouragement for monocropping by the agricultural extension agencies and private seed, pesticide and fertilizer companies since the past three decades, farmers still follow intercropping and mixed cropping, as they realizing merits of such cropping system (Table 4.15). The adoption of this practice needs seeds of required quantities of diverse crops that are grown in the field. Just like crop rotation, this too has been a significant practice from the farmers' perspective in maintaining soil fertility management and managing crop pest.

In conventional farming, among all size-classes, 40.56 percent was mixed cropping followed by monocropping (29.25 percent) and intercropping. Among the sample households of organic farming, 66.30 percent are following mixed cropping followed by strip cropping(15.22), monocropping (11.96 percent) and intercropping (6.52 percent). Farmers value such diversity since it provides greater protection against the risk of crop failure (Scoones, 2001 and Reddy 2010). The reasons given by farmers for crop diversity include access to diverse and nutritive food to the family members, availability of different kinds of fodder to feed the livestock, improvement in soil fertility, and effective utilization of farmland and to make sure that under no conditions of unfavorable environment and climate, the whole crop is lost.

Table 4.16: Size-class-wise Distribution of Sample Households according to Cropping System in *Kharif* 2008-09 (percent)

Cropping method	Conventional				Organic			
	Small	Medium	Large	All	Small	Medium	Large	All
Monocropping	14.28 (5)	29.17 (7)	42.55 (20)	29.25 (31)	8.00 (4)	6.90 (2)	38.46 (5)	11.96 (11)
Intercropping	42.87 (15)	25.00 (6)	14.89 (7)	26.42 (28)	8.00 (4)	3.45 (1)	7.69 (1)	6.52 (6)
Mixed Cropping	37.14 (13)	41.66 (10)	42.55 (20)	40.56 (43)	60.00 (30)	82.76 (24)	53.85 (7)	66.30 (61)
Strip Cropping	5.71 (2)	4.17 (1)	2.12 (1)	3.77 (4)	24.00 (12)	6.89 (2)	0.00 (0)	15.22 (14)
Grand Total	100.00 (35)	100.00 (24)	100.00 (47)	100.00 (106)	100.00 (50)	100.00 (29)	100.00 (13)	100.00 (92)

Source: Based on primary survey

By practising inter/mixed cropping, the farmers combine crops with varying lengths of root depth, thus avoiding competition for space, moisture and nutrients. In mixed cropping system, root diversity at different levels below the ground physically stabilises soil structure against erosion and soil movement on steep slopes, and in tropical systems, the contribution of roots to soil organic matter is proportionately larger than from inputs above the ground. The effects of roots on the biophysical properties of the soil are particularly critical in farming systems where crop residues are at a premium for fuel and fodder. Earthworms, other soil fauna and micro-organisms, together with roots of plants and trees, ensure nutrient cycling; pests and diseases are kept in check by predators and disease-control organisms, as well as by genetic resistances in crop plants themselves; further, insect pollinators contribute to the cross-fertilisation of out crossing crop plants.

The natural process of biological nitrogen fixation by roots constitutes an important source of nitrogen for crop growth. It therefore provides a major alternative to the use of commercial nitrogen fertiliser in agriculture. Intercropping/mixed cropping safeguards against total failure of the crops during unfavourable climatic conditions and can help to increase production and income on dry lands (Singh, 1979).

While in monocropping system, the incidence of pest or spread of disease is easy as there is a single crop, the inter/mixed cropping system itself acts like a barrier to the establishment of pests, thereby reducing the damage. Moreover it becomes difficult for pests to locate food in the mixed cropping system. Interestingly, some of the crops in the mixed cropping system, simultaneously provide food for natural enemies of crop pests. So, more the variety of crops in a field, higher is the population of beneficial organisms which take care of pests. This helps to avoid use of pesticides.

Crop Rotation (*Panta Marpidi*)

Crop rotation is another tried and tested practice. Growing of different crops on a piece of land in a pre-planned succession is called crop rotation. Crop rotation is popularly known as *panta marpidi* among the farmers of Andhra Pradesh. Crop rotation ensures that the same soil nutrients are not used up by the crop every season. Crops which use different nutrients are grown alternatively to keep the nutrient balance in the plots. Farmers attach high value to this practice indicating the significant contribution of this practice to soil fertility maintenance since ages. Crop rotation itself does not involve any cost but involves the decision to change the crop every season in a particular plot.

Table 4.17: Crop Rotation in the Sampled Plots (percent)

Crop Changes	Conventional N=106 Plots				Organic N= 92 Plots			
	Small	Medium	Large	All	Small	Medium	Large	All
Crop Rotation Followed	11.43 (4)	16.67 (4)	40.43 (19)	25.47 (27)	56.00 (28)	55.17 (16)	38.46 (5)	53.26 (49)
Crop Rotation not Followed	88.57 (31)	83.33 (20)	59.57 (28)	74.53 (79)	44.00 (22)	44.83 (13)	61.54 (8)	46.74 (43)
Grand Total	100.00 (35)	100.00 (24)	100.00 (47)	100.00 (106)	100.00 (50)	100.00 (29)	100.00 (13)	100.00 (92)

Source: Based on primary survey

The farmers expressed that if the same crop is grown continuously on the same patch of land it cannot produce good yield. They have been advised by their elders that crops have to be rotated in order to maintain the fertility of soils. Thus farmers not only grow crops, but also take care of soil and its fertility. Compared with monoculture cropping practices, multicrop rotations with two or three crops in a year can result in increased soil organic carbon content (Purakayastha *et al.*, 2008). This is because of addition of large amount of biomass in the soil, both above as well as under the ground. Such crop planning is practiced in dry land regions. The complexity and diversity of such micro-environments created by farmers are often undervalued (Chambers, 1995). Table 4.17 clearly reveals that crop rotation is more (53.26 percent) in organic farming as compared with conventional farming, where crop rotation is followed in only 25.47 percent of the total sampled plots.

Soil Sample Analysis

Focused group discussions with organic farmers in the study villages revealed that the fertility of their soils has improved. They came up with several indicators to support their statements which are discussed in the subsequent chapter. Keeping this in view, a soil sample analysis was taken up to assess the impact of organic manures on soil fertility after shifting from conventional farming to organic farming. Two soil samples each from organic and conventional farmers were selected randomly from the 8 study villages. The samples drawn from organic plots and inorganic plots were not from the same farmer. An attempt was made to compare the changes happening in the chemical properties of soils where organic agriculture and conventional agriculture is being followed. The soil samples were taken from the 0-30 cm depth. Soil test data from 16 organic plots and 16

conventional agriculture fields, which are 3 to 5 acres in size, were analyzed for changes over time in soil chemical properties such as organic carbon and available soil nitrogen, as these two are generally considered as the index of soil fertility. The soil samples were analysed at the Regional Agriculture Research Station, Warangal, of Acharya N.G. Ranga Agricultural University, under the guidance of Soil Scientist Dr. R. Uma Reddy. The results of the soil sample analysis are presented in Table 4.18.

Table 4.18: Chemical Properties of Soils in Organic Farms and Conventional Farms

S. No. of Farmer	Organic Farming		S. No. of Farmer	Conventional Farming	
	O. C (%)	Nitrogen (Kg/hect.)		O. C (%)	Nitrogen (Kg/hect.)
F1	0.81	401.41	F1	0.63	301.06
F2	0.80	388.86	F2	0.63	302.11
F3	0.80	338.69	F3	0.62	301.41
F4	0.76	338.69	F4	0.56	275.97
F5	0.76	331.42	F5	0.55	275.97
F6	0.74	327.47	F6	0.52	275.97
F7	0.74	302.79	F7	0.51	250.88
F8	0.73	235.87	F8	0.49	210.88
F9	0.72	234.70	F9	0.45	205.79
F10	0.68	225.79	F10	0.43	195.62
F11	0.63	213.25	F11	0.43	188.16
F12	0.63	200.70	F12	0.36	178.16
F13	0.62	188.16	F13	0.27	163.07
F14	0.60	188.16	F14	0.24	163.07
F15	0.58	188.16	F15	0.24	151.53
F16	0.40	175.62	F16	0.16	150.23

Source: Based on soil analysis results.

It is seen that the organic manuring practices adopted by the organic farmers has led to gradual improvement in soil fertility parameters such as organic carbon content and available soil nitrogen. It can be seen from Table 4.18 that organic carbon of conventional farming plots ranged from 0.16 to 0.63% whereas in organic farming plots, it ranged between 0.40 and 0.81. This can be attributed to the application of organic manure for the past three years since their shift to organic farming. Similarly, the available soil nitrogen is more in case of organic farming plots ranging between 175.62 and 401.41(kg/ha), whereas this is lesser in conventional farming plots - ranging between 150.23 and 301.06 (kg/ha).

Because a large amount of completely decomposed organic manures (low C : N ratio) added to the soil continuously for two to three years (in Anantapur, single crop a year) organic carbon content of soil is seen to increase, because of which the population of micro-flora is also increasing - organic manures provide a readily available source of carbon for the micro-organisms in the soil, particularly heterotrophs. The most important reactions which the micro-organisms carry out are decomposition of organic matter, synthesis of humic substances in the soil, transformation of nutrients and nutrient recycling in soil. The organic manures (residues), which undergo breakdown and transformation, are complex in nature, containing carbohydrates, proteins and other nitrogenous compounds lignins, fats, etc., in course of the microbial reactions; the soil is enriched with the dead tissues of organisms forming part of its organic matter. The whole process of decomposition of organic matter, mainly of plant origins, is due to the microbes.

Addition of organic manures helps in enriching the soil with available soil nutrients. Organic farming conserves soil fertility as it relies upon large-scale application of animal wastes, Farm Yard Manure, compost, crop rotation, crop residues, green manures, vermicompost and bio-fertilizers. All these lie in harmony with nature and also improve the structural status of the soil, leading to good soil compactness (soil compaction is the process of increasing dry bulk density of soil. In fact, it is not desirable, but in coarse textured soils, it helps in reducing hydraulic conductivity of soil, enhancing moisture conservation in soil, better seed germination), ideal bulk density, pore space and lessens the crust formation (high exchangeable sodium percentage, low organic content of the soil is also responsible for crust formation which is a serious barrier for seedling emergence in Anantapur soil) of the soil, but the degree of improvement depends upon the quantity and length of application of manure, the climatic conditions, and nature of soil. Application of organic manures also lowers input costs and enables the plant to show drought resistance. Organic farming is one of the important ways of maintaining soil health.

Per acre Expenditure and Income

An attempt is made to arrive at the per acre average income of total sample HHs in the year 2008-09. This was calculated by subtracting cost of crop production from gross income of agricultural produce. The analysis was done with respect to groundnut based cropping system.

Table 4.19: Average per acre Expenditure (in Rs.) of Sample Households during the Year 2008-09

S. No.	Item	Conventional Agriculture	Organic Agriculture
1	Seed quantity	2071	1989
2	Organic fertilizer value	374	619
3	Chemical fertilizer	328	0.0
4	Pesticide/Bio-pesticide	629	26
5	Human Labour	1603	1669
6	Bullock Labour	877	707
7	Machine Labour	259	112
	Total	6141	5122

Source: Based on primary survey

It is seen from Table 4.19 that the average per acre agricultural expenditure of the sample households practicing conventional agriculture is Rs.6141 and for those practicing organic agriculture it is Rs.5122. It can be clearly seen that there was a significant decrease in the expenses related to pesticide use and chemical fertilizers. The expenses on bullock labour were slightly lesser in organic farming. This could be due to the slightly lesser usage of bullocks due to lesser livestock population (especially cows and bullocks) available with organic farmers. The same was revealed by the farmers in the focused group discussions. The expenses on seed were nearly same in both types of farming.

Table 4.20: Average per acre Income (in Rs.) of Sample Households during the Year 2008-09

S. No.	Item	Conventional Agriculture	Organic Agriculture
1	Grain yield	1585	1219
2	Fodder yield /Stacks/Bundles	361	382
3	Crop by-products	75	132
4	Uncultivated foods	51	191
	Total	2072	1924

Source: Based on primary survey

Table 4.20 reveals that the per acre income is quite less in both organic and conventional farming. The income is almost one-third of the expenditure incurred per acre. This is

mainly due to poor yields due to excess rain. The average yield of both organic and conventional farms ranged between 135 and 225 kg. It could be seen that the grain yield was less in the case of organic agriculture as compared with conventional agriculture. Similarly, the per acre income of sample households practicing organic agriculture was Rs.1924, which is lesser by Rs.148 than conventional agriculture. But it was revealed in FGDs that in the year 2007-08 the average yield of the sample households ranged between 450 and 675 kg. It was clearly reported by farmers that though the yields were slightly lesser in organic farms, the input costs were also much lesser in organic farms as compared with conventional agriculture. There is a scope for minimizing the economic cost and environmental loss under organic farming system as compared to conventional farming in the long run (Rajendran, 2002). Three years' experience of organic farmers revealed that despite slightly lesser yields in organic farms, the per acre net income was equal or more than conventional agriculture due to lesser input costs. This means that organic agriculture is more economically viable as compared to conventional agriculture. But it is difficult to conclude this with the empirical data obtained during the research period (2008-09). However, a series of focused group discussions with several organic farmers in 8 study villages clearly brings out the fact that despite a yield reduction of 15-25% in the initial years of shifting to organic farming, lesser input costs in organic farming makes it economically more profitable than conventional agriculture. Some farmers reported during FGDs that the yield in organic farms even in the initial years of shifting from conventional agriculture was no less. It is interesting to notice that the input costs incurred for pest management and fertility enhancement are considerably reduced for organic farmers. Though grain yield was less for organic farmers, the income from fodder, crop by-products and uncultivated foods was higher than in conventional agriculture. This could be due to the wider adoption of inter/mixed cropping systems by the organic farmers which resulted in higher availability of fodder, crop by-products and uncultivated foods.

Dharani Fam Co-op Ltd

Dharani Farming and Marketing Cooperative Ltd., (*Dharani FaM Co-op*), a producer owned cooperative, is an organic extension of the TIMBAKTU Collective's work with the dryland farmers in Anantapur Dist. While a marketing unit was established with the funds from Sir Dorabji Tata Trust, which helped cover costs of staff and marketing support, additional resources were raised from individual investors ("*Friends of Timbaktu*" and other collaborators) as interest bearing and noninterest bearing loans. One of the women thrift cooperatives *(Adisakthi MATCS)* promoted by the Collective, put in the initial capital for the venture. The total loans raised were invested in the development of the basic infrastructure necessary as the base for further work.

Adisakthi MATCS had initially taken the responsibility (during the year 2005-06) of marketing the organic produce of the small-holder farmers participating in the project. The business venture was called *"Adisakthi Dharani"*. However, in due course, the potential for a new producer owned cooperative was found. In 2007/08, after intensive discussions among the participating farmers, the directors of *Adisakthi MATCS* and the leaders of the Timbaktu Collective, it was decided that the participating farmers should form themselves into a producer owned cooperative. As a result, in April 2008, "*Dharani Vyavasaya mariu Marketing Paraspara Sahayaka Sahakara Sangham Ltd*" meaning "*Dharani Farming and Marketing Mutually Aided Co-operative society Ltd*" was registered under Andhra Pradesh Mutually Aided Cooperative Societies Act of 1995. *Adisakthi MATCS*, handed over the venture, including the assets and liabilities, to this newly formed cooperative. Thus the business venture called *"Adisakthi Dharani"* was renamed *"Dharani FaM Co-op Ltd"* with a new board of directors. Now it has a total membership of 890 farmers.

The primary intention of *Dharani FaM Co-operative Ltd* is to procure, process and market the produce of its farmer members, if possible at a premium price. It is hoped that more small-holder farmers will join the co-operative, be encouraged to grow food in a sustainable and organic manner and get the kind of returns they should be getting.

Basis For DHARANI Initiative

When the Collective started working with the farmers of Anantapur dist, there were certain areas that required immediate attention in order to relieve the farmers from their distress situation. The Collective felt that a producer owned processing and marketing venture would be able to address the following major issues.

Unavailability of Credit

Due to recurring drought conditions, most of the borrowers in rural areas of Rayalaseema region could not repay the loans borrowed earlier. In view of this, financial institutions kept those villages as de-faulted borrowers, included in the black list ceasing their chance of borrowing again. This had become a stumbling block to majority of the rural households in all the regions in the state particularly in Rayalaseema region. Consequently, the dependency on moneylenders and private financiers is again on the increase, leading to increase in the cost of production, unremunerative cultivation and increased indebtedness.

Exploitative Trading

An entire district of farmers specialising in one crop, has also significantly increased market risk for farmers. Private traders and groundnut processing mill owners, whose

pricing and weighing methods are at unfair terms, control much of the local market. These traders and mill owners often also couple as suppliers for farm inputs such as for seed, chemicals and credit to farmers. The relationship as a whole is exploitative and often leaves the farmer at the mercy of the trader/mill owner. With the entire local system tuned and built to support only groundnut, in terms of marketing, credit, inputs, production know-how or social support, the farmer is forced to go back and continue growing groundnut, but only to further sink in the mire.

Trade policies and increased market risk

The purchase price of groundnut has also been affected by policies relating to oil imports and trade. Imported *Palm oil*, now sells at much lower price than that of groundnut oil. The local groundnut purchase price is also affected by the situation in Maharashtra-Gujarat (which are other major groundnut producing regions) and bigger traders up the value chain, which only further exposes the Anantapur farmer to greater market risk.

No access to the growing Organic food market

The Organic food market is growing at a healthy rate of 15-25% worldwide. In India too, the awareness for organic and healthy nutritious food is on a constant rise. Much of the organic food grown today in India, as well as the organic guarantee systems developed, are focused on export markets in European Union, United States and Japan. Small-holder farmers have neither direct access to this growing market and nor do they benefit from its added margins for lack of proper infrastructure and the requisite technical and marketing ability.

Relevance Of DHARANI FAM Co-op LTD

Dharani FaM Co-op Ltd., was thus established to play a greater role in addressing these issues. As a producer owned business enterprise, it can ensure its membersbetter and fair price for their produce by linking to the market. Linking the farmer members to the growing organic market will add to the direct returns of the farmer members. Provision of cultivation loans through the co-operative will also reduce the debt burden of the farmers, at least to the extent of relieving them from the clutches of the local moneylenders / traders. Farmers are also entitled to share the profit of the co-operative once it crosses the break-even point. In addition to regular crop loan distribution and procurement process, the other activities of cooperative include processing and value addition, preparation of promotional materials, creating rural and urban market linkages for organic produce, brand building, setting up a website, certification and capacity building of directors.

DHARANI FAM Co-op So Far

Though *Dharani FaM Co-op*, in its present form, is only one year old, the marketing related activities have been carried out for more than three years. As explained earlier, the women's thrift cooperative, *Adisakthi MATCS*, was anchoring the business venture under the name '*Adisakthi Dharani*'. The achievements of *Dharani FaM Coop* elaborated here also include the '*Adisakthi Dharani*' era of the same venture. The collective strength of farmers has managed to do various things. These include raising funds towards working capital and fixed investment, organizing the legal clearances required for running a business venture, procuring crops from the farmer members, organizing storage space for agricultural commodities, raw materials and finished goods., processing, certification process, networking and brand building and financial summary of marketing operations

Chapter 5

Organic Farming: Farmer's Perceptions

The present study, in addition to the quantitative data through household interviews, also tried to understand the farmers' perception - especially the women's - regarding the various aspects related to the organic farming. These include reasons for shift to organic farming, yield reduction during conversion, improved health due to organic farming, importance of livestock for organic farming, food habits of the organic farming families, access to uncultivated foods in organic farms, advantages of marketing by Dharani Cooperative and marketing issues involved and advantages of organic farming. In addition to these things, the farmers clearly brought out the impact of organic farming on soil, human beings and livestock. In this chapter, we also discuss whether the farmers will continue organic farming after the TIMBAKTU withdraws its support, and the visible impact of organic farming on other farmers in the village. Finally, a few important suggestions given by the farmers for easy spread of organic farming is also discussed in this chapter.

Activities Supported by TIMBAKTU

The farmers who have taken up organic farming were supported by the NGO TIMBAKTU by way of providing various inputs. These initiatives helped the farmers to reduce their input costs and also obtain the sustained yields. The major support extended to the farmers by TIMBAKTU is as follows:

1. Support for collection of cow urine (*ganju*): The farmers were provided with big wide flooring stones to lay in the cattle shed so that the urine passed by the animal does not sink into the soil. A small pot-like vessel (*thottilu*) is fixed in the ground in one corner, wherein the urine is collected. This urine forms an important input for the preparation of *jeevamrutham*, an organic fertilizer.
2. Provided the sprayer.
3. Support for taking up soil and moisture conservation works.

4. Supply of neem oil.
5. Provision of neem cake.
6. Provided the seeds of fox tail millet, cow pea, jowar and castor.
7. Financial support for crop harvesting.
8. Support for marketing organic produce.
9. Training through farmers' field school.

Organic Farming Practices

Since organic farming warrants cultivation in the absence of agro-chemicals, it involves a careful selection of components of the farming system keeping in view of the local resources, agro-climatic features and socio-economic structure. The following organic practices are being followed by the organic farmers for cultivation of their crops:

1) Varietal Diversity:

Varieties which are hardy and capable of withstanding pests and diseases are preferred. Local varieties have found a prominent place along with the introduced varieties which were performing well in the local farming conditions. The following table provides information related to the varietal adoption and diversity in each crop.

Table 5.1: Details of Varietal Adoption of crops grown by the Sample Farmers

Crop	Variety Used
Groundnut	Small bunchy type (*Chinna Gutti*), TMV1, TMV2, JL-24 and Local Groundnut.
Red gram	Local and LRG 30.
Korra	Local and Sri Krishna Devaraya.
Jowar	Local and high-yielding varieties.
Bajra	Local and *ravi.*
Cow pea	Local.
Horse gram	Local.
Sesame	Local.
Castor	Local.
Green gram	Local.

Source: Based on Primary Survey

2) Seed Treatment

Organic farmers followed different seed treatment methods; some of them are discussed here. Prior to shifting to organic farming, the farmers adopted seed treatment with Dithane M-45 which costed Rs.75/acre. However, now the seed treatment costs Rs.50 or less. The farmers also use, in addition, a mixture of neem oil (250 ml) + ash (500gms) + asafoetida (20gms) is used. The farmers revealed during focused group discussions, that because of the smell of asafoetida, the problem of wild pigs was controlled to an extent. The smell acts a repellent. In Kondapuram Village, seed treatment is done using a mixture of cow urine + neem oil + ash. This helps to control the root grub (*veru purugu*).

3) Manuring

To achieve economical production, the fertility of the soil has to be maintained and gradually improved. Improvement and maintenance of organic matter of the soil is important, as this would increase the physical parameters of the soil, improve soil structure and enhance nutrient supply. Since the huge amount of FYM that is required to meet the nutrient requirement of the crops is not available, a combination of sources with different biological properties is used. These include *jeevamrutham*, tank silt, sheep manure, sheep penning, neem cake, biofertilisers, green leaf manuring, green manuring, *panchagavya* and vermicompost

a) Farm Yard Manure (FYM)

A wide range of organic inputs are being utilised by farmers, among which FYM is the major fertility-enhancing input. It has been the principal means of replenishing soil losses since ages (Butterworth *et al.*,2003 and Reddy 2010). Typically, organic inputs require transport as well as labour-intensive processing to provide nutrients in the right quantities and form. Importantly, these materials are valued by farmers for properties other than just providing nutrients. This includes the ability of soils to hold and provide water and nutrients for crops.

Farm yard Manure is usually a combination of manure and various wastes and crop residues. It is derived from cattle, goats, sheep, and (to a lesser extent) poultry. Besides adding nutrients, FYM adds organic matter that improves soil structure (aeration and water-holding capacity) and other soil properties. Farmers are aware of these benefits and listed them side by side with soil nutrient aspects. This clearly shows the farmers' holistic understanding of soils, whereby yield is seen as a function not only of nutrient availability in the soil, but also other physical and biological properties of the soil.

b) *Jeevamrutham*

This is made from a mixture of sieved FYM powder (200 kg), cow pea (2 kg), jaggery (2 kg), red gram or horse gram flour (1 kg), cow dung (10 kg), cow urine (20 litres). All the materials are soaked in a tin for a week and the contents are stirred once in the morning and evening. This liquid is added to the FYM powder and is stored in dry shade. *Jeevamrutham* is made in such a way that it is ready for application in season or can be made in advance and stored in a place. Speaking about its effect, farmer Kondappa of Kondapuram Village says, "DAP *kanna yekkuva* power *choopisthadhi, Inka* DAP *vesthe varsham rakunte vadi pothadhi. Adhe jeevamrutham ayithe vadipodhu*" (This is more powerful than DAP).

c) Vermicompost

Vermicompost is a newly-introduced practice that is spreading rapidly. While there are different methods of making the compost bed and different types of worms used in the process, the overall principle is the same. By decomposing the organic matter, nutrients are more easily available to the micro-organisms in the soil and therefore, ultimately to plants. Depending on the temperature, humidity and nature of the organic material, the process takes several weeks. Nutrient composition of the vermicompost varies with the substrate that is vermicomposted, but generally contains several diverse micro-flora that aid in good plant growth. The resulting fine-grained compost can be applied before sowing, or as top-dressing after germination.

d) Biofertilisers

Seed inoculation of Azatobactor, Rhizobium and Azospirillum is done so that it helps in nitrogen fixation.

e) Green Manuring

Green manures are fast growing species that are ploughed back into the soil before the crop matures. The decomposing green manure improves soil organic matter and makes nutrients available for following crops.

4) Intercropping/Mixed Cropping

The principle is the same as that in crop rotation, but this is done at the same time and space so that an adjoining crop replaces the nutrient extracted from the soil by one crop, maintaining the nutrient balance. The adoption of this practice needs seeds of required quantities of diverse crops that are grown in the field. Just like crop rotation, this too has been a significant practice from the farmers' perspective in maintaining soil fertility management and managing crop pest.

5) Selection of Crop Rotations

Crop rotations play a very important role in restoring soil fertility and minimizing damage due to insect pests and weeds. Legumes that fix nitrogen are typically intercropped or included in rotations. Crops in the study villages include groundnut, red gram, cow pea, horse gram and green gram.

6) Pest Management

Crop protection to reduce damage due to insect pests to organically grown crops revolves around the use of non-pesticidal management of pests which include cultural, mechanical and biological control methods. Bio-pesticides are used to control the pests. All these methods help to build up a population of natural enemies of crop pests and play a prominent role in pest management.

a) Pest Control in Groundnut haulms

The pest *Noomalli* which attacks the groundnut haulms in storage is controlled by spreading green grass around the stack at a distance of two meters all around. By the next day morning *Noomalli* is seen on this grass which is then collected and thrown away at a distant place. Similarly, neem seed kernel extract helps in controlling '*aaku mudatha*' and '*paccha purugu*'. Seed treatment of Trichoderma and Rhizobium is done to avoid bud necrosis.

b) *Pancha Patra Kashayalu*

Instead of pesticides, organic farmers are using leaf extracted decoctions (*kashayalu*) along with neem seed kernel extract. *Pancha patra kashayam* is one such extract being used by organic farmers. It is made out of a mixture of two kilograms each of neem + pongamia + calotropis + *Vitex Negunda* + custard apple plant leafs. A paste is made out of these and is soaked in 50 litres of cow urine for a period of 15 days. Then it is filtered and for one can of sprayer water, 1 litre extract of these leaves is mixed and sprayed on the field. Hitherto farmers used to spend Rs.250-300 per acre for pesticides. Use of *pancha patra kashayam* now results in negligible cost; these leaves are available locally and the preparation process is within the control of the farmers. At most two person days are required for preparing this leaf extract (*kashayam*).

7) Soil and Moisture Conservation Works

Soil and water conservation measures to control runoff and erosion, are important to farmers. Erosion contributes to loss in soil fertility, especially as the organic and finest (and most fertile) soil fractions are susceptible. Soil and Water Conservation (SWC) works such as bunding to control erosion will therefore help maintain soil fertility.

Watershed development projects focus largely on soil and water conservation measures, usually physical structures and tree planting. Land configuration practices (such as tied ridges) in combination with improved nutrient management can also significantly improve productivity (Selvaraju *et al.*, 1999). Earthen bunding, stone bunding, stone clearing and diversion drains are the major soil and moisture conservation works.

Reasons for Shift to Organic Farming

Organic farmers followed traditional agricultural practices or conventional agricultural practices prior to shifting to organic farming. A combination of reasons encouraged the farmers to shift towards organic farming. The following reasons were revealed by farmers during the focused group discussions:

- In chemical farming the input costs have increased, while the soils are getting infertile ("*Dantlo yekkuva pettu badulu vasthunai, bhoomilo chedipothunnai*"). At this juncture, the NGO, TIMBAKTU created awareness among farmers about organic farming and extended all possible support. Another major advantage was that marketing of organic produce was taken care by TIMBAKTU.
- Weighing of produce is done accurately by Dharani Cooperative (*thookalu karektu*)
- The soils were becoming infertile due to chemical fertilizer use and hence the shift to organic farming ("*Mandhulu yeruvulu vesi bhoosaram kolpothunte*").
- Due to climatic changes, the crops were not yielding well, and soils were becoming infertile. ("*Kalamnu batti pantalu pandaka, bhoosaram kolpothunte*"). At this juncture, TIMBAKTU came forward with the idea of organic farming which attracted the farmers.
- Many farmers were interested in practicing organic farming but there was nobody to handhold them and support them ("*Janalaku idhi cheyyalani undhi, kani pattukoni cheyinche vallu leru*"). Fortunately, TIMBAKTU gave strong support including technical support through Farmer Field School.
- As the inputs were being given, the farmers felt that it would be good to go for organic farming ("*Mandulu, avanni isthunte baguntadhani vachinamu*"). Part of the inputs were provided by the NGO, while the others were organized by the farmers themselves ("*Konni vallu istharu, konni memu chesukuntamu*").
- This kind of organic cultivation belonged to their ancestors. Hence, they thought it would be good for them ("*Peddolla kalaniki sambandhinchindi kabatti cheyalante malli chesthunnam*"), and hoped that the input costs in farming would reduce ("*Pettubadi thakkuvaithadhani*")

- The chemical fertilizers are not giving strength to the soil. ("Government *sattuva vesthe bhoomiki pattu ledhu*").
- The application of chemical fertilizers is spoiling the fertility of the land, crop yields are coming down and health is getting affected. At this juncture the farmers wanted to reduce inputs costs, improve health and get remunerative price for their produce; hence, the farmers quickly accepted the idea of organic farming proposed by TIMBAKTU ("Government *yeruvulu vesthe, bhoomi karabu ayithundhi, panta dhigubadi ledhu* and *aarogyam chedipothundhi*").
- Despite application of more and more chemical fertilizers, the crop yields were not satisfactory and hence, the farmers decided to turn to organic farming hoping that it may increase the crop yields ("*Sattuvalesi lesi pantalu baga pandaledhu, sendriya sattuva vesthe pantalu baga panduthadhani anipinchindhi*").
- If we use only manure to grow crops the food we eat is more tastier ("*Swantha yeruvu thayaru chesukoni panta pandisthe annam baga untundhi thinaneke*"). Though the farmers were aware of the importance of growing things organically, they took it up only after TIMBAKTU gave them some inputs for cultivating the crop.

Yield Reduction during Conversion

Regarding the reduction in yields during the conversion from organic to inorganic farming, the farmers during the FGDs expressed that there was not much yield loss for those farmers who had earlier applied good quantities of FYM. For others there was a reduction of 25% yield during the shift to organic farming. When asked how they could cope with this yield loss, the farmers said, "*pettubadulu levu kabatti saripoyindhi*" (as the input costs have decreased, the net benefits were fine).

Improved Health due to Organic Farming

The farmers felt that stoppage of pesticide application had positive impact on their health. Some of the benefits listed by farmers during the FGDs are as follows:

- Hitherto on the day of pesticide spray to the field, the farmer could never sleep properly due to inhalation while spraying. Whereas now with bio-pesticide spray of neem seed kernel extract, there is no such problem ("*Inthaku mundu* pesticide spray *chesinanadu nidra unda kunde, kashayam kodithe yemi* problem *ledhu*").
- Earlier the farmers ate store rice which was not doing good for their health

("*Anni* store *biyyam ani antha arogyam levu*").

- Earlier it was loss of money on pesticides. Despite sprays, the crops got damaged and the pests were not controlled ("p*anta padaipothadhi, purugu podhu*"). Their health got spoiled and they had problems like itching ("*Mana arogyma kooda karabu, gulagula*, etc."). Today, even if a bag of neem cake is applied for controlling pests, their health remains unaffected ("*yapa chekka sanchettukoni sallu yemi kadhu*").

- Now as the supply of fodder also comes from organic farming fields, the health of cattle too is very good ("*Ippudu pashuvulaku kooda manchigundhi*"). Earlier, for the *Noomalli* (bug) pest they sprayed gamaxene (BHC) to fodder stacks. Now due to organic farming practices this is being not done. Due to this the livestock is eating "gamaxene-free fodder" and is keeping healthy. This can be clearly seen from the fact that the animals showed the following symptoms hitherto:

1. *Appudu daggedhi* (the animal use to cough)
2. *Paruthayi* (dysentery)
3. *Neerasanga undevi* (less energetic)
4. Feverish

Importance of Livestock for Organic Farming

Lack of livestock is an important constraint for organic farmers that affects manurial needs and timely agricultural operations. In study village Chinnapalli, more than 50% of the households do not have livestock among the organic farmers. "*Pashuvulunte sendriya vyvasaymku manchidi*", says Ramanjaneyulu of Chinnapalli Village (livestock is good for organic farming), "*Yedlu mana chethulunte yeppudu thema unte appudu dhunnukovacchu. Ade tractor ayithe vaniki* advance *icchi aagali*", says Chenraidu of the same village (if we own bullocks, we can plough the land whenever moisture is available in the land, but if we depend on tractors, we need to give advance to its owner and wait for him to come). By that time moisture in the soil may be lost and seed sowing cannot be taken up. Adding to this, another farmer says, "*Karthilo vanosthe yedlu lenollaki chala ibbandhi avuthundhi*" (if the first showers come on time, those who do not own bullocks will face difficulty in ploughing the land).

Another point made by the farmers was that the tractor owners have increased the per acre ploughing cost from Rs.450 to Rs.550, citing the hike in diesel prices. But now, though the diesel prices have come down, they have not yet reduced the prices. The table below shows how the cost of cultivation has increased in groundnut cultivation.

Table 5.2: Details of Increase in Input Costs in the Study Area

Particulars	Cost in 2008-09	Cost in the Previous Year (2007-08)
Wages	Rs.100-150	Rs.50
Tractor	Rs.500	Rs.300
Seed dibbling cost per acre	Rs.1000	Rs.500
Pair of bullocks	Rs.35,000	Rs.20,000

Source: Field study

Some of the farmers in Kondapuram say that due to lack of bullocks, the land preparation costs have gone up. Hence, people wanted cows and bullocks. Cows give *ganju* whereas bullocks can be used for ploughing. Farmers of Gantimarri, speaking about the importance of livestock for organic farming said, "*Maku avi lyakane thippalu*" (we face problems in organic farming due to lack of livestock). We need more support for livestock. The multiple benefits provided by livestock are listed below:

- Urine (*ganju*)
- Dung (*peda/yeruvu*)
- Milk (*palu*)
- Milk products
- Timely ploughing of the land can be done (*bhoomiki sedyam chesukovacchu*). If we depend on tractor for land ploughing, we plough only once instead of twice due to cost involved. On the contrary, if we have a pair of bullocks, we plough twice as the situation is under our control ("Tractor *tho ayithe rendu thoorlu kottinchukuntaru. Adhe yedlu unte oka thoori kottedi rendu thoorlu koduthamu*").

In Beedanpalli Village, a lot of sericulture activity is seen; mulberry crop is grown in a wide area. Hence, there is fodder scarcity in this village; whereas in Rachur Village, those HHs who have livestock after harvesting groundnut immediately sow jowar which supplies fodder to cattle. This is grown on the residual moisture left after harvesting the groundnut crop. In Venkatampalli, good livestock strength is present. It was found that for a household owning 5 acres, 6-7 livestock can take care of the manure needs and ploughing

needs of the farmer. In this village, 23 organic farming group members are there out of which 13 have livestock and these people share *ganju* (cow urine) with other members. Some households do not have the capacity to buy livestock. Green fodder is lacking in this village and farmers have to buy dry fodder for livestock.

In another study village, Kondapuram, most of the group members do not have livestock and they strongly needed support for livestock, especially for cow and bullocks. The organic farmers of this village said that due to *korra* and jowar cultivation, the fodder availability has increased and hence, more livestock can be maintained with the existing fodder resources. A typical organic farmer of this village produces 6 cart loads of groundnut hay + 4 cart loads of jowar + half cart load of *korra gaddi*.

Despite being aware of the value of livestock in farming, the farmers are unable to afford them. Even those who owned livestock had to sell them due to some compulsions, and are now unable to buy them again as they have to spend huge amount. "*Pashuvulu lekunte cheloki sendriya yeruvu padadhu*", says a farmer (if there is no livestock, there is no chance of adding organic manure to our fields).

Seed

In Chinnapalli Village, in the year 2007-08, farmers saved the seed. But this year (2008-09) the crop was not good and they could not save the seed. "*Thella nela loni* seed *panikiradhu. Adhe yerra nelaloni* seed *vadukovacchu vitthananiki*", says Suggapa (seed of the crop grown in light red soils is not suitable for sowing purpose, whereas the crop grown in red soil is good).

In Gantimarri, farmers saved the seeds last year (2007-08) as the yield was good. But this year, (2008-09) the produce quality was not so good and hence, they could not save their own seed. Due to this, they are looking for seed support next year from either TIMBAKTU or the Agriculture Department. Earlier, after rains the soil could retain moisture for only six days, but now, the moisture remains in the soil for up to ten days. So the farmers can take up sowing couple of days late. "*Vitthanam veyadaniki late ayina yemi kadhu*" (even if there is delay in sowing nothing happens).

In Shapuram Village too, there was no seed saved this year. "*Memu appu theesukuntamu kabatti, vitthanamku unchukokunda antha panta ammestham*", said a farmer (as we take loan, we cannot keep produce for sowing in the next season as we have to repay the loan). Since the last two years, farmers are purchasing the seed from TIMBAKTU. They charge an interest of Rs.1/month. Earlier the landlords and moneylenders used to charge Rs.2/month.

Interestingly, Rachur villagers said that they saved seeds. They saved 4-5 bags/acre this year. "*Aaridra lo vesinollu avutan manchiga unna vallu* seed save *chesukunaru*", said a woman (those who have sown early got healthy crop and could save seed for the next season).

Plants Taken up for Bio-Mass Development

Each organic farmer has planted 100 plants per five acres. About 50 percent survived in majority of the study villages. *Seema tangedu, vepa, chiguru chetlu, kanuga* and *chinta chetlu*. The farmers said, "*Aggi padithe kalipothai*" (the plants get burnt if it gets caught in fire). Informing the difficulties in protecting these crops, the women say, "*panta ayipothene mekalu, gorlu meputharu, avi thinakunna thokkesthai*". They felt that in order to protect these plants water supply and proper fencing is essential. Only in Venkatapuram Village, 10 farmers did not take up planting under the bio-mass development programme. The plants of all those who have planted are in good condition till now.

Food Habits of the Organic Farming Families

With the shift towards organic farming, there is a change in the food habits of many households, both in terms of type of food and its quantity. In fact, these foods used to find a prominent place in their food basket hitherto. The change is as follows:

1. Organic farming families eat *korra* rice at least 4-5 times in a year. Some of the households even consume 20-30 times in a year.
2. They are eating more quantities of *sajja* (bajra) and *jonna* (jowar). These crops they ate earlier too, but now they are eating in more quantities and more frequently. "*Appudu nelaku ledha padhigenu rojulaku okasari, ipudu varaniki okasari*".
3. The health of the family members of the organic farming households has improved. The indicators as expressed by them are:

- *"Appudu vollu noppulu" (earlier we had body pains)*
- *"Padhi rojulakokasari davakhanaku povatledhu"(we are not seeing a doctor once in 10 days as we did earlier).*
- *The taste of food grown organically is good.*
- *Good quality cooking oil is being provided from Dharani which keeps us healthy.*

In study villages like Kondapuram, the farmers said that they are keeping one-third of the total millet crop produced for consumption and the remaining is being sent to the market.

Advantages of Marketing by Dharani Cooperative

- Last year(2007-08) in TIMBAKTU marketing, the price was fixed based on weight; whereas this year, it is fixed as per the general market rate. No problem with groundnut traders in the open market (*Vyaparagalla badha ledhu)*. The traders in open market deceive us, whereas the TIMBAKTU weighing is correct (*Vyaparasthulu thookam yekkuva theesukuntaru*, TIMBAKTU *thookalu* correct).

- Assured market price (*Kacchithamaina* market). Last year 5% more price was given than the market price. This year(2008-09) the same price as market was given.

- People are in need of money during the weeding stage. As they get financial support from traders, they are forced to sell back the produce to traders and in the process get exploited. In the open market, they lose nearly 8 kg of produce for each bag of groundnut. This is a huge loss. So for each acre on an average the yield is 20 bags. Calculating 8kg/bag it comes to160 kg, which is worth value of almost Rs.2500-3000. During the groundnut season, if financial support is provided for weeding, the farmers will be relieved of traders, and hence, this 8 kg loss per bag to private traders in market can be avoided.

- After harvesting, the produce is picked up within a week. Cash is paid quickly, deducting the amount supported for the soil fertility enhancement ("*sattuvalaku icchindhi pattukoni thondaraga isthamu*"). Hitherto, the traders used to take 15-30days for making the payment for the produce sold. Cash is given fast as compared to open market.

- Dharani Cooperative farm provides loans for seeds and during harvest.

An amount of Rs.1200 per acre is given to each farmer for purchase of seed. Similarly, Rs.1000 per acre is given to each farmer for crop harvesting. The loans are given at an interest rate of 1%, whereas if taken outside it will be 5%. The main requirement of the small farmers during the changing times is better access to capital and education (Singh, 2009).

Marketing Issues

Organic farmers have brought out some issues involved in marketing of their organic produce. Crops such as red gram have to be picked up quickly as there may be chances of attack by storage pests. Hence, they have to be lifted from farmers immediately and taken to the mills for making *dal*. If taken late, the stored grain is attacked by pests.

"*Rashi cheyagane pappu cheyali*" says Pallakka (after harvesting, red gram must be converted immediately into *dal*). Those who harvest the pigeon pea first have to wait till the other farmers harvest their produce. But such produce is in the danger of attack from pests during storage and hence needs to be picked up soon. But unless a substantial quantity of pigeon pea is available, Dharani Cooperative will not come to pick up the produce. The produce is picked up only after at least five farmers harvest their produce. As they have so many villages it is a problem for them too. TIMBAKTU is also aware of this.

In the study villages, it was told by organic farmers that even after the three years project period, if grown organically, TIMBAKTU is willing to buy their produce and the farmers too are willing to sell them their produce.

Box 5.1: Buying Procedure of Dharani FAM Cooperative

Crops grown organically are purchased from organic farmers belonging to 15 *sanghas* of eight villages. Groundnut crop grown in 3 acres of organic farm is purchased from these farmers. This year 5 bags were procured from each farmer from a total of three acres of organic farm. The quantity procured including bag weight is 42 kg, but the money was paid for 40 kg. For purchase of the produce from farmers, the moisture content of the groundnut crop should be less than 7%. The market price of the crop on the day of procurement of the produce is taken as the basis for deciding the price (*Aaroju unna* local market *dharatho konugollu*). The crop is purchased on a group-wise basis. The directors of Dharani decide the villages and timing to be procured. "*Vitthana runalu, panta kotha runalu, konugolu samayam lone appulu chellinchali*", says Pushpa, the co-ordinator of the programme (the farmer has to repay the amount taken for the purchase of seed and crop harvesting at the time of selling the produce). The loan taken for seed purpose and for harvest of the crop has to be settled while selling the produce to Dharani Cooperative which extends loans to them).

Source: Field study

Advantages of Organic Farming

Based on their experience in organic farming, farmers have cited several advantages during the focused group discussions. The perceived advantages of organic farming as expressed by farmers are

- "*Aarogyam baguntundhi, pashuvula aarogyam baguntundhi*" (our health is good, so is the health of livestock).
- "*Inthaku mundu raithulam allakallolum ayinam*" (earlier, during chemical farming, the farmers' life was totally disturbed).
- "*Thakkuva pettubaditho yekkuva labham*"(more profits with lesser input costs). More dependence on local resources.
- "*Bhoomilo marpu kanapaduthunnadi, bhoomi sallavuthunnadhi*" (we can see the change in soil, it is becoming fertile). The application of chemical fertilizers kills the soil life ("Chemicals *vesthe sookshma jeevalu chasthai*"). "*Bhoomi inthaku mundhu katika barindhi, ippudu methaga ayyindhi*" (earlier, the soil was becoming hard whereas now it is becoming loose).
- "*Thema yekkuva pattukoni vuntundhi, dhintlo chettu baga abhivridhi avuthundi*" (the soil is holding more moisture, resulting in good plant growth).
- "*Rasayana yeruvu vesthe chekka kattu kuntunde, ippudu sallavuthundhi*"(application of chemical fertilizers resulted in formation of hard pans; now in organic farming the soil is becoming loose).
- Now it is mixed cropping, crop rotation, and border crops within the field.
- 25 years back we ate *korra*, *sajja*, *sama*, *jonna*, *aarkalu*, *ragulu*, *vulvalu* and *sankati*. "*Avanni thinnapudu manishiki kayilalulevu*" (when we ate all these food crops, we did not have any health problem). Again now, we are eating crops like *korra(foxtail millet)*, *sama(little millet)*, *sajjalu(bajra)*, *jonna(jowar)* and *ragi(finger millet)*.
- Earlier, pests attacked despite pesticide sprays. Hence, we lost hope returned to organic farming. There is not much pest problem now, except that there is problem of "*nalla cheema*"(black ants) which eats up *pootha(flowers)*. "*Mana me chesukoni kashayalu kottukuntamu*" (we prepare our own bio-pesticides and use in farming).

- Now due to organic farming, we are saving Rs.600/acre which was spent earlier for each spraying of pesticide. As each farmer is doing organic farming in three acres, we are saving nearly Rs.1500-2000 in the area of pesticide spraying. Those who could not buy the pesticide left the crop like that. As we are collecting neem seeds and spraying Neem Seed Kernal Extract (NSKE), it is within our hands and the cost is very low. Some farmers are buying neem oil @Rs.20/litre. The farmers also said that they are also using neem leaf extract mixed with *ganju*.

- Good yields. In Beedanpalli village, one of the farmers who have sown 250 gm of *korra* got a yield of one quintal.

- It was expressed by farmers that after switching over to organic farming, the occurrence of weeds is found to be lesser when compared to earlier methods of conventional agriculture where chemical fertilizers were applied. The labour requirements also vary for weeding. Hitherto in conventional agriculture, 6-8 persons were required per acre after two inter-cultivation operations with *dhante*. However, now in organic farming, only 4-6 persons are required after two inter-cultivation operations with danthe. The wage rate is Rs.100-120 per woman/day. However, in Venkatampalli, the farmers could not tell decisively whether the requirement of manual labour has increased due to organic farming. the farmers said, that it varies from field to field.

- "Government *yeruvu kone pani ledhu*" (no need to buy chemical fertilizers). We need not go out to town from village for bringing the inputs. We can save on input costs of chemical fertilizers(Government *mandulu dudlu migulu baduthai).* Earlier we spent Rs.500 per acre as fertilizer cost in conventional farming, whereas now under organic farming, we use *podi jeevamrutham* which costs around Rs.200/acre and is more effective than DAP. Now, access to enough manure.

- One of the farmers said, "*yekuva thema lo vitthanam vesthe panta yerraga vasthindhi*" (if sowing is done under too much moist conditions, the crop looks reddish). After the shift to organic farming, "*Rendu nallu varsham lekunna thattukuntundhi*" (the crop withstands moisture stress for a couple of days more).

- "*Innallu unde bhoomiki, ippatiki vere rakam ayyindhi*" (the soil we see at present is looking different from that earlier - it is looking better).

- "*Dunninappudu melu chese yerralu kanipisthai*" (While we ploughed, we could see the earthworms' ecological benefits).

- "*Thema ippudu varaniki gani untundhi, appudu ayidhu rojulu untunte*" (the soil moisture is retained for 10 days now, earlier it was for only 5 days).
- "Market *thookalu* correct" (the weighing done by Dharani Cooperative is correct).
- "O*ka mootaku rendu kejilu vallu theesukuntannaru*", the Dharani people take only 2 kg/bag, whereas in the open market they used to take around 6-8 kg/bag.
- "*Aa roju market yemi unte adhe*" (this year the rate was fixed according to the rate in the open market on that day). The price varies between Rs.2030-2100.
- Earlier, there were more input costs. After shifting to organic farming there are less input costs and no exploitation by traders. We send the produce to Dharani.

Impact of Organic Farming on Soil

- The soil became smooth *(Methagga ayyindhi)*.
- The colour of the soil has changed (*Bhoomi* colour *marindhi*).
- The soil, while ploughing, is very loose (*Mannu dhunne tappudu* loose *ga untundhi*).
- The root grub was controlled due to application of neem cake. (*Vepa chekka vesthe veru purugu thakkuvaindhi*).
- In Gantimarri, the farmers reported that after organic farming the moisture retention increased from 2-3 days to 6-7days. During this time seed can be sown.
- The manure effect lasts for 2-3 years compared to chemical fertilizers, "giving more strength to soil".
- More earthworms could be seen in organic farms where as they could not been seen in the chemical fertilizer fields (*Sendriya vyavasayam chese sendlo yerralekkuva kanipisthunnai, pakkana mandhulu vese dantlo levu*).

Availability of Uncultivated Foods/Weeds in Organic Farms

The assessment of prevalence of weed presence in organic and conventional farms reveals that in organic farms, "*china gaddi*" (grass with small growth) is seen. This does not affect the crop much. On the other hand, in conventional chemical farms, the prevalent grasses are *mudakula alam, gunuga, neerubailaku and thummaku.* In organic fields, their prevalence is less.

Various kinds of uncultivated foods are seen in the organic fields (Table 5.3). Farmer Laxmi Devi says, "*thogiretappudu vatini vidchi pedutham*" (while weeding we leave them without plucking out as it can be used as food). Earlier, the uncultivated green "*yerraboddaku*" was predominant in all study villages. The chemicalisation of agriculture has reduced the availability of the uncultivated greens.

Table 5.3: Uncultivated Foods Consumed in the Study Villages

Village	Type of Uncultivated Food Available	Frequency of Consumption	Approximate No. of Times Consumed in a Year	Worth of the Quantity Consumed by HHs in a Year
Venkatapuram	*Yerrabaddi* and *gurugu*	1-2 times in a week	20-30 days	Rs.200-300
Chinnapalli	*Gogaku, chendumalli chettu*, tomato plants and *kalamgari chetlu* (water melon)	Once in a week	24-30 days	Rs.360- 450.
Gantimarri	*Yerrabaddi* and *gurugu*	Once in a week	20 days	Rs.200
Beedanpalli	*Chenchali, gurugaku, yerrabaddi*	5-6 times in a month	40 days	Rs.600
Rachur	*Gurugaku, kodijuttu aaku, isuka, chenchali aaku, pedda chenchali aaku, chilakura, yerrabaddi aaku* and *yennedaraku*	2-3 times in a week	60-70 days	Rs.600-750
Venkatampalli	*Yerrabaddi, chenchali, gurugaku, atakamamidi, palleraku, chagodithaku, isuka chenchali, ponaganti koora aaku* and *polavaku*	Varies from HH to HH. Some eat only once in a week and others eat daily	25-50 days	Rs.500-1000
Kondapuram	*Yerrabaddi, sanchelaku, chilakura, gurugaku, gogaku, palleraku, atiki mamidaku*			

Source: Based on Primary Survey

Earlier, there was more grass, whereas now less grass is seen due to organic farming. Also, now there are lesser weeds ("*Ippudu sendriya yeruvula balam nidanamga vasthadi andhuke gaddi kooda melliga lesthadhi*". *Adhe* chemical fertilizer *ayithe* fast *ga perugathadhi*"). In Venkatampalli, The group members did not see much difference in the amount of weeds due to organic farming. However, they could see a range of uncultivated greens in their village.

Impact of Organic Farming on other Farmers in the Village

The practices adopted by the organic farmers also influenced other villagers in various ways. They are discussed below:

- In some of the villages like Venkatampalli, other farmers in the village too wanted to join the group doing organic farming. Across all size classes, farmers are showing interest to join the organic farming group.

- Some are getting influenced positively and they are using more organic manures such as *ganju, peda muruga petti*.

- Other farmers have started adopting *kashayalu* instead of pesticide sprays. Some others are using only organic manures.

- Some farmers are following green leaf manuring practice. Seed treatment with trichoderma and rhizobium is being done.

- In Shapuram Village, during the year 2008-09, under high rainfall conditions the yield was more or less the same for both organic and conventional farmers. Other villagers are feeling that the produce of organic farmers is being sold at Rs.100 more per quintal over the normal market price. ("*Valla shenege kaya nooru roopayalu yekkuva poyindhi kadha ane mata vasthundhi*").

- It was told that other farmers in Beedanpalli Village also took the seeds of cow pea, jowar and castor from them. At times, they even borrowed in the name of group members.

- In Rachur Village, due to the organic farming project of TIMBAKTU, other farmers also stopped the use of chemical fertilizers. Hitherto a village trader sold one lorry dosage of chemical fertilizers. But now due to the impact of organic farming, other farmers are also not using these chemicals. These days he is not able to sell even a single bag. Earlier, in a day's time, a whole load of chemical fertilizers got sold like a hot cake.

- In villages like Kondapuram, after seeing the organic farmers, others are also going for the crop diversity. This village has seeds of groundnut, *kandi, sajja, pesarlu, ayudalu*, and *alsandalu*. Non-organic farmers in their village too are being influenced. "They have borrowed seeds, *jeevamrutham* and *panchagavya* from us", said an organic farmer.

Will Farmers Continue Organic Farming after the Withdrawal of TIMBAKTU Project?

It was interesting to hear from the farmers of the study villages in a single voice that they will continue to farm organically in the event of TIMBAKTU withdrawing after the project period. Oblesu of Chinnapalli says, "*Vellu lekapoyina sendriya vyavasayam chese bathukuthamu*" (despite their withdrawal, we will continue organic farming).

In Gantimarri Village, when asked whether they will continue organic farming even after the withdrawal of TIMBAKTU next year, the farmers replied saying, "*mundu chesindhe meeru cheppinaru, andhuke* TIMBAKTU *aapina memu vesukuntamu*" (this kind of agriculture is the one which we used to follow hitherto and even if TIMBAKTU stops support for inputs, we will continue organic farming). To support their claim, they said that already some of the organic farmers are already cultivating the remaining land (other than the three acres of land for which TIMBAKTU supports) also with organic farming practices.

Things to be Done for Easy Spread of Organic Farming

Though farmers are happy with the support received for taking up organic farming, they have suggested some key areas which need attention and also the support. These are given below:

- More FYM is necessary. For this, livestock development has to be supported. If livestock is provided, there may not be much problem for fodder in some of the villages like Venkatampalli, where they were confident of getting the required fodder from their own lands, while the remaining could be brought from other sources ("*Lenollaki pashuvulu iyyali*"). Those who do not have livestock have to be supported so that they do well in organic farming. About two bullocks and two cows can meet the requirements of 3-4 acres of an organic farm. Hay from about five acres of land is sufficient for a pair of bullocks for a whole year. If necessary, we also buy *vari gaddi* @Rs.500/*bandi*. A *bandi* will be sufficient for a pair of bullocks for one month. According to the villagers of Beedanpalli, they need support to purchase cows. "*Maku yemi lekunna, aavulu isthe sendriya vyavasayam chesukuntam*", said a farmer; the cows can be used milch purpose or for ploughing the land.

- Support for other soil-fertility-enhancing inputs was demanded by farmers. These include tank silt application, or any other organic matter. They suggested that mixing of tank silt in FYM compost heaps can be supported.

- It was felt by farmers that the support by TIMBAKTU organic farming project @ 100 kg of neem cake per acre was not sufficient. Application of neem cake @ 200 kg per acre will totally control root grub. Moreover, due to neem cake application, the soils are becoming fertile.

- TIMBAKTU provided good quality seed and hence the farmers want more support in this area. In this year (2008-09), the quality of the crop was not so good and is of third grade quality; hence, they could not save the seed for the next season. "*Itthanamku* nice *ga undale*", says farmer Muthyalu of Venkatampalli Village.

- Vermicompost units have to be encouraged. Now the Agricultural. Department is giving subsidy only for bigger units. Farmers have to contribute an amount of Rs.20,000 as their share. This is not possible for all farmers, especially the small and marginal.

- One bullock cart for few families should be given which helps to transport inputs to the field, for e.g., for carrying agricultural implements, tank silt and sand to the fields.

- For farmers, the utility of neem cake and tank silt is very high ("*Maku vepa chekka, matti tholisthe baga untadhi*").

- As our soils are sloppy, soil and moisture conservation works are needed.

- In Gantimarri Village, in certain cases during the first year of transition to organic farming, the yield increased from 15-20 bags/acre to 30 bags/per acre. This has happened because groundnut was replaced (due to delayed rains) in the preceding year by horse gram and jowar. Horse gram, being a nitrogen-fixing leguminous crop, improved soil fertility. Due to this, in the very first year, the organic farmers got bumper yields. Another important reason was that crop rotation was practiced and red hairy caterpillar was controlled; hence, there was no Red Hairy Caterpillar presence in the first year of organic farming.

- More trainings on the organic farming practices.

- The farmers also demanded better quality seeds of groundnut, castor, *alasandalu*, *korra* and other *chiru dhanyalu*.

In this chapter, it could be clearly seen from farmers perception that organic farming reduced their input costs. The adoption of organic farming practices resulted in several advantages especially for their soil, human and livestock health. Farmers strongly perceived that the marketing support received through Dharani co-operative played a key role in their decision to shift to organic farming. In addition to other benefits, marketing support has saved the farmers from the exploitation of traders. It was evident that other farmers in the village are getting influenced positively towards organic farming. Having seen the benefits, the resolve of farmers to farm organically irrespective of TIMABKTU's support is an encouraging sign for organic farming.

Chapter 6

Conclusions

Organic Farming Practices

Organic farmers have been using a range of organic agricultural practices which are based on local resources. Due to this the input costs were lesser, thus reducing the cultivation expenses. As the practices were based on local resources, the farmers had control over the things they wanted to do.

Support to Local Livelihoods

It is clearly evident from empirical data that various organic practices related to seed treatment, soil fertility enhancement, pest management, and livestock care have provided employment to villagers and thereby supported their livelihoods. Hitherto, most of the money was going to the big companies which are involved in agri-business. Despite these benefits, there is very less government assistance for the promotion of organic agriculture, as it exists for conventional agriculture in the form of subsidies, agricultural extension services and official research (Reddy, 2009c).

Ecological Benefit

The soil sample analysis clearly indicates that there is change in soil fertility due to increased organic carbon percent. This supports soil life to a great extent, which in turn, contributes to the enhancement of soil fertility through biological process. Farmers during FGDs revealed that with the use of more organic manures, there is more binding between soil particles. As alternatives to pesticides are used in managing pests, environment pollution is reduced, thus safeguarding soil, ground water, surface water bodies, animals, plants, human beings and many more life forms on this earth. Another interesting development was that availability of uncultivated foods has increased in the organic plots as compared to the previously practiced conventional farming.

Economic Benefits

It is difficult to come to a conclusion about the economic viability of organic farming as compared to conventional farming. The year 2008-09 has seen abnormally high rainfall which affected the yields drastically both in organic farms and conventional farms. However, it was clear from the empirical data that input costs were much lesser in the case of organic farming, resulting in lesser economic losses for organic farmers. However, during the FGDs, it was clearly brought out by farmers based on their three years of organic farming experience that the per acre economic benefits were more in organic farms. Despite slightly lesser yields, this was possible because there was a significant reduction in the input costs of organic farms.

Good Market Support

This was a very important factor which motivated the farmers to take up organic farming. Each and every single farmer in the study area was appreciative of the accurate weighing procedure adopted by Dharani Cooperative. Farmers were paid slightly higher price than open market (but in the year 2008-09, it was the same). Furthermore, due to the correct weighing procedure adopted by Dharani Cooperative, the organic farmers could save an amount ranging between Rs.2000-Rs.3000 per acre, which is a substantial gain for small and marginal farmers.

Millets in Farming

It is evident from the empirical data of the research study that millets are back into farming system, enhancing the food and nutritional security of sampled households. Millets like korra, jowar and bajra have found prominent place in the fields of the organic farmers. Having the capacity to adapt to a wide range of ecological conditions, millets are climate change compliant crops. Institutional finance and insurance, which is offered generously to farmers who cultivate preferred grains such as rice, wheat and non-food crops must be extended to millet farmers also (MINI, 2009).

Enhancement of Agro-Biodiversity

A comparative analysis of organic farms and conventional farms revealed that there is huge crop diversity in the organic farms. This has positive implications for soil fertility management, pest management and for withstanding risk of climate changes; more of mixed and intercropping was seen in organic farms. Similarly, the adoption of crop rotation was more in organic farms which also has a positive impact on soil fertility and management of pests.

Livestock Necessity

It could be seen from the research data that there is not much difference in the livestock population of both organic and conventional farms. Organic farms needed more natural manure and lesser livestock population with organic farmers made it difficult for them to meet the manurial needs. It was argued by the organic farmers during the FGDs that there is a need for a very strong support for livestock, especially bullocks and cows, for better results in organic farming. They not only help in timely agricultural operations, but also provide crucial inputs such as dung, urine, etc.

It can be summed up that organic farming is doing better compared to conventional farming on several fronts. Small farmer organizations or associations that are already engaged in sustainable agriculture constitute potentially powerful platforms for scaling up organic production among small holders (Singh, 2009). The input costs have reduced substantially for the organic farmers and they are very happy as they are no more pushed into debts. In addition to this organic farming is seen to provide several ecological benefits. However, a strong support for livestock development will help the farmers to reap greater benefits from organic farming.

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