

भारत में जैव खेती संबंधित :
समस्या और बाधाएँ

ORGANIC FARMING IN INDIA :
RELEVANCE, PROBLEMS AND CONSTRAINTS

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लेखक

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PREFACE

The inability of Indian agriculture to meet the demand for food in the country during the two and half decades immediately after independence had been a matter of concern at those times. The system of our agriculture based on the traditional knowledge and practices handed down from generation to generation could not produce enough to feed the increasing population. The ignominy of our dependence for food on the western developed nations and the politics of food aid practiced by them added to our determination to be self-sufficient in food production by modernising agriculture. The green revolution fulfilled our aspirations by changing India from a food importing to a food exporting nation.

However, the achievement was at the expense of ecology and environment and to the detriment of the well-being of the people. The agriculture system adopted from the west has started showing increasing unsustainability and once again the need for an appropriate method suitable to our requirements is being felt.

The practice of organic farming, said to be the best known alternative to the conventional method, also originated in the west, which suffered from the ill effects of chemical agriculture. However, organic farming is based on the similar principles underlying our traditional agriculture. Organic agriculture aims at the human welfare without any harm to the environment which is the foundation of human life itself.

The paper discusses the progress and the present status of organic agriculture in the major practicing countries. The ill effects of the conventional farming system being felt in India are also analysed in the context of the relevance of organic farming in the Indian conditions. Efforts made by the government and people to promote organic agriculture in the country and the prospects for its spread are assessed too.

I am indebted to Dr. A.K. Bandyopadhyay, Chief General Manager, Department of Economic Analysis and Research, NABARD, not only for reposing confidence on me but also for supporting my efforts at every stage. My association with a NGO established to promote organic farming and the related close interactions I had with the farmers in the process have immensely benefited me to develop an insight into the issues of relevance. I have also benefitted from discussions with several experts, farmers and friends in the preparation of the paper. I am grateful to all of them.

S Narayanan

EXECUTIVE SUMMARY

Organic farming, evolved on the basic theoretical expositions of Rodale in the United States, Lady Balfour in England and Sir Albert Howard in India in the 1940s, has progressed to cover about 23 million hectares of land all over the world. Howard's magnum opus, 'An Agricultural Testament' has a special significance to us in India as it is based on an analysis of the environment friendly farming practiced here for centuries. However, it is another matter that we lag behind a majority of agriculture based countries in the world in the practice of organic farming in spite of the fact that we have been one of the sufferers of the conventional farming system.

The relatively high success of organic farming in some countries are due to the high awareness of the health problems caused by the consumption of contaminated food products, the ill effects of environment degradation, appropriate supports by the government and organisations like the European Union and International Federation of Organic Agriculture Movements (IFOAM). The financial support for organic farming extended by various national and provincial governments in these countries is very substantial to push up the spread of organic methods. Strong marketing networks linking the farms, processing and distribution and the organisation of production under the NGOs with stringent certification programmes were other facts, which contributed to the growth of organic farming. The growth rate of market values of organic products is about 20 per cent per annum in some of these countries.

The conventional farming had helped India not only to produce enough food for own consumption but also generated surpluses for exports. However, the increasing population and income will lead to further increases in demand for food and also for raw materials for industry. The modern system of farming, it is increasingly felt, is becoming unsustainable as evidenced by declining crop productivities, damage to environment, chemical contaminations, etc. The necessity of having an alternative agriculture method which can function in a friendly eco-system while sustaining and increasing the crop productivity is realized now. Organic farming is recognized as the best known alternative to the conventional agriculture.

The progress of organic agriculture in India is very slow. We are able to convert only 41,000 ha of area so far, which is a mere 0.03 per

cent of the cultivated area. These figures should be compared to 2,58,500 ha (11.30 per cent) of Austria, 1,02,999 ha (9.70 per cent) of Switzerland, 1,83,000 ha (7.94 per cent) of Italy, 6,32,165 ha (3.70 per cent) of Germany and 9,50,000 ha (0.23 per cent) of USA. The production of organic farms came to about 14,000 tonnes in India during 2002 and 85 per cent of it was exported. Domestic consumption is marginal and is concentrated in the metropolitan cities in the country. NGOs are spearheading the organic movement in India as in other countries. The major weaknesses of organic agriculture in the country are absence of linkages between the farmers and markets and absence of financial support from the governments. India has the potential to become a major organic producing country given the international demand for our farm products, different agro-climatic regions for the cultivation of a number of crops, the size of the domestic market and above all the long tradition of environment friendly farming and living. Experts have identified the areas suitable for the introduction of organic farming. However, an appropriate policy framework is yet to be laid down by the government. The only progress made in this direction appears to be the implementation of National Standards for Organic Production (NSOP) in 2000 and the founding of a National Institute of Organic Farming. A few agencies with the assistance of international bodies have entered the field of inspection and certification.

An appropriate national agriculture policy, giving a prominent place to organic farming addressing the issues related to its coverage, financial support during the conversion period, creation of linkages among the farmers, processors, traders and consumers, inspection and certification of organic products and increasing the public awareness of the benefits of organic agriculture along with the ill effects of the conventional system, should be designed. This must be followed by concrete action on the ground if we do not want to miss the far reaching changes all over the world heralded by the organic farming movement.

I INTRODUCTION

Sustainable development has caught the imagination and action all over the world for more than a decade. Sustainable agriculture is necessary to attain the goal of sustainable development. According to the Food and Agriculture Organization (FAO), sustainable agriculture "is the successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of environment and conserving natural resources". All definitions of sustainable agriculture lay great emphasis on maintaining an agriculture growth rate, which can meet the demand for food of all living things without draining the basic resources.

Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Many techniques used in organic farming like inter-cropping, mulching and integration of crops and livestock are not alien to various agriculture systems including the traditional agriculture practiced in old countries like India. However, organic farming is based on various laws and certification programmes, which prohibit the use of almost all synthetic inputs, and health of the soil is recognised as the central theme of the method.

Adverse effects of modern agricultural practices not only on the farm but also on the health of all living things and thus on the environment have been well documented all over the world. Application of technology, particularly in terms of the use of chemical fertilizers and pesticides all around us has persuaded people to think aloud. Their negative effects on the environment are manifested through soil erosion, water shortages, salination, soil contamination, genetic erosion, etc.

Organic farming is one of the widely used methods, which is thought of as the best alternative to avoid the ill effects of chemical farming. There are several definitions of organic farming and the one given by the US Department of Agriculture (USDA) is considered the most coherent and stringent. It is defined as 'a system that is designed and maintained to produce agricultural products by the use of methods and substances that maintain the integrity of organic agricultural products until they reach the consumer. This is accomplished by using substances, to fulfill any specific fluctuation within the system so as to maintain long term

soil biological activity, ensure effective peak management, recycle wastes to return nutrients to the land, provide attentive care for farm animals and handle the agricultural products without the use of extraneous synthetic additives or processing in accordance with the act and the regulations in this part'. The origin of organic farming goes back, in its recent history, to 1940s. During this period, the path breaking literature on the subject published by J.I. Rodale in the United States, Lady Balfour in England and Sir Albert Howard in India contributed to the cause of organic farming.

The farming being practiced for the last three decades in India has increasingly been found non-sustainable. The system is oriented towards high production without much concern for ecology and the very existence of man himself.

1.1 Need for the Paper

There are three categories of opinions about the relevance of organic farming for India. The first one simply dismisses it as a fad or craze. The second category, which includes many farmers and scientists, opines that there are merits in the organic farming but we should proceed cautiously considering the national needs and conditions in which Indian agriculture functions. They are fully aware of the environmental problems created by the conventional farming. But many of them believe that yields are lower in organic cultivation during the initial period and also the cost of labour tends to increase therein. The third one is all for organic farming and advocates its adoption wholeheartedly. They think that tomorrow's ecology is more important than today's conventional farm benefits.

However, among many a major reservation, the profitability of organic farming vis a vis conventional farming, is the crucial one from the point of view of the Indian farmers, particularly the small and marginal.

Organic farming involves management of the agro-eco system as autonomous, based on the capacity of the soil in the given local climatic conditions. In spite of the ridicule poured out on organic farming by many, it has come to stay and is spreading steadily but slowly all over the world. India has been very slow to adopt it but it has made inroads into our conventional farming system. One advantage we have here is the fact that the farming techniques practiced in this country before the advent of the green

revolution were basically eco-friendly and they have not faded away from the memories of the present elder generation of our farming community.

India's options in finding out an alternative method to the conventional farming are limited. The World Trade Organization (WTO) deadline for banning exports of vegetables and horticulture products based on inorganic farming will expire in 2005. Sensing the importance, the Central and state governments have taken several initiatives to popularise organic farming in the country.

1.2 Review of Literature

Howard's (1940) *Agricultural Testament* draws attention to the destruction of soil and deals with the consequences of it. It suggests methods to restore and maintain the soil fertility. The study contains a detailed deposition of the famous Indore method of maintaining soil health. The reasons and sources of the erosion of soil fertility and its effect on living things are discussed. The criticism of the agriculture research and examples of how it had to be carried out to protect soil and its productivity are discussed in detail.

Bernwad Geier (1999) is of the opinion that there is no other farming method so clearly regulated by standards and rules as organic agriculture. The organic movement has decades of experience through practicing ecologically sound agriculture and also in establishing inspection and certification schemes to give the consumers the guarantee and confidence in actuality. Organic farming reduces external inputs and it is based on a holistic approach to farming. He describes the worldwide success stories of organic farming based on the performance of important countries in the west. The magnitude of world trade in organic farming products is also mentioned. To the question of whether the organic farming can feed the world, he says that neither chemical nor organic farming systems can do it; but the farmers can.

Save and Sanghavi (1991) are of the view that after their intensive experiments with organic farming and narrating the results to the informed, it is time that the governments and farmers are brought around. They firmly state that the economic profitability of organic farming can be proved. Four crops of banana grown by the natural way on the same farm by them are compared with those produced by the conventional way. While the natural farm yielded

18 kg of banana in the first round, the conventional one gave 25 kg. 30 kg was the yield at the second round on both the farms. However, on the third round, the natural farm gave 25 kg, the conventional one yielded only 20 kg. The results on the fourth round were stunning – the plants on the conventional farm died out; but the natural ones gave 15 kg on an average. Thus, the aggregate output was 88 kg on the natural farm and 75 kg on the conventional one.

While, the natural banana commanded a price of Rs 2.50 per kg, the conventional one could fetch only Rs 1.75 per kg. This has been the major reason for the substantial net profit (Rs 154) earned from the cultivation of natural banana (conventional banana could get only a net profit of Rs 26.25). The expenses incurred were Rs 66 and Rs 105 for the natural and conventional bananas respectively. However, a stringent cost and return analysis representing a larger sample size will be necessary to draw meaningful conclusions. It should be born in mind that the output obtained from the natural banana farm was also because of the accessibility to the inputs and expertise, which the authors happened to possess. Farmers placed in less advantageous positions may not derive such results. The price advantage to the natural organic farming products will also taper off when the supply increases. The environmental costs and returns have to be internalized and it is quite possible that the organic farming will prove to be a far better alternative to the conventional one. However, these aspects will have to be built into a scientific and tight economic reasoning, among others.

Kaushik (1997) analyses the issues and policy implications in the adoption of sustainable agriculture. The concept of trades off has a forceful role to play in organic farming both at the individual and national decision making levels. Public vis-a-vis private benefits, current vis-a-vis future incomes, current consumption and future growths, etc. are very pertinent issues to be determined. The author also lists a host of other issues. While this study makes a contribution at the conceptual level, it has not attempted to answer the practical questions in the minds of the farmers and other sections of the people.

Sharma (2001) makes a case for organic farming as the most widely recognized alternative farming system to the conventional one. The disadvantages of the latter are described in detail. Other alternatives in the form of biological farming, natural farming and

permaculture are also described. The focus is on the organic farming, which is considered as the best and thus is discussed extensively. The work is not addressing the relevant issues in the adoption of organic farming on ground.

Veeresh (1999) opines that both high technology and sustainable environment cannot go together. Organic farming is conceived as one of the alternatives to conventional agriculture in order to sustain production without seriously harming the environment and ecology. However, he says that in different countries organic farming is perceived differently. While in the advanced countries, its focus is on prevention of chemical contamination, we, in countries like India are concerned of the low soil productivity. Even the capacity to absorb fertilizers depends on the organic content of the soil. The principles of organic farming are more scientific than those of the conventional. India's productivity of many crops is the lowest in the world in spite of the increase in the conventional input use. The decline in soil nutrients, particularly in areas where the chemical inputs are increasingly being used in the absence of adequate organic matter is cited as a reason for low productivity. Doubts about the availability of massive sources of organic inputs also exist. He advocates an advance to organic farming at a reasonable pace and recommends conversion of only 70 per cent of the total cultivable area where unirrigated farming is in vogue. This 70 per cent supplies only 40 per cent of our food production. While this analysis has several merits, it is more addressed to the policy makers and less to the farmers.

Sankaram Ayala (2001) is of the view that almost all benefits of high yielding varieties based farming accrue mostly in the short term and in the long term they cause adverse effects. There is an urgent need for a corrective action. The author rules out organic farming based on the absolute exclusion of fertilizers and chemicals, not only for the present, but also in the foreseeable future. There ought to be an appropriate blend of conventional farming system and its alternatives. The average yields under organic and conventional practices are almost the same and the declining yield rate over time is slightly lower in organic farming. The author also quotes a US aggregate economic model, which shows substantial decreased yields on the widespread adoption of organic farming. Decreased aggregate outputs, increased farm income and increased consumer prices are other results the model gives. While the details about this US analysis are not known, its relevance to India where we already have the lowest yields of a

number of crops under the conventional system appears to be open.

Singh and others (2001), recording the experiments on rice-chick pea cropping sequence using organic manure, found the yields substantially higher compared to the control group. Similar results were obtained for rice, ginger, sunflower, soyabean and sesame.

Ahn Jongsung opines that organic agriculture is economically viable (Anon, 1998). The author gives emphasis on marketing the organic products on the basis of reputation and credibility. In Japan, the farmers sell the produces directly to the consumers. The Kenyan farmers have seen that in organic farming, costs go down and profits increase. A farmer from UP who allotted a portion of his land exclusively for organic farming found that the yields of sugarcane, rice, wheat and vegetables were lower than those under chemical farming. An Englishman, settled in Tamil Nadu, who runs an organic farm in 70 acres planted with coffee, citrus, other fruits, rice, pepper and vegetables says that he does not earn a profit and does not have confidence in organic farming.

Somani and others (1992) have published a collection of 42 papers presented at a National Seminar on Natural Farming. Korah Mathen recounts several problems in evolving representative and rigorous yardsticks for comparison between modern and alternative farming. Yields cannot be compared, because of monoculture nature of chemical farming with those of multi crops raised under organic/natural farming. Economic analysis is also problematic because one has to quantify the intangibles. He advocated the resource use efficiency analysis. But the question of profitability of different systems of farming seems difficult to be examined in the absence of an economic analysis although the author does not rely upon it.

Save (1992) found that after three years of switching over to natural cultivation, the soil was still recovering from the after effects of chemical farming. When the soil regained its health, production increased and the use of inputs decreased. The farm, which was yielding 200 to 250 coconuts per tree, gave 350 to 400 per annum.

Rahudkar and Phate (1992) narrate the experiences of organic farming in Maharashtra. Individual farmers growing sugarcane and grapes, after using vermi compost, saw the soil fertility increased,

irrigation decreased by 45 per cent and sugarcane quality improved. The authors say that net profits from both the sugarcane and grape crops are high in organic farms.

The foregoing overview of the literature makes it clear that opinions about organic farming are divided both among the farmers and experts. Disputes about the profitability and yield increases in organic farming are acute, but there is a consensus on its eco-friendly nature and inherent ability to protect human health. There are strong views for and against organic farming (the latter, mainly on the grounds of practicability of feeding a billion people, financial and economic viability, availability of organic inputs and the know-how). Those who are totally against it are prepared to ignore the ill effects of the conventional farming system. There are many who while approving organic agriculture, want a mixture of both the systems or advocate a careful approach by proceeding slowly towards the conversion of the conventional farms into organic. The questions about the yield and financial viability are crucial from the point of view of farmers; but they remain unanswered to a large extent. The study of a geographical area in the country endowed with a large number of resources for organic farming, but has not made any significant stride towards it, is also not found in the literature overview.

1.3 Objectives of the Paper

- (i) To understand the need for organic farming in India in the light of the experiences of other countries.
- (ii) To assess and evaluate the factors which may facilitate the adoption of organic farming in the country.
- (iii) To analyse the constraints, both political and social, and above all economic, in the introduction of organic farming in India.

1.4 Methodology

The paper is based on secondary data. Information from literature on the historical evolution of the organic farming and the progress it has made both in India and abroad collected from the published sources like the websites of the European Union countries, International Federation of Organic Farming Movements (IFOAM), books and periodicals and news paper reports is liberally used for the preparation of the paper.

Discussions with informed individuals\institutions, agriculture experts, social scientists, economists, government administrators, policy makers, consumers, market intermediaries, Accreditation and Certification Agencies, NGOs and farmers were held.

1.5 Organisation of the Paper

The paper is organised into four chapters. The first chapter introduces the subject with a review of the related literature. The objectives and need of the paper are also given in the chapter.

The relevance of organic farming to India in the light of its progress in the major countries is discussed in the next chapter. The ill effects of the conventional farming system experienced by the country are mentioned along with the potential benefits of organic farming.

The third chapter contains the progress of organic farming in India. Some of the projects and initiatives by institutions and individuals are also described to illustrate the efforts to promote organic farming.

Problems and prospects of organic farming in the country are discussed in the fourth and last chapter. The concluding part attempts to propose a few measures to promote organic farming in India.

II RELEVANCE OF ORGANIC FARMING

The relevance and need for an eco-friendly alternative farming system arose from the ill effects of the chemical farming practices adopted worldwide during the second half of the last century. The methods of farming evolved and adopted by our forefathers for centuries were less injurious to the environment. People began to think of various alternative farming systems based on the protection of environment which in turn would increase the welfare of the humankind by various ways like clean and healthy foods, an ecology which is conducive to the survival of all the living and non-living things, low use of the non-renewable energy sources, etc. Many systems of farming came out of the efforts of many experts and laymen. However, organic farming is considered to be the best among all of them because of its scientific approach and wider acceptance all over the world.

2.1 The International Scene

The negative effects of modern chemical based farming system were first experienced by those countries, which introduced it initially. So, naturally, it was in those countries organic farming was adopted in relatively large scales. There are very large organisations promoting the organic farming movement in European countries, America and Australia etc. These organisations, for example, the International Federation of Organic Agriculture Movements (IFOAM) and Greenpeace have studied the problems of the chemical farming methods and compared the benefits accruing to the organic farming with the former. Organic farming movements have since spread to Asia and Africa too.

IFOAM was founded in France in 1972. It spearheads and coordinates organic farming efforts the world over by promoting organic agriculture as an environment friendly and sustaining method. It focuses on organic farming by highlighting the minimum pollution and low use of non-renewable natural resources through this method. It has about 600 organisational members spread over about 120 countries including India.

IFOAM undertakes a wide range of activities related to organic farming such as exchanging knowledge and thoughts among its members; representation of the movement in governmental, administrative and policy making forums in the national and international arena; updating of production, processing and trading

standards; formulation and coordination of research projects; and holding of international conferences and seminars. IFOAM participates in the activities related to organic farming under the auspices of the United Nations and keeps active contacts with several international NGOs.

The Food and Agriculture Organisation (FAO) of the United Nations provides support to organic farming in the member countries. It also attempts the harmonization of national organic standards, which is absolutely essential to increase international trade in organic products. The FAO has, in association with the World Health Organisation (WHO), evolved the Codex Alimentarius for organic products.

Organic farming has several advantages over the conventional one apart from the protection of both the environment and human health. Improved soil fertility, better water quality, prevention of soil erosion, generation of rural employment, etc. are some of them.

The concept of quality food has undergone a drastic change over the past few decades. It does give emphasis on the characteristics of the end product, but the process and method of production and transport are now considered equally important. Not only the importers but also the domestic retailers have their own quality specifications or standards, which in many cases are tougher than those of the government regulations. Consumers have become health conscious and are willing to pay for the clean, healthy and natural food. Many developed countries have various support programmes to help organic farming with financial incentives and technical guidance.

The organic food market in the world has grown rapidly in the past decade. International trade in organic foods showed an annual growth rate of about 20-22 per cent during this period. Many retail chains and supermarkets in advanced countries are accorded with 'green status' to sell organic foods. The organic food processing industry is considered nature friendly and thus encouraged. Table 1 presents the size of the organic food markets in some developed countries in 2000. The US food market tops with a value of \$8.0 billion, followed by Germany and Japan with \$2.5 billion each while France accounts for \$1.25 billion. Moreover, the organic foods command higher prices which often range from 10 to 100 per cent more than the conventional ones.

Table 1 : The World Organic Food Market

(In billion US \$)

Sr. No.	Country	1997	2000 (estimates)
1	USA	4.20	8.00
2	Germany	1.80	2.50
3	Japan	1.20	2.50
4	Italy	0.75	1.10
5	France	0.72	1.25
6	UK	0.45	0.90
7	Australia	NA	0.17
8	China	NA	0.12
9	New Zealand	NA	0.58
10	Taiwan	NA	0.10
11	Philippines	NA	0.06
12	Others	1.33	10.38
Total		10.45	19.73

The important organic products traded in the international market are dried fruits and nuts, processed fruits and vegetables, cocoa, spices, herbs, oil crops and derived products, sweeteners, dried leguminous products, meat, dairy products, alcoholic beverages, processed foods and fruit preparations. Cotton, cut flowers, animals and pot plants are major non-food products in the world markets.

Organic farming is bound to grow around the world as many countries are developing their own standards and regulations. The US and the European Union have very comprehensive National Organic Programmes and the early nineties have seen organic farming regulations in Japan, Canada and Australia. New Zealand, Israel and Brazil have adopted the organic standards equivalent to those of USA and the European Union. China, Thailand, South Korea, Philippines, Turkey and Mexico have established certifying agencies. India too has adopted the National Programme for Organic Production (NPOP) with national standards.

There were about 35,000 certified organic farms in 17 countries during 1998 covering an area of more than a million hectares. A survey held recently revealed that 6-7 per cent farms in USA and Germany are certified organic farms. Many organic inspection and certifying agencies like Crop Improvement Association (OCIA), IFOAM, Ecocert, BCS, SKAL, KRAV, IMO, FVO, QAI, Oregon, Tilth and NASAA have strong international presence and have even developed the ability to assist marketing of organic products world wide.

Certification of products is the foundation on which organic agriculture rests. Its role in production and marketing of organic foods becomes a significant corner stone in the creation of a confident consumer community. The need for a trustworthy and healthy organic market is important as the consumers are becoming increasingly separated from the food production process. The void is filled in by a plethora of processing, distribution and marketing intermediaries. The consumers should possess knowledge and confidence that the products they buy are truly organic. Such environment can be created by an organised system of inspection and certification supported by law and regulations of the state. Organic products enjoy trust based on the label or logo approved by the certification process. The aim of organic certification is, therefore, to (a) provide an identifiable label (a logo or a symbol) and (b) give an assurance to the consumers that the product is truly organic.

It is widely recognised the world over that the certification of organic products should be based on the following principles:

- I Organic production and processing standards should be clearly laid down.
- II The conformation of production and processing to these stands must be verified.
- III Organic labels should be permitted only to those produces, which are found conforming to the set standards.

Thus, a label on an organic product conveys that the manufacturer has a license for organic production, an independent agency has inspected the production/processing practices followed by the producer, and compliance of the set standards is made. Such an assurance becomes crucial in the generation of consumer confidence in the organic products, particularly as they are costlier than the conventional ones. The marketing agents of organic products also need such an assurance to maintain fair trade practices essential to the growth and sustainability of the demand for such products.

2.1.1 Growth of Organic Farming

Organic farming has spread to about 100 countries around the world (Annexure - 1). An estimate in 2004 puts about an area of 24 million hectares under organic farming worldwide. Australia with its 10.5 million hectares leads the countries. However, much

of this area is pastoral land for grazing. Argentina with 3.19 million hectares, Italy with 1.83 million hectares and USA with 0.95 million hectares follow suit. The importance of organic farming is growing in many countries. Austria and Switzerland have about 10 per cent of their food system under organic agriculture. The annual growth of organic farming is estimated to be about 20 per cent in USA, France, Japan and Singapore.

2.1.2 The Developed World

Great strides have been made in organic farming by the western developed countries. We very often tend to put small farms in harmony with the organic farming system imagining that the large farms are not attuned for its adoption. In USA, there are large organic farms coming to thousands of acres and they raise crops using organic methods completely avoiding the use chemicals for manuring and controlling of pests and weeds. They implement crop rotations and lay emphasis on the timing of cultural operations.

Table - 2 shows the top 15 countries in terms of area under organic farming, percentage of organic area to the cultivated area the number of organic farms :

Table - 2 : Area under Organic Farming and Number of Farms

Sr. No.	Country	Area under Organic Farming (ha)	Percentage of Organic area to cultivated area	Number of farms
1	Australia	10500000	2.31	1380
2	Argentina	3192000	1.89	1900
3	Italy	1830000	7.94	56440
4	USA	950000	0.23	6949
5	Uruguay	687481	4.00	334
6	United Kingdom	679631	3.96	3981
7	Germany	632165	3.70	14703
8	Spain	485079	1.88	15607
9	Canada	430600	0.58	3236
10	France	419750	1.40	10364
11	China	301295	0.06	2910
12	Brazil	275576	0.08	14866
13	Chile	273000	1.50	300
14	Austria	258500	11.30	18292
15	Czech Republic	218114	5.09	654

Sr. No.	Country	Percentage of organic area to cultivated area	Area under Organic farming (ha)	Number of farms
1	Liechtenstein	17.00	690	35
2	Austria	11.30	258500	18292
3	Switzerland	9.70	102999	6169
4	Italy	7.94	1830000	56440
5	Finland	6.60	147943	4983
6	Denmark	6.51	174600	3525
7	Sweden	6.30	193611	3589
8	Czech Republic	5.09	218114	654
9	Uruguay	4.00	687481	334
10	United Kingdom	3.96	679631	3981
11	Germany	3.70	632165	14703
12	Norway	2.62	26673	2099
13	Slovakia	2.40	58706	82
14	Australia	2.31	10500000	1380
15	Eastland	2.00	20141	369

Sr. No.	Country	Number Of Farms	Percentage of organic area to cultivated area	Area under organic farming (ha)
1	Italy	56440	7.94	1830000
2	Indonesia	45000	0.09	40000
3	Mexico	34862	0.13	143154
4	Uganda	28200	1.39	122000
5	Peru	19685	0.27	84908
6	Turkey	18385	0.14	57001
7	Austria	18292	11.30	258500
8	Spain	15607	1.88	485079
9	Brazil	14866	0.08	275576
10	Germany	14703	3.70	632165
11	Dominical Rep	12000	0.40	14963
12	France	10364	1.40	419750
13	USA	6949	0.23	950000
14	Greece	6680	0.60	31118
15	Switzerland	6169	9.70	102999

Note : This table is compiled from Annexure - 1.

Australia had the largest area under organic farming and Argentina was the next, followed by Italy. However, in terms of percentage of organic farming area to that of the cultivated, Australia was the fourteenth and Italy fourth. In terms of number of farms under organic agriculture, Italy topped. An examination of all these three characteristics, indicates that Italy, Germany and Austria are the leading countries in organic agriculture and they are among the developed nations of the world. Not even a single developing country except Argentina in terms of area found a position among the top fifteen mentioned in the Table. However, it should be remembered that the US was the fourth in terms of area under organic farming and had the largest market for organic products in the world.

USA

Organic farming did spread fast in USA during the 1990s. The growth was in response to the rising demand for organic products both in the national and international markets. The US agriculture farms view organic farming as a method to reduce input costs and use of non-renewable resources, which increases accessibility to the high value markets and assures premium prices for the produces and above all increased farm income. The US organic farming system uses eco-friendly agriculture practices in cultural and pest management and avoids the application of chemicals. Antibiotics and hormones are not used in livestock production.

The growth of consumer demand for organic products has also resulted in the specialization in growing, processing and marketing of these products. The implementation of national organic standards in 2002 by the USDA has further boosted the demand for organic products in the country.

Because of increasing prices and ineffectiveness of chemicals, many farms in USA do not favour intensive chemical based agriculture. A survey of certified organic farms revealed that more than 60 per cent of them grew vegetables and they had livestock for manure to use in the farm. The farmers had identified three problem areas, which required study. They were (1) the need for increasing demand for organic products, (2) the influence of cultural practices on quality and nutritional value of the products and (3) the relationship between plant nutrition and resistance to pests.

In another study of consumer demand for organic foods, it was found that about 30 per cent of shoppers used some organic food in a year, while 10 per cent used it once a week. The value of sales of organic products in US was \$1.5 billion in 1992 and \$8 billion in 2000. Many methods to promote sales and consumption of organic food have been introduced. The US Senate approved a bill to make a part of the Federal School Lunch Programme organic. Organic food shows are held annually to give awards for the best organic foods and drinks. The Federal government encourages the planting of native plants for Municipal planting programmes. The government has initiated policies to reduce the application of pesticides and labelling food to indicate the amount of pesticides used to produce the commodity is compulsory. There are about 17 organic certification agencies in US.

The certification and labelling laws are very rigid in United States. Imports of organic products must conform to the standards laid down by the USDA and naturally, the ability of many developing countries to comply with these requirements is limited. A grower or a dealer in need of certification has to lodge a plan to an accredited agency of the USDA. There are both private and state certification programmes. The plan must contain all details in relation to the farming or handling methods and the materials those will have to be used therein. The anticipated improvements and future aims should also be a part of the plan. The farmers or dealers of wild crops should also submit a plan mentioning that the harvesting techniques to be employed will not cause any damage both to the produce and the environment.

All records related to the management practices and the materials utilized in organic production should be maintained for five years. Certification will be approved only if the crops are grown on the land free of prohibited substances for three years prior to harvest. The period of conversion is three years between the conventional and organic farming and the crops grown during this period cannot be labelled organic or any other label indicating that they are under conversion.

The Organic Foods Production Act (OFPA) contains a wide and detailed coverage of organic farming methods and materials along with the soil fertility, application of manure, crop rotation and composting. The National Organic Standards Board's (NOSB) recommended ingredients include crop residues, crop wastes from food processing operations, animal manure, yard wastes from

private and municipal sources, or other vegetable by-products. Municipal solid waste compost and sewage sludge composts and the use of prohibited material as composts/ingredients are banned. There is a National List of acceptable and banned materials which includes pest control treatments and other agricultural inputs like fertilizers and seed treatments. An evaluation of all agricultural inputs has been made for their long term effect on the environment irrespective of the fact that they are synthetic or natural.

The exporters of other countries to the US market will have to face these very tough specifications, particularly if their national standards are not equivalent to those of the USDA.

Italy

The European Union (EU) of 25 countries had 5.5 million hectares under organic farming at the end of 2002 managed by 1,60,000 organic farms. This constitutes about 3.4 per cent of the agricultural area and 1.7 per cent of farms in EU. It is estimated that the growth in the area was 9 per cent over the last year. The increases came mainly from France, Spain and the United Kingdom. The European Commission has formulated the 'European Action Plan for Organic Food and Farming' on 10th June 2004. It proposes 21 specific actions to promote organic farming in the EU countries and the Action Plan is with the European Parliament for consideration. As said earlier, the progress achieved by Italy, Austria and Germany was impressive and as such it is discussed here.

The pioneers of organic farming in Italy had contributed immensely to the spread of organic agriculture, which is acclaimed to be one of the best in the world. Farmers, medical doctors, food processors, traders and consumers were in the forefront working hard from the 1950s for the cause of organic farming in the country (Santucci and Pignataro, 2002).

Growth of organic farming in Italy has been spectacular during the period of 1990-2000. The organically cultivated area increased from 13,000 ha to more than a million ha which came to about 7.2 per cent of the total cultivated area. The number of farmers was about 13,00 in 1990, which shot up to 47,357 at the end of 2000. At the end of 2002, the area increased to 1,83,000 ha (7.94 per cent of the cultivated area) and the number of farms to 56,440. The reasons for such a substantial increase were the food

scandals like the mad cow disease leading to the search for safe foods, the constant endeavor for alternative farming methods which were environmentally, technically and economically attractive to the farmers and the liberal subsidies.

The farmers who opted for organic methods prior to 1990 were people of non-agriculture background, people searching for novel life styles, etc. A significant proportion of them consisted of non-Italians like, Germans, Swiss, Austrians and Americans. They had the unity of purpose in establishing cultural associations in cooperation with like minded people by setting up marketing links with organic farms. However, the decade of 1990-2000 saw that the new entrants into organic farming were Italians and many of them did not have experience of the new methods. But they possessed a good knowledge of the ecology and understood the need for a marketing system. The period also witnessed a change in the geographical distribution of area under organic cultivation. Sardinia became an important region in organic farming with the extension of subsidies to pasture lands used for sheep rearing and milk production. Sardinia and Sicily account for about 44 per cent organic area in Italy.

At present 41 per cent of the organic area is under pastures. Cereal crops are raised on 18.2 per cent of the area and the olive cultivation alone has the highest single crop share of 10 per cent. The high growth of organic production led to the growth of the processing units to the extent of 142 per cent during 1997-2000 alone. Presently, there are about 42,000 processing units of which 1,300 are established by the farmers themselves. Organic farming has resulted in the setting up, conversion or expansion of new economic activities in the rural areas of Italy.

The first organic shop had come up in Milan, the industrial and financial capital of Italy, during the 1970s under a consumers' cooperative venture. The most important fact of the market distribution of organic products in Italy is the predominant position of the farmers' or consumers' cooperatives. The distribution was mostly done during the immediate post 1970s by small grocery stores and the major share was that of the direct sales in the open market places and at the farms.

After 1990, specialized markets, supermarkets, franchisees, school canteens, etc. became the major channels. Supermarkets are entering the field in large numbers since 1999 with their own

labels to convince the consumer of the reliability of the products in the midst of numerous labels. Dairy products have a share of 26 per cent of the consumer expenditure on organic products; fruits and vegetables accounts for 13 per cent; breads and biscuits had a share of 12 percent. A growing number of kindergartens, school and university canteens, restaurants and factory canteens are opting for organic foods in the country. A survey of the motives of the consumers of organic foods revealed that every one was going for organic products to protect the health of his/her family.

The support for organic farming by the European Union by various legislations providing subsidies was instrumental in the growth of organic farming in Italy. The devolution of power to the Regional Government on agriculture policy in 1972 has resulted in different levels of subsidies in different regions/crops.

There are nine organic certification bodies in Italy. Some of them were earlier cultural associations promoting organic farming. A single agency named ICEA has a share of 24 per cent of the certified farms coming to about 29 per cent of the area. These nine agencies have about 900 local offices, 1000 staff and technicians for inspecting farms, processing units and storages for giving certifications.

Universities and Public Research Centres are becoming increasingly interested in research and extension activities in relation to organic agriculture. A National School of Organic Farming has been established by the Ministry of Agriculture to impart education.

Austria

Austria is a leading country in Europe in the adoption of organic farming. At the end of 2003, about 11.6 per cent of the cultivated area which came to 2,96,154 ha was under organic agriculture. The number of organic farms came to 18,576, which was 9.2 per cent of the total number of agriculture farms in Austria.

The conversion of cultivated land to organic method of agriculture was slow till 1990. The federal government introduced subsidies for organic conversion of cultivation in 1991. The government programme of agri-environment of 1995 and the conversion of grass lands into organic farms gave a great fillip to the organic movement. There was a decrease in the conversions in 2000, but

it increased substantially from 2001 to 2003. The decline was due to the difficulties in marketing the organic produces in the country. This was an indication that the emphasis on farm production was not enough to promote organic agriculture.

The increasing phase from 2001 to 2003 saw about 700 farms having an area of 30,000 ha being converted. This came from lands cultivating cereals and vegetables. One of the reasons for the change is attributed to the realization of the benefits of organic farming by the young farmers with a better concern for ecology and understanding of economics than their parents. The organic farmers belonged to a number of associations and the latter had different approaches/objectives, regional differences and marketing techniques. About 64.5 per cent of the organic farmers were members of these associations, which functioned under two umbrella organizations, named ARGE and OelG. These associations have their own production and quality standards, which in many cases are more stringent, than those of the State. Presently there are 11 major organic farming associations in Austria and while 6 of them come under ARGE, the remaining five and 4 marketing associations are members of OelG, the latter being the one giving importance of marketing too in the promotion of organic agriculture in Austria.

The concentration of organic farms is in the regions with large areas of grass land. It is easier for the conversion of the grass land to organic farming as they used to be cultivated extensively. Grass land farms constitute about 66 per cent of the total organic farms. The average size of an organic farm in Austria is 16 ha.

Certification of organic farms in Austria is done with the provincial government and a contract between the farm and an inspection agency is essential for registration. An approved organic label is available to guarantee the quality of the organic products. The conditions to be fulfilled by an inspection agency for accreditation are very tough in Austria. 17,500 registered organic farms (95 per cent of all organic farms) receive government subsidies and about 50 per cent of it is born by the European Union and balance by the federal and provincial governments.

The market value of Austrian organic products was 2.18 billion Euro in 2000 which was 3 per cent of the total food market. About 70 per cent of these products is distributed by the conventional food chains. Now, the distribution of organic foods through the

supermarket chains is gaining momentum. It is reported that the supermarkets selling organic products enjoy an improved image among their customers. Organic farms' cooperatives also market organic products. Cooperative ventures between the organic farmers and hospitals, nursing homes, etc. have come up to sell organic products. Home delivery services and organic shops are also established, particularly in large cities.

Agricultural Schools and Colleges offer training programmes/courses in organic farming and promote scientific research. The Institute for Organic Farming at the University of Vienna is a major centre for research in organic agriculture.

Development of a strategy for co-operation among the organic farmers, their associations, processors and traders is considered a major challenge in the promotion of organic farming in Austria.

Germany

Germany, where the IFOAM is located at Tholey-Theley since 1987, is a leading nation in the adoption of organic farming in Europe. The IFOAM has its Regional Group founded in 1991 with the German speaking nations (Austria, Germany, Luxemburg and Switzerland) as members. Germany has about 3 per cent of its total agricultural area under organic farming against 2 per cent of the European countries as a whole. The country has also a large number of processors and importers of organic produces. So, it would be useful to examine the organic farming movement in that country in some detail.

The history and development of organic agriculture in Germany begins from the days of bio-dynamic farming initiated in 1924. Bio-dynamic theory of farming treats farm as a living being which responds to non-material influences, called dynamic forces. The proponents of bio-dynamic farming believe that these forces can be enhanced by bio-dynamic preparations. Even certification for bio-dynamic agriculture started in 1954 in the country. Organic-bio-dynamic farming was developed in Switzerland in the early twentieth century. Hans Mueller and his wife Maria Mueller were the spirits behind this movement in Switzerland. Mueller had developed the method during the 1950s and the theoretical basis was provided by Hans-Peter Rusch, the German microbiologist and medical doctor.

The damage inflicted to the environment by the modern farming system was clear by the end of 1960s. The ill effects of pollution were obvious and a producer organisation, named Bioland was established in 1971 in Germany. Another organisation for the organic cultivation of fruits and vegetables had been founded in 1961. A federation for organic farming associations was established in 1988 consisting of six producer organisations. A common basic standard for organic agriculture was laid down in 1984 as a framework for individual organisation.

Organic farming spread very fast in Germany during the subsequent period. State funding for organic agriculture was available from 1989. The unification of both the Germanys in 1990 saw fast growth of organic farming in the former East German areas. The trade sector felt the absence of a German logo for organic products and the seal 'Biosiegel' was launched by the federal government.

The German government has put the goal of bringing 20 per cent of the agricultural land under organic farming by 2010 from the 3 per cent of 2002. A series of measures were introduced to achieve the goal. These steps are under the EU programme of support to organic agriculture and the federal programme for organic farming.

There are eight organic producer organisations in Germany and they represent about 60 per cent of the organic farming community. All these associations have the common organic seals for labelling the certified products, both primary and processed. The organic producers, processors and traders of the country have formed a common organization aiming at the propagation of achievements of organic production, protection of environment etc.

There are several other organisations functioning in relation to organic farming in Germany. SOL (Foundation for Ecology and Agriculture), FiBL (Berlin), Schweisfurh Foundation, Foundation Future Agriculture and Society for Ecological Animal Husbandry are some of the institutions contributing to the spread of organic farming in Germany.

Organic farming has gained acceptance in the former East Germany compared to the West. The reasons are the substantial changes in the German agriculture after the reunification, existence of large conservation areas in which organic farming can well be fitted into. Large areas in the eastern part are designated

as disadvantaged and incentives are provided there to go for organic farming. The arguments for and against organic farming between the organic and conventional farmers are intense in the western parts of Germany and this has to some extent slowed down the spread of the organic agriculture there. However, government regulations (both the Federal and State) and the support of European Union Regulations have made the organic agriculture accepted in the country.

The standards and certification process for organic farming are stricter in Germany than in other European Union countries. The German regulations restrict certification to the whole farm and the processing standards are tough. There are private and state standards and the inspections are done according to both of them. The use of genetically engineered organisms and techniques are banned in organic agriculture. There are more than 20 inspection bodies and the 22 states of the country control them. Table 3 gives the estimated organic production in Germany in 1999.

Table 3 : Organic Production in Germany - 1999.

(Quantity in Tonnes)

Sr. No.	Description	Organic Production	Total Agricultural Production	Percentage of Organic Production to Total
1	Cereals	350,000	45,271,000	0.77
2	Beans	8,000	95,736	8.34
3	Fodder Peas	20,000	610,039	3.28
4	Potatoes	112,500	11,568,000	0.97
5	Sugar Beet	13,500	3,450,000	0.39
6	Oil seeds	22,000	4,368,000	0.50
7	Vegetables	120,098	2,910,000	4.13
8	Fruits	52,338	1,331,000	3.93
9	Beef	36,000	1,438,600	2.50
10	Pork	10,000	397,800	0.25
11	Sheep & Goat Meat	5,500	44,300	12.42
12	Poultry	2,600	825,800	0.31
13	Eggs	150 million	14,342 million	1.05
14	Milk	335	28,334,000	1.18

The German organic food market was worth about 3 billion Euro in 2000. Both the federal and state governments extend financial support to organic farming. Farmers are encouraged to adopt organic methods from 1989 and those who adopt production methods compatible with the protection of environment are given assistance. In addition to the direct subsidies, marketing assistance is also provided to the organic farms. Subsidies for producers' marketing organisations, processing and market promotion are available.

Advisory services are provided to the farmers for organic farming. Advisory services were organised by the farmers themselves during the initial period of the introduction of organic farming in Germany. Now producer associations with governmental financial support offer such services. Farmers themselves hire advisors with state support and official advisors are also available.

Research and training facilities are existing in almost all the German agricultural universities and technical colleges in organic farming. Degree courses are offered in organic agriculture and organic farming research is also funded by the state. A state research institute for organic farming was established in 2000.

2.1.3 The Developing World

Large sections of farmers in the developing countries are poor and their land holdings in many countries are small. Their access to external inputs is limited and their ability to improve production is low given the economic and social disabilities to which they are exposed. Globalization and the opening up of the trade barriers among the nations have resulted in the decline of agricultural prices in the local markets to the detriment of the interests of these small farmers. These conditions can be made a bit favourable for the introduction of organic farming in which the traditional system is found conducive for such adaptations with the state support for conversion to organic agriculture. Table 4 shows the area under organic farming, its percentage to the total and the number of organic farms in the 15 countries which lag behind others in the adoption of organic methods of cultivation.

Table 4 : Countries Lagging Behind in Organic Agriculture

Sr. No.	Country	Area under Organic farming (ha)	Percentage of organic area to cultivated area	Number of farms
1	Vietnam	2	—	38
2	Zimbabwe	40	—	10
3	Nepal	45	—	26
4	Cyprus	52	0.04	15
5	Syria	74	—	1
6	Benin	81	—	119
7	Croatia	120	—	18
8	Malaysia	131	—	27
9	Laos	150	0.01	—
10	Mauritius	175	0.15	3
11	Fiji	200	0.04	10
12	Jamaica	205	0.04	7
13	Lebanon	250	0.07	17
14	Suriname	250	0.28	—
15	Malawi	298	0.01	6

Sr. No.	Country	Percentage of Organic area to cultivated area	Area under Organic farming (ha)	Number of farms
1	Laos	0.01	150	—
2	Malawi	0.01	298	6
3	Tanzania	0.01	5155	991
4	Guyana	0.02	425	26
5	Philippines	0.02	2000	500
6	Thailand	0.02	3429	940
7	Zambia	0.02	5688	72
8	Cameroon	0.03	2500	—
9	India	0.03	41000	5661
10	Cyprus	0.04	52	15
11	Fiji	0.04	200	10
12	Jamaica	0.04	205	7
13	Ghana	0.04	5453	—
14	Rep of Korea	0.05	902	1237
15	South Africa	0.05	45000	250

Sr. No.	Country	Number of farms	Percentage of Organic area to Cultivated area	Area under Organic Farming (ha)
1	Syria	1	—	74
2	Mauritius	3	0.15	175
3	Malawi	6	0.01	298
4	Jamaica	7	0.04	205
5	Fiji	10	0.04	200
6	Zimbabwe	10	—	40
7	Cyprus	15	0.04	52
8	Lebanon	17	0.07	250
9	Croatia	18	—	120
10	Guyana	26	0.02	425
11	Nepal	26	—	45
12	Island	27	0.24	5466
13	Malaysia	27	—	131
14	Ukraine	31	0.40	164499
15	Liechtenstein	35	17.00	690

Note : This table is compiled from Annexure - 1.

Most of the countries lagging behind in the adoption of organic agriculture were from Asia and Africa. In terms of both in absolute and percentage area under organic farming, Tanzania, Zambia, Ghana, India and South Africa are far behind many nations in organic agriculture.

2.2 Need for Organic Farming in India

The need for organic farming in India arises from the unsustainability of agriculture production and the damage caused to ecology through the conventional farming practices.

The present system of agriculture which we call 'conventional' and practiced the world over evolved in the western nations as a product of their socio-economic environment which promoted an over riding quest for accumulation of wealth. This method of farming adopted by other countries is inherently self destructive and unsustainable.

The modern farming is highly perfected by the Americans who dispossessed the natives of their farms right from the early period

of the new settlers in US (Wadia, 1996). The large farms appropriated by the immigrants required machines to do the large scale cultural operations. These machines needed large amount of fossil fuels besides forcing the farmers to raise the same crops again and again, in order to utilize these machines to their optimum capacities. The result was the reduction of bio-diversity and labour. The high cost of the machines necessitated high profits, which in turn put pressure to raise productivity. Then, only those crops with high productivity were cultivated which needed increased quantities of fertilizers and pesticides. Increasing use of pesticides resulted in the damage to environment and increased resistance of insects to them. Pesticides harmed useful organisms in the soil.

The monoculture of high yielding seeds required external inputs of chemical fertilizers. The fertilizers also destroy soil organisms. They damage the rhizobia that fix nitrogen and other micro organisms that make phosphates available to plants (Wadia, 1996). The long term effect was reduction of crop yields. The damaged soil was easily eroded by wind and water. The eroding soil needed use of continuously increasing quantities of fertilizers, much of which was washed/leached into surface and underground water sources.

The theme of consumer welfare has become central in the economic activities in the developed countries in the world. Sustainable agriculture based on technologies that combine increased production with improved environmental protection has been accepted as absolutely essential for the maximization of the consumer welfare. The consumers are increasingly concerned about the quality of the products they consume and food safety has become a crucial requirement. Safety, quality and hygienic standards are increasingly being made strict. The mad cow disease and the question of genetically modified food production are the recent instances, which made the countries to tighten the laws. Mycotoxin contamination, unacceptable levels of pesticide residues and environment degradation are the problems on which the attention is centred. Keeping the interests of the consumers, the European Union has taken tough measures including criminal prosecution to ensure food safety. Another area to increase the consumer welfare is promotion of the eco-friendly methods in agriculture. No-till, or conservation agriculture, lower input approaches of integrated pest or nutrient management and organic farming are some of them.

The Indian agriculture switched over to the conventional system of production on the advent of the green revolution in the 1970s. The change was in the national interest which suffered set backs because of the country's over dependence on the foreign food sources. The national determination was so intense that all the attention was focused on the increase in agriculture production.

The agriculture and allied sectors in India provide employment to 65 per cent of the workers and accounts for 30 per cent of the national income. The growth of population and the increase in income will lead to a rise in demand for foodgrains as also for the agricultural raw materials for industry in the future. The area under cultivation, obviously, cannot be increased and the present 140 million hectares will have to meet the future increases in such demands. There is a strong reason for even a decline in the cultivated area because of the urbanization and industrialization, which in turn will exert much pressure on the existing, cropped area.

Science and technology have helped man to increase agricultural production from the natural resources like land. But the realization that this has been achieved at the cost of the nature and environment, which support the human life itself, is becoming clear. It has been fully evident that the present pattern of economic development, which ignores the ecology and environment, cannot sustain the achievement of man without substantial erosion of the factors that support the life system of all living things on the Earth. The evidence of the ill effects of development is well documented. As said earlier, we in India have to be concerned much more than any other nation of the world as agriculture is the source of livelihood of more than 6-7 million of our people and it is the foundation of the economic development of the country.

There were times when people lived close to nature with access to flora and fauna in healthier and cleaner surroundings. One has to look back at our present metropolitan cities or other large towns before the past fifty years as recorded in history/memmmories of the present elder generation to see the striking differences in the surroundings in which the people lived there. Land, water and air, the most fundamental resources supporting the human life, have degraded into such an extent that they now constitute a threat to the livelihood of millions of people in the country.

Ecological and environmental effects have been highly publicised all over the world. Many times, these analysis have taken the shape of doomsday forecasts. Powerful interests in the developed western countries have also politicised these issues to take advantage of the poor nations of the world. Efforts to impose trade restrictions on the plea of environment protection are a direct result of these campaigns. But we have to recognize that the abysmal level to which we have degraded our resources requires immediate remedial measures without terming the demand for them as the ploys of the rich nations to exploit the poor.

Another turn of the events has been the blame game for ecological problems stated at the Earth Summit and other international conferences. The developed countries, it is true, are to a great extent instrumental to degrade the environment. However, the poorer countries of the world including India cannot delay or ignore the need for remedial measures, which are to be effectively implemented. We cannot gloss over the fact that we have also contributed to the degradation of ecology; look at the droughts and floods, disappearance of forests, high noise level and air pollution in the cities which are our own creations.

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 to combat desertification (Alam and Wani, 2003). It is reported that about 70 hectares of desert in Egypt could be converted into fertile soil supporting livestock through organic and biodynamic practices. India, which has some areas of semi-arid and arid nature, can benefit from the experiment.

The organic agriculture movement in India received inspiration and assistance from IFOAM which has about 600 organizational members from 120 countries. All India Federation of Organic Farming (AIFO) is a member of IFOAM and consists of a number of NGOs, farmers' organisations, promotional bodies and institutions.

The national productivity of many of the cereal crops, millets, oilseeds, pulses and horticultural crops continues to be one of the lowest in the world in spite of the green revolution. The fertilizer and pesticide consumption has increased manifold; but this trend has not been reflected in the crop productivity to that extent. The

country's farming sector has started showing indications of reversing the rising productivity as against the increasing trend of input use.

The unsustainability of Indian agriculture is caused by the modern farming methods which have badly affected/damaged production resources and the environment.

2.2.1 Affects of Modern Farming Technology

The role of agriculture in economic development in an agrarian country like India is a pre-dominant one. Agriculture provides food for more than 1 billion people and yields raw materials for agro-based industries. Agricultural exports earn foreign exchange. Modernization of Indian agriculture began during the mid-sixties which resulted in the green revolution making the country a foodgrain surplus nation from a deficit one depending on food imports. Modern agriculture is based on the use of high yielding varieties of seeds, chemical fertilizers, irrigation water, pesticides, etc., and also on the adoption of multiple cropping systems with the extension of area under cultivation. But it also put severe pressure on natural resources like, land and water. However, given the continuous growth of modern technology along with the intensive use of natural resources, many of them of non renewable, it is felt that agriculture cannot be sustainable in future because of the adverse changes being caused to the environment and the ecosystem. The environmental non-degradable nature of the agricultural development and its ecological balance have been studied in relation to the modern Indian farming system by experts which shows exploitation of land and water for agriculture, and the excessive use of chemicals.

Chemical Contamination

Fertilizers

Consumption of chemical fertilizers (N,P,K) has been increasing in India during the past thirty years at a rate of almost half a million tonnes on an average, a year. It was only 13.13 kg/ha in 1970-71, 31.83 kg/ha in 1980-81 and 74.81 kg/ha in 1995-96. It shot up to about 96 kg/ha during 1999-2000. Table 5 shows the consumption of fertilizers in India from 1970-71 to 2001-02.

Table 5 : Consumption of Chemical Fertilizers in India.

Sr. No.	Year	Consumption (M. Tonnes)	Consumption (Kg/ha)
1	1970-71	2.18	13.13
2	1980-81	5.52	31.83
3	1990-91	12.54	67.49
4	1991-92	12.73	69.84
5	1992-93	12.15	65.53
6	1993-94	12.24	66.69
7	1994-95	13.56	73.12
8	1995-96	13.88	74.81
9	1996-97	14.31	76.70
10	1997-98	16.19	86.80
11	1998-99	16.80	89.80
12	1999-00	18.07	95.60
13	2000-01	16.71	NA
14	2001-02	17.54	NA

Source : Indian Agriculture in Brief.

The present use of about 96 kg of fertilizers per ha in India appears to be modest compared to the advanced countries. Currently about 80 per cent of the fertilizer is consumed in only about 120 districts constituting less than 33 per cent of the gross cultivating area. Experts point out that the efficiency of fertilizer use in India is only 30-35 per cent as the balance 65-70 per cent reaches the under ground water. The intensity of their use in a few regions and a few crops are causes of serious concern to human health, soil, water, environment and thus to the sustainability of agriculture production in the country.

It is true that the increasing use of fertilizer at high rates has boosted agricultural production in the country. But it has also caused adverse impact on soil and water as well as environment. Several studies on the effects of high level of fertilizer application on soil health have confirmed the adverse impacts (Singh et. al., 1995).

Both drinking and irrigation water wells in large numbers have been found contaminated with nitrates, some of them are having even 45 mg per litre, well above the safe level.

Long term continuous use of high doses of chemical fertilizers badly affects the physical, chemical and biological properties of the soil. A study at the University of Agricultural Sciences, Bangalore confirmed the deterioration of soil health because of the reduction in water holding capacity, soil pH, organic carbon content and the availability of trace elements such as zinc in case of ragi crop even with the application of normal doses of fertilizer in the long run (Hegde, et. al., 1995). In the long run, increasing nitrogenous fertilizer use leads to the accumulation of nitrates in the soil. The application of sulphatic fertilizers leaves sulphates in the soil. Rainfall and excessive use of irrigation water cause these chemicals to change the alkaline or acidic nature of the soil. The nitrates go to the rivers, wells, lakes etc. And also leak into the drainage system which goes into the drinking water contaminating the environment. It also causes depletion of the ozone layer adding to the global warming. Use of nitrogen in the form of ammonium sulphate in the rice crop emanates ammonia polluting the atmosphere. The heavy metals present in the fertilizers and sewage sludge leach into ground water. Table 6 shows the content of some heavy metals in fertilizers and sludges.

Table 6 : Content of Heavy Metals in Fertilizers and Sludges

(Metals : mg/kg)

Source	Cd	Cr	Cu	Pb	Zn
Ammonium Nitrate	1.1	2.5	3.6	5.4	11.7
Super Phosphate	16.6	157.0	22.6	20.6	244.0
NPK Fertilizers (8-10-18)	4.9	54.3	8.3	3.2	97.5
Sewage Sludge	20.0	500.0	250.0	700.0	3000.0

Source : Deb and Joshi (1994).

Pesticides

The use of chemical pesticides began with the discovery of toxicological properties of DDT and HCH during the Second World War. Many chlorinated hydrocarbon insecticides like aldrin, dieldrin, toxaphane, chlordane, endosulfan, etc. came into the market during the second half of the last century. Simultaneously, organophosphate and carbonate compounds were employed in agriculture. A new group of insecticides, such as premethrin, cypermethrin, fenalaterate, etc. which were effective at low doses came into being in the 1970s.

The use of pesticides has helped in increasing agriculture production and also led to the development of resistance in pests, contamination of the environment and resurgence of many pests.

There are about 1000 agrochemicals in use in the world over. India accounts for about 3.7 per cent of the total world consumption. At present, our consumption is about 90,000 tonnes of plant protection chemicals. It comes to about 500 grams per ha compared to 10-12 kg/ha in Japan and 5 kg/ha in Europe. However, the use of pesticides in India is uneven like the fertilizers. While in cotton it is about 3 to 4 kg/ha, in pulses it comes to below 500 grams/ha (Kathpal and Beena Kumari, 1997). Pesticide application is also concentrated in some areas as in the case of fertilizers mentioned earlier.

Agricultural chemicals have become a major input in Indian agriculture with the increasing demand for food, feed and fibre. The pesticide consumption was about 2000 tonnes annually during the 1950s. India happens to be the second largest manufacturer of pesticides in Asia after Japan. It is also of interest to know that in spite of increased consumption of plant protection chemicals, the produce loss due to insects and pests increased by 5 times during the period from 1988 to 1995.

Increasing application of fertilizer also leads to increasing use of pesticides to control pests and diseases. The trend of increasing fertilizer use also compels the farmers to enhance the use of pesticides as well. For example, the use of fertilizers in increasing amounts leads to growth of weeds and in the process of weedicide use many plants growing nearby also get killed, which reduces the biodiversity. Meanwhile, the weeds also develop resistance to herbicides and the quest to formulate even powerful herbicides begins.

Pesticide consumption in India from 1970-71 to 2000-01 is shown in Table 7.

Table 7 : Pesticide Consumption in India.

Sr. No.	Year	Consumption ('000 Tonnes)
1	1970-71	24.32
2	1980-81	45.00
3	1990-91	75.00
4	1991-92	72.13
5	1992-93	70.79
6	1993-94	63.65
7	1994-95	61.36
8	1995-96	61.26
9	1996-97	61.26
10	1997-98	56.11
11	1998-99	52.44
12	1999-00	49.16
13	2000-01	46.20
14	2001-02	44.58

Source : Indian Agriculture in Brief.

Consumption of pesticides increased from 24.32 thousand tonnes in 1970-71 to 75 thousand tonnes in 1990-91 and it slowed down during the subsequent period. Insects, pests and diseases like viral, bacterial and fungal affect the high yielding varieties of crops. Almost all pesticides are toxic in nature and pollute the environment leading to grave damage to ecology and human life itself. This indiscriminate use leaves toxic residues in foodgrains, fodder, vegetables, meat, milk, milk products, etc. besides in soil and water (Dhaliwal and Singh, 1993).

High doses of pesticides severely affect the aquatic animals, fish and the wild life. Insects develop resistance to insecticides in crops like cotton and in turn force the farmers to the excessive use of them. Cases of pesticide poisoning and human and animal deaths are also reported. Pesticides irritate the skin and the respiratory system in the humans gets damaged.

It was found that all water bodies like, rivers, canals, lakes, tanks and ponds and also the costal water were contaminated with high amounts of DDT, HCH and other organochlorine pesticides. River water is seen as more contaminated than other water sources.

Contamination of drinking water with DDT and HCH is reported from different states. Since the concentrations of contaminants are higher than MRL (0.5 ppb) values fixed by the Environmental Protection Agency (EPA), the seriousness of the problem can be gauged.

Pesticides also contaminate animal feeds and fodder. Green fodder, paddy and wheat straw contain residues of DDT and HCH. Several studies have confirmed this trend (Kathpal, 1997).

Milk and milk products are also affected by the pesticide use. Both bovine and human milk showed high levels of pesticide contamination. The sources of contamination of bovine milk are traced to the fodder and feed concentrates and in case of the human milk, the consumption of contaminated food by the lactating mothers is reported to be the reason.

Infant formula/baby milk powders also showed DDT and HCH contamination level ranging from 94 to 100 per cent. Butter and ghee, the other animal products revealed high contamination levels in many parts of the country.

Cereals like wheat and rice were seen contaminated highly by pesticides like, DDT, HCH and malathion. The case of vegetable, vegetable oil, honey, fish etc. is also not different as they too have unacceptable high pesticide residue content levels.

The adverse effect of pesticide contamination on humans in India is understood from the study of dietary intake. Such studies, although a few in number, have confirmed high levels of pesticides (mainly, DDT and HCH) contamination which come to more than 3 to 5 times than the agriculturally developed countries.

The daily intake of pesticide per individual is estimated to be about 0.51 milli-grams which is above the accepted level. The Indian Institute of Horticulture Research has reported contamination of 50 per cent of the fruits and vegetables sold in the Bangalore market with the residues of DDT and HCH (Prakash, 2003).

Use of herbicides over a period results in the shift of the weed flora. The weeds of minor importance, often, become major weeds. Repeated application of weedicides helps the development of resistance in weed at alarming proportions. The remedy

recommended is rotation of herbicides or the use of other herbicides. Any way, the end result is contamination of ground water and soils inflicting damage on environment.

The number of herbicides registered in India comes to about 28 in 1997-98 which was only 10 before 10 years. This is often compared to about 300 herbicides available in the North America. There are only 10 herbicides manufactured in the country and the herbicides consumption was about 6000 Tonnes during 1994-95. It is reported that the level of herbicide use in rice, wheat, and tea in India is almost the same that of the world at large. Sugarcane, soyabean, groundnut, coffee, cotton, onion and potato are the other crops, which find widespread application of herbicides in India.

The contamination of water, air and soil with toxic synthetic fertilizers, pesticides and herbicides leads to increasing deaths of many creatures, and to human illness and mortality.

The end result is loss of biodiversity and natural harmony, increased expenditure to purify water, air, etc. The toxins in the food crops cannot be removed and the threat to human existence itself seems to be real.

The firms engaged in the manufacture and supply of agricultural inputs have a vested interest in keeping the input use increasing. Besides, they influence the government policy towards agriculture.

Salinity and Water logging

Water is one of the important inputs for the vigorous growth and high yields of crops. The modernisation of Indian agriculture has resulted in the increased use of irrigation water. The area under irrigation has grown substantially during the past three decades. Table 8 shows the gross irrigated area in the country.

Table 8 : Gross Area Under Irrigation in India.

Sr. No.	Year	Gross Irrigated Area (Million ha)
(1)	(2)	(3)
1	1970-71	38.18
2	1980-81	49.73
3	1990-91	62.47
4	1991-92	65.68
5	1992-93	66.76
6	1993-94	68.37
7	1994-95	70.65
8	1995-96	71.35
9	1996-97	73.25
10	1997-98	72.78

Source : Indian Agriculture in Brief.

The gross irrigated area of 38.18 million ha in 1970-71 increased to 49.73 million ha in 1980-81 and the next decade ending 1990-91 saw this further rising substantially to about 62.47 million ha. It increased to 72.78 million ha during 1997-98.

Heavy irrigation is necessary to get high production, as the new varieties cannot withstand water scarcity. This leads to salinity and water logging leaving the land uncultivable. Over exploitation of underground water is another effect. When water table falls, increasing energy will be required to lift water for irrigation.

Irrigation is necessary for the vigorous growth and high yields of crops in the modern method of cultivation. Many of the crops, particularly the rice and wheat high yielding varieties need more irrigation water than the traditional varieties. The area under irrigation in the country is only about 35 per cent and the remaining is still dependent on rains. So, there is a necessity to use irrigation water judiciously. Its excessive use results in severe ecological dangers like water logging of vast cultivated areas by seepages from canals. The loss of water through seepages and evaporation is estimated to be about 38 per cent. Flooding also results in run off and leaching losses of fertilizer nutrients, pesticides and soil particles. Excessive use of canal water makes the field vulnerable to soil erosion. The excessive irrigation in certain areas results in wastage as evident from the water logging

of vast cultivated areas caused by the seepage from many water sources.

Water logging is harmful to the soil. Seepage of canal water leads to salts present in the lowest layer of soil come up to the surface and the soil may turn alkaline or saline. Dams and multipurpose projects degrade the soil in the command area due to soil salinity and water logging. The chambel region in Rajasthan and Madhya Pradesh, the command area of the Bhakra Nangal, etc are the examples of water logging created by huge water irrigation projects.

Crops irrigated by sewage water have adverse effects on the health of the human population consuming the produce. The workers work on these farms also face health hazards.

Depletion of Energy Resources

Chemical fertilizers, pesticides, herbicides, etc are manufactured using the non-renewable materials like the fossil fuels. The global demand for oil and natural gas is increasing and thus the price of the inputs to agriculture is bound to rise. India's petroleum resources, which presently meet only about 30-35 per cent of the consumption demand, are under pressure. Increasing demand for chemicals and energy in agriculture sector will have affects on our energy sources.

The investments in agriculture have to be increased to meet the rising input costs and larger areas are brought under farming to earn profits. Large farms have to transport the produce to distant areas. Again, energy will be required for transportation, processing and packaging.

The rice-wheat cropping pattern and the cultivation of crops like sugarcane require high irrigation, which results in the depletion of water level. Singh and Singh (1996) found that the water level in the states of Punjab and Haryana had gone down by 0.3 to 1 m per annum during a period of 10 years due to the excessive use of water for paddy crop.

Input-Output Imbalance

A crop, in its growth process, incorporates a part of the soil fertility into the parts of the plant. The roots remain in the soil. The leaves and stems are fed to the cattle/burnt as fuel/directly

returned to the soil. The consumed part by cattle and human also go back to the soil. The practice of commercial farming leads to continuous export of the soil fertility to outside the farming areas as the organic matter leaves the locality. The soil nutrients in the form of farm produces continue to be exported. The import of chemical fertilizers cannot compensate the loss of soil nutrients through exports. The soil becomes powdery and gets eroded by wind or rain. If the harvests are exported from the country, the loss is higher (Anon, 1996).

The Earth can produce only a limited amount of biomass from a given area. If man tries to extract more, the system degenerates. If we realize that we live in a closed eco-system and act in tune, the resources can be used in a sustainable way. The maintenance of a dynamic equilibrium balances the inputs and outputs in a region. If agriculture becomes unsustainable, no society can survive for a long time.

Expansion of Cultivated Area

Not only the intensive cultivation through the use of technological inputs, but also the extensive crop production through increase in the area under cultivation has been an important aspect of modern agriculture seen in India. Increasingly areas under forests are brought under plough along with the marginal, sub-marginal and undulating land. The net sown area was 140 million ha in 1970-71 and stood at 142 million ha at the end of 1997-98.

Reduction in Genetic Diversity

The genetic base of crops is very important and a reduction of genetic diversity leads to the emergence of pests on a large scale. Farmers, in olden times, apart from using the crop rotation methods to maintain the soil fertility also relied on the genetic means to increase crop production. Relying exclusively on nation's own reserves of fertility and immunology, the farming community by evolving trial and error methods discovered hybrid varieties of crops by crossing the related strains. These crosses were from the same environment and no violence was used to separate them from nature by maintaining the ecological balance (Alvares, 1996).

The high yielding varieties of crops are the crosses from different environments and distantly related strains. For example, the high yielding rice variety got by the crossing between the dwarf and

non-dwarf varieties has major genetic weaknesses. The dwarf gene is susceptible to pest and viral attacks and the seed cannot manifest its potential without chemical fertilizer. Thus, an artificial environment has to be created for the growth of the crop (Alvares, 1996).

Thus synthetic fertilizers supplant natural fertility, which results in larger population of pests. The new technology adopted then depends upon the replacement of the local/traditional varieties of seeds. But this results in the reduction of genetic diversity and increase in genetic erosion. These modern technologies are but the result of clever manipulations of nature's genes.

Low Productivity

The productivity of cereals, millets, oilseeds, pulses and plantation crops is very low in comparison with those in other countries in the world. This is in spite of our success in improving the quality of seeds and adoption of efficient technology. The impact of green revolution is showing signs of weakness and production appears to have decreased even after an increase in the inputs used (Veeresh, 1999).

The production of foodgrains in the country increased very substantially during 1960 to 1980 to reach 160 million Tonnes from 60 million tonnes. But the decade ending 1990 and 2000 did not witness such increases and the attainment of the targeted production of 240 million tonnes to meet the demand of the population by 2010 seems to be difficult.

The reasons attributed to the low productivity are the drastic reduction in soil nutrients in the areas where fertilizer is used intensively in which the organic matter is not supplemented (Veeresh, 1999).

2.2.2 Benefits of Organic Farming

Organic agricultural practices are based on a maximum harmonious relationship with nature aiming at the non-destruction of the environment. The developed nations of the world are concerned about the spreading contamination of poisonous chemicals in food, feed, fodder and fibre. Naturally, organic farming system is looked upon as one of the means to remedy these maladies there. However, the major problem in India is the poor productivity of our soils because of the low level content of the organic matter.

The efficiency of the organic inputs in the promotion of productivity depends on the organic contents of the soil. There were many resemblances of organic farming principles in the traditional agriculture of India. But the former gives a more open and verifiable scientific foundation than the latter.

Healthy Foods

A study conducted in USA on the nutritional values of both organic and conventional foods found that consumption of the former is healthier. Apples, pears, potatoes, corn, wheat and baby foods were analyzed to find out 'bad' elements such as aluminum, cadmium, lead and mercury and also 'good' elements like boron, calcium, iron, magnesium selenium and zinc. The organic food, in general, had more than 20 per cent less of the bad elements and about 100 per cent more of the good elements.

Improvement in Soil Quality

Soil quality is the foundation on which organic farming is based. Efforts are directed to build and maintain the soil fertility through the farming practices. Multicropping, crop rotations, organic manures and pesticides, and minimum tillage are the methods employed for the purpose. Natural plant nutrients from green manures, farmyard manures, composts and plant residues build organic content in the soil. It is reported that soil under organic farming conditions had lower bulk density, higher water holding capacity, higher microbial biomass carbon and nitrogen and higher soil respiration activities compared to the conventional farms (Sharma, 2003). This indicates that sufficiently higher amounts of nutrients are made available to the crops due to enhanced microbial activity under organic farming. The effect of organic cultivation on soil fertility as reported at the farm of Central Institute for Cotton Research, Nagpur is given in Table 9.

Table 9 : Organic Carbon and available P Contents

Year	Organic		Non-Organic	
	Organic carbon (%)	Available P (kg/ha)	Organic carbon (%)	Available P (kg/ha)
June 1993	0.38	12.1	0.38	12.1
Feb 1994	0.40	12.6	0.36	12.0
Feb 1995	0.46	14.5	0.35	12.9
Feb 1996	0.52	15.0	0.38	12.0

Source : Sharma, PD, 2003.

Increased Crop Productivity and Income

Field trials of organic cotton at Nagpur revealed that during the conversion period, cotton yield was low compared to the conventional (using fertilizer and pesticides) and integrated crop management (using 50 per cent each of organic and inorganic inputs). However, the yields of organic cotton started rising from third year. Cotton yields under organic, conventional and the mixed systems were 898, 623 and 710 kg/ha respectively at the end of the fourth year of the cultivation. The yield of soyabean under organic farming was also the highest compared to the other two systems (Annexure - 2).

The Central Institute for Cotton Research, Nagpur conducted a study of economics of cotton cultivation in Yavatmal district of Maharashtra. The cost of cultivation of cotton was lower in the organic farming than in the modern system (Annexure - 3). The low costs were due to the non-use of fertilizers and chemical insecticides. As a result of the low yields during the conversion period, the net income from the organic farm was lesser than the conventional farm. But the yield under organic method increased progressively equalling it to that of the conventional system by the sixth year (Annexure - 4). The input costs were low under organic farming and with a 20 per cent of premium prices of output, the net income increased progressively from fourth year under organic farming. The appreciation of net income from organic cotton cultivation by the sixth year was 80 per cent over the conventional crop (Sharma, PD, 2003).

Results reported from 1050 field demonstration cum trials under the National Project on Development and Use of Biofertilizers in different parts of the country show an increase of 4 per cent in yield in plantation crops, 7 per cent in fruit crops, 9 per cent in wheat and sugarcane, 10 per cent in millet and vegetable, 11 per cent in fibre, condiments and spice crops, 14 per cent in oilseeds and flowers and 15 per cent in tobacco (Bisoyi, et. al., 2003).

A study of 100 farmers in Himachal Pradesh during a period of 3 years found that the total cost of production of maize and wheat was lower under organic farming and the net income was 2 to 3 times higher. Both productivity and premium prices contributed to the increased profitability. Another study of 100 farmers of organic and conventional methods in five districts of Karnataka indicated that the cost of organic farming was lower by 80 per cent than

that of the conventional one (Thakur, et. al., 2003). The cost benefit ratios mentioned for various crops were :

Crops	Organic	Inorganic
Groundnut	1:1.26	1:1.31
Jowar	1:1.36	1:1.28
Cotton	1:1.34	1:1.24
Coconut	1:1.70	1:1.31
Banana	1:3.66	1:2.82

Low Incidence of Pests

The study of the effectiveness of organic cotton cultivation on pests at the farm of Central Institute for Cotton Research, Nagpur revealed that the mean monthly counts of eggs, larva and adults of American Bollworm were far lesser under organic farming than under the conventional method (Sharma, PD, 2003).

Bio-control methods like the neem based pesticides to Trichoderma are available in the country. Indigenous technological products such as Panchagavya (five products of cow origin) which was experimented at the University of Agricultural Sciences, Bangalore found to control effectively wilt disease in tomato (Prakash, TN, 2003).

Employment Opportunities

According to many studies, organic farming requires more labour input than the conventional farming system. Thus, India which has a very large amount of labour unemployment and under employment will find organic farming an attraction. Moreover, the problem of periodical unemployment will also get mitigated because of the diversification of the crops with their different planting and harvesting schedules resulting in the requirement of a relatively high labour input.

Indirect Benefits

Several indirect benefits from organic farming are available to both the farmers and consumers. While the consumers get healthy foods with better palatability and taste and nutritive values, the farmers are indirectly benefited from healthy soils and farm production environment. Eco-tourism is increasingly becoming

popular and organic farms have turned into such favourite spots in countries like Italy. Protection of the ecosystem, flora, fauna and increased biodiversity and the resulting benefits to all human and living things are great advantages of organic farming which are yet to be properly accounted for.

2.2.3 Proposed Objectives

The broad objectives of organic farming in India can be the following in the light of the discussions on the adverse effects of the conventional farming system the country practiced for about 30-40 years and the potential benefits of the organic methods:

- 1 Sustainable agriculture
- 2 Increasing agriculture production
- 3 Food self-sufficiency
- 4 Environmental protection
- 5 Conservation of natural resources
- 6 Rural development

III PROGRESS OF ORGANIC FARMING IN INDIA

The first conference of NGOs on organic farming in India was organized by the Association for Propagation of Indigenous Genetic Resources (APIGR) in October 1984 at Wardha. Several other meetings on organic farming were held at different places in the country towards the end of 1980s. Here, mention must be made of the Bordi Conference in Maharashtra, the state which was the focal point for the organic farming movement in India. The Rajasthan College of Agriculture with the support of the state government organized a meeting on organic agriculture in 1992. The United Planters' Association of South India (UPASI) organised two national level conferences on organic farming in 1993 and 1995. ARISE (Agricultural Renewal in India for a Sustainable Environment) is a major organization in the country engaged in the promotion of organic farming. ARISE was founded in 1995 at a national conference of organic farming held at Auroville. ARISE comprises of a supporting network of regional groups aiming at sustainable environment by protecting bio-diversity and promoting organic agricultural practices. The selection of Auroville for the conference was apt as it housed the Arabindo Ashram and the pioneering work under its auspices on building technology, alternative energy research, wasteland development, afforestation and organic agriculture.

By 1980, three groups of Indians had taken to organic farming. The first one consisted of urban educated technocrats for peripheral interest, which did not last long. Educated farmers consisted of the second group whose farming practices were based on scientific knowledge. The third group practiced organic farming through trial and error. The successful organic farmers in India are those who have access to sufficient natural resources like, water and other organic inputs mostly on their own farms. These farms produce crops like sugarcane, areca, cocoa, coconut, pepper and spices. Many of them have shown that switch over to organic farming do not affect yields and income and more importantly, knowledge/expertise is available for successful adoption of organic farming in the country.

The International Federation of Organic Agriculture Movements (IFOAM) estimates that an area of about 41,000 hectares in India is under organic farming representing about 0.17 per cent of the world organic acreage. It also reveals that the percentage of organic area to the total cultivated area comes to only about 0.03

per cent and the total number of farms comes to about 5,661. But, a comparison of our 41,000 ha to Australia (10.5 million ha), Argentina (3.19 million ha), Italy (1.83 million ha), and USA (0.95 million ha) clearly indicates that organic farming in India has to go very far even to catch up with that of the leading nations of the world.

Non Governmental Organizations (NGOs) are spearheading organic farming in India. A report in 2002 indicates that about 14,000 tonnes of organic products have been raised in India. They include tea, coffee, rice, wheat, pulses, fruits, spices and vegetables. India exports organic agricultural produces to European Union, USA, Canada, Saudi Arabia, UAE, Japan, Singapore and Australia, among others.

The International Conference on "Indian Organic Products-Global Markets" at the end of 2002 was the first to be held in India. IFOAM predicts that India and China have great potential to be organic farm produce exporters in the future. An important event in the history of the modern nascent organic farming in India was the unveiling of the National Programme for Organic Production (NPOP) on 8th May, 2000 and the subsequent Accreditation and Certification Programme on 1st October, 2001. The logo "India Organic" was released on 26th July 2002 to support the NPOP.

3.1 Progress

An important progress towards organic agriculture made by India is the increasing awareness of the ill effects of the modern farming system, which the country adopted about 35 years ago. The threat poised by the conventional food products to the human health and the damage done to the ecology are being viewed seriously. Efforts are made to produce healthy foods and the demand for them is increasing. The importance of the marketing of the organic products is highlighted for the promotion of organic agriculture. Several individuals and associations have taken to organic farming and organic products are available in the large cities to a very limited extent.

Production and Exports

The aggregate production of organic agriculture came to about 14,000 tonnes during 2002 and the exports amounted to 11,925 tonnes. Details are given in Table 10:

Table 10 : Exports of Organic Products from India - 2002.

Products	Tonnes
Tea	3000
Rice	2500
Pulses and Vegetables	1800
Cotton	1200
Wheat	1150
Spices	700
Coffee	550
Cashew nut	375
Pulses	300
Herbal products	250
Oil seeds	100
Total	11925

Source : Tea Board, Coffee Board, Spices Board and APEDA

Indian organic products are mainly exported to Europe (Netherlands, United Kingdom, Germany, Belgium, Sweden, Switzerland, France, Italy, Spain, etc.), USA, Canada, Saudi Arabia, UAE, Japan, Singapore, Australia and South Africa.

Regulations

The most important step towards organic farming taken by the government was to draw a regulatory framework. It is true that the initiatives by the government to introduce organic farming by laying down regulations came belatedly as many countries have already done this kind of basic work decades ago. The implementation of NPOP is ensured by the formulation of the National Accreditation Policy and Programme (NAPP). The regulations make it mandatory that all organic certification bodies should be accredited by an Accreditation Agency. The international certification agencies operating in India even prior to these regulations will also have to get accreditation under the new dispensation.

The regulations lay down the institutional arrangements for implementing the national programme for organic production. The NPOP is administered, monitored and implemented for the benefit of farmers, processors, traders and consumers. It envisages a three tiered organisation under the overall guidance of the Union Government with the Department of Commerce, Ministry of

Commerce and Industry as the nodal agency. Policy making and declaration of the standards for organic products, recognition of organic standards of other nations, efforts to get our standards recognized by others and coordination with other arms of the government for the successful management of the organic agriculture are the major functions entrusted to the ministry.

The agencies accredited are the Agricultural and Processed Food Products Export Development Authority (APEDA), Coffee Board, Tea Board and the Spices Board. The regulations cover exports, imports and the domestic trade of the organic products. But the government regulations are applicable to only the exports. So, an organic farm product can be exported only if it is certified by a certification body accredited for the purpose. The categories of products covered under accreditation are organic crop production, organic animal production, organic processing operations, wild products and forestry.

A national level steering committee is functioning as the apex advisory body for assisting the government to promote organic farming in the country. This body consists of representative's from the Ministries of Agriculture, Food Processing Industries, Forests and Environment, Science and Technology, Rural Development and Commerce.

Organic production requires certification after periodic inspections in order to ensure that all prescribed practices are followed. The inspection and certification are done by the agencies accredited to the Accrediting Agencies dealing with the commodity. Inspection and certification agencies can be government departments, NGOs, trade or consumer or producer organisations. Such agencies should be registered bodies, with managements in position, declaring the persons who shall be held responsible for any miscarriage of certification and having proof of adequate field staff to undertake periodic inspections. The continued accreditation of such bodies is dependent upon their record of fidelity to the principles of organic production. They are authorised to award certificates after due satisfaction that practices conformed to those enunciated by the Accrediting Agency in relation to the item concerned. The charges levied by the certifying agencies are fixed by the Accrediting Agencies.

Research and Training

A National Institute for Organic Farming has been established to spearhead research in organic agriculture. The government of India constituted task force had also recommended the initiation of the postgraduate level courses in organic farming. The Morarka Foundation and Maharana Pratap University of Agriculture and Technology (MPUAT), Rajasthan have collaborated in the design and implementation of such a programme.

3.2 Projects and Initiatives

Several projects and initiatives to promote organic farming in the country have begun at the behest of individuals and institutions. The following are only a few of such efforts the details which could be available.

A project aided by the World Bank to empower the rural communities in the country to grow organic products for exports had come up in 2002. The programme aims at the improvement and promotion of organic production of spices, certification and export of black pepper, white pepper, ginger, turmeric, cardamom, clove, nutmeg and herbals like rosemary, thyme, oregano and parsley. The implementation of the programme is done by the NGOs, and Idukki and Waynad districts of Kerala, Nilgiri district of Tamil Nadu and Kandhamal district of Orissa are the areas selected for the purpose. Imparting training to both the NGOs and the farmers on organic production methods, basic standards required, documentation, inspection and certification is a major objective of the programme. The assistance to NGOs includes among others computer hardware and software especially for market promotion of their produces.

An initiative for the spread of organic farming by various stakeholders in the Indian organic agriculture sector is their coming together to constitute an apex body for providing centralized services and expertise for the increasing number of organic farmers in the country. Initial steps for setting up the Indian Competence Centre for Organic Agriculture (ICCOA) has been taken at a meeting held at the National Academy for Agricultural Sciences in New Delhi in 2003 under the joint auspices of INDOCERT, a Kerala based organic certification agency and the Swiss based FiBL (Research Institute of Organic Agriculture). The decision was the outcome of an Indian team's visit to Switzerland in 2003 to study

the structure of Swiss organic farming. The meeting elected a nine member promoter board of directors to facilitate the setting up of ICCOA, which would be registered as a charitable society. The Centre would strive to strengthen and supplement the efforts of the state governments in promoting the development of organic agriculture in the country.

In Haryana, an enterprising farmer who began farming on his 16 acre land in the Sonapat district in 1971 could establish an organic farm on 108 acres, raising vegetables and other crops (Rathi, et. al., 2003). It appears that his success is mainly attributable to the efforts made by him to market the products. NGOs functioning in the neighbourhood of Delhi buy the produces like rice, wheat, pulses and vegetables from his farm at a premium price of 30 to 50 per cent. An exporting firm at a premium of 20 to 30 per cent buys his basmathi rice. Almost 70 per cent of his farm production is sold through advance agreements/contracts. Presently he and his friends are working with the resident associations in Delhi to market their organic products at a premium of about 25 per cent.

In Rajasthan, the Morarka Foundation, established in 1995, promotes sustainable agriculture. It has about 10,000 partners producing vermi-compost and the Foundation is said to be the single largest producer of this organic input in Asia. It encourages the production of bio-pesticides and supports procurement of certified organic products. It has set up a joint venture to promote agri-biotechnology parks and a model park of such a nature has come up in Jaipur on 20 acres of land.

The campaign launched by the Foundation in the Shekhawati region of the state in favour of organic farming has resulted in reduction of cultivation costs and improvement in the quality of the produces. Small and marginal farmers in the districts of Sikar and Jhunjhunu, who had been complaining of degradation of their agricultural land and declining productivity, were benefited. The efforts of the Foundation to popularize the use of vermi-compost in place of the chemical fertilizer by creating awareness and imparting training to the farmers have been successful. The Foundation too has a large facility to produce vermi-compost. Application of vermi-compost reduces irrigation, increases the flavour of the products and results in a decline in the damage to the crops by insects. The Foundation is presently engaged in developing techniques to enrich vermi-compost through micro-organisms to make it suitable for location and crop specific application.

The promotion of organic farming is encouraged through natural resource management based on ecology protection and sustainable agricultural methods.

In Kerala, the POABS Organic Estate at Nelliampathy is engaged in the organic cultivation of several agricultural produces. Research on organic farming methods including manures and pesticides is also undertaken there. Liquid manures, mixtures of slurry, cow urine and some herbal preparations are also made for use in the estate.

Several people have taken to organic farming in the state fully convinced of its beneficial effects on man and nature. A farmer who took organic farming as a mission in the district of Kottayam was an example. His estate grew only green crops, from vegetables to rubber. When the rubber plantation was raised on organic methods, the yields were low during the initial years. On the application of the organic inputs, they increased and after three years the yields were on par with the conventional rubber trees.

An initiative to make the state of Kerala fully organic has begun with the formulation of a draft policy in 2003. A workshop on Organic Sustainability of Kerala – A Global Model was organised jointly by the state agriculture department and the Confederation of Indian Industry to deliberate on the organic farming in Kerala. The government policy will focus on conversion of land, produces and budgetary support. Assistance will also be available for certification and inputs, promoting the local certifying bodies, development of agronomic practices, extension support and training to farmers. Creation of consumer awareness, quality considerations, and emphasis on income rather than on yield will also be part of the policy. A campaign to promote organic farming on the lines of the programme on Literate Kerala is proposed to be launched. Organic farming, it is suggested, can be promoted among the educated youth who are presently averse to conventional agriculture.

The Peerumedu Development Society (PDS) is a cooperative society in the Idukki district, which promotes organic farming for the last 12 years. Pepper, cardamom, coffee, tea, nutmeg, clove, etc. are the crops raised by about 20000 farmers of the PDS who are encouraged to adopt organic farming. PDS collects the products from its member farmers and exports too. It has also started an organic tea processing factory in district.

A view currently gaining ground in the state is that organic farming has almost become necessary for the Kerala farmer, reeling under the onslaught of the highly sensitive international markets for agriculture products. The close linking of solid waste management with bio-manure production is opening up new avenues in city planning in Kerala. The State has short listed three organizations for conducting solid waste management programmes. The possibilities of making fuel pellets out of the rejected wastes are also being explored.

'Jaivam' or organic is the catchword now gaining popularity in Kerala. The tide seems to be turning in favour of bio-manure, bio-pest control and bio-disease control in all forms of agriculture. The state controlled Vegetable and Fruits Promotion Council, Keralam (VFPCK) is also taking slow steps in promoting the 'bio' trend as against the overriding importance given to the chemical methods of farming.

'Infam' is an association of agriculturists functioning in the state. As a part of its efforts to promote organic farming, it is planning to launch a producers' company for marketing of organic produces with a view to assist the growing trend of organic farming in the state. In the initial stage, the functioning of the company will be confined to the Wayanad district. The company will have about 3200 farmers of the district as members who have decided to switch over to organic mode of cultivation. Steps are also being taken to forge collaboration with the Indian Institute of Rural Management (IRMA), Anand. The proposed tie up with IRMA will be for technical help and also for marketing of the products. The Infam has conducted about 300 training programmes in Wayanad district, which had motivated the farmers to adopt organic farming methods of cultivation. The MS Swaminathan Research Foundation, Chennai that has been operating in the area, assists the movement. Wayanad district is on the verge of an environmental calamity due to the excessive use of chemical fertilizers and pesticides that depleted the soil beyond redemption. The top soil is fast losing its fertility and is becoming barren in many areas. About 2100 banana farmers used tonnes of Furidan, an insecticide annually in the district alone. The increased use of chemicals was also posing a health hazard. A survey conducted by the Infam among the school children in Thavingal Panchayath recently revealed that 250 of them were cancer patients. The cancer disease in the region is alarmingly on the rise.

Karnataka has finalized the policy on organic farming and thus has become the first state (after Uttaranchal) in the country to adopt it. It encourages the farmers to adopt organic farming and gradually give up the use of chemical fertilizers and pesticides. The government has earmarked Rs 20 crores in the state budget of 2004-05 for the purpose.

The organic farming movement in the state has reached a stage in which the creation of markets for the products has become essential. Association for Promotion of Organic Farming (APOF) at Bangalore consists of 150 voluntary members. It has been promoting organic farming by creating awareness, inspecting and giving organic certification to the farms. Organic farm production in the state is not very significant. However, some NGOs and individuals are buying organic produces although the movement to convert the land to organic farming has not been successful. There is no organised market for organic produces and if not sold out in the right time, they are left with the conventional produce at the same prices.

At the same time, while the farmers are interested in the organic cultivation the consumers are willing to pay for such products. But the link between the two simply does not exist. Consumers demand consistent supplies of good quality organic products and the farmers want an assured market for such produces.

APOP is making the farmers aware of the organic farming methods, particularly about the preparation of the soil for the purpose. The principles behind the healthy soil through the use of the on-farm inputs and compost making are explained to them.

Purushoththom Rao who owned 10 acres of land in the Shimoga district took up organic farming in 1989. He raised coconut and paddy along with several other crops in place of arecanut which was destroyed due to strong winds. The yield of coconut he obtained was 80 per cent more than that of his conventional farming friends. The cost of paddy cultivation incurred was 80 per cent lesser than his said friends.

An enterprising farmer practicing organic farming could export several products to the European market. His firm sent 5000 kg of black pepper, 1000 kg of nutmeg, 500 kg of mace, 4000 kg of white pepper, 1000 kg of clove, 300 kg of vanilla, 2000 kg of turmeric, 2000 kg of ginger, 5000 kg of white hibiscus, 80000 kg

of henna and 500 kg of cardamom. His firm is certified by a European agency as organic since 1994.

The state of Manipur in the north-east of India has decided to encourage organic agriculture. The north-east region with its unique characteristics and agricultural practices can be a potential area for the introduction of organic farming. Manipur is aiming at the encouragement of the eco-friendly farm practices and pollution free industry in the state. Dependence of the agro-chemicals will be avoided and factories and industries causing harm to plants and humans will be discouraged. The emphasis on protection of environment is in perfect harmony with the identification of the entire north-east as the mega diversity spot containing rich reserves of flora and fauna. Given the geographical location and agro-climatic zones, the state gives importance to horticulture and agro-industries. The National Horticulture Board has identified 2.77 lakh hectares for the exclusive development of horticulture in the state. It has been decided to encourage organic farming in this development area. The state has proposed to the setting up of an exclusive export zone for organic products in collaboration with the Agriculture Processed Food Export Development Authority (APEDA).

Tamil Nadu plans to encourage organic farming in horticulture and plantation crops to increase the income of the farmers of the state. The state government also wants to promote organic cultivation of fruits, vegetables and tea. The Tamil Nadu Agricultural University has established a model organic farm on a 2.5 hectare area in the campus.

The National Bank for Agriculture and Rural Development (NABARD) has decided to promote organic cultivation of horticultural crops in the mango producing areas of southern Tamil Nadu districts. Theni and Dindigul are major mango growing areas and the fact that the state government has decided to promote an agri export zone for mangoes in these districts will quicken the efforts for organic farming. The aim is to take the benefits of the premium prices for organic products in the developed countries through exports of mangoes.

NABARD has funded a farmer in Theni district to the tune of Rs 3.5 crores for organic mango cultivation on a 252 acre area. Identification of land for organic cultivation was a difficult process and it took one year for the farmer to do so and another three years to convince the banks. Search for the ideal planting

materials took several months and he incurred an annual cost of Rs 46000 for certification.

A seminar organised at Shri Murugappa Chettiar Research Centre (MCRC) at Chennai focused on the need for natural cultivation of food products. Application of farm manure, biological pest control, companion planting, inter cropping, introduction of beneficial microbes and fungies were advocated for natural food farming. The importance of earthworms and the harm caused to them by chemical farming were highlighted at the discussions.

In the history of organic farming in Tamil Nadu, the efforts made in 1970s to revive the traditional methods of agriculture at Chennai were praiseworthy. A study held by MCRC in the city revealed that 58 per cent of the people were aware of the benefits of organic farming and 82 per cent were ready to buy organic foods if the prices were competitive.

A few farmers in Puliangudi village in Tirunelveli district have successfully adopted a package of eco-friendly technologies in the paddy cultivation. It is found that these practices show good results on the indigenous rice varieties. The cost of cultivation has substantially been reduced and the farmers receive a premium for the organic rice. The cost of cultivation worked out comes to about Rs 8,750 per hectare. The price of rice obtained was Rs 30 per kg. The cultivation turned out to be rewarding economically besides being environmentally acceptable. Several farmers are coming forward to practice the method of organic farming after witnessing the results. Another farmer of the same village revealed that he got about 9,250 kg of paddy per ha and no plant protection was done after adoption of the new method. His cost of cultivation worked out was about Rs 12,500 per ha.

In Goa, a co-operative institution, the Adarsha Krishi Sahakari Kharedi Vikri Prakriya Sanstha (AKSKVPS), pioneered organic farming of cashew and coconut crops. The organisation has 1000 members and is led by its Chairman under whose leadership the organic cultivation is launched. The Cooperative Society has been receiving export orders from traders from abroad for supply of organic cashew nuts. The Society has helped more than 450 cashew growers to convert to organic farming by imparting training and other supports. It also has a processing facility for about 100 tonnes of cashew nuts during the season. The price paid for a kg of organic raw nuts is Rs 35.50. The processed nuts are taken to Mumbai and Delhi by the Society for sale.

The state of Madhya Pradesh has gone for organic soya cultivation. Plans are also ready to convert maize, wheat and pulse cultivation to organic on the principle of crop rotation. Organic soyabean is cultivated in the Malwa region of the state in the districts of Khargone and Dhar on an area of 8,700 hectares under contract farming. Farmers who have not used chemical fertilizers and pesticides during the last two years on the land offered for organic farming are selected. This condition was necessary to restore the soil health to make the land suitable for organic cultivation. Certification of the farm has been done by SKAL, an international agency accredited to APEDA. On getting the certificate, the farm can use the logo 'India Organic' on soyabean and its products like soya oil and deoiled cake. The production is meant for both the national and international markets. It is said that the conventional yellow soyabean fetches Rs 12,000 per tonne in the local market, while the organic soyabean rules at Rs 34,000 per tonne in Delhi. However, a price premium of 50 per cent is the least expected for the organic soya. This will be financially beneficial to the farmers, even though the productivity of conventional soyabean is put at 800-900 kg, which is higher than 500-600 kg of the organic soya. The genetically modified soya crops dominate the international market for soyabean and its products. However, the demand for organic soya is high ensuring a good premium for exports from the country.

IV PROBLEMS, CONSTRAINTS AND PROSPECTS

It is quite natural that a change in the system of agriculture in a country of more than a billion people should be a well thought out process, which requires utmost care and caution. There may be several impediments on the way. An understanding of these problems and prospects will go a long way in decision making.

4.1 Problems and Constraints

The most important constraint felt in the progress of organic farming is the inability of the government policy making level to take a firm decision to promote organic agriculture. Unless such a clear and unambiguous direction is available in terms of both financial and technical supports, from the Centre to the Panchayath levels, mere regulation making will amount to nothing. The following are found to be the major problem areas for the growth of organic farming in the country:

Lack of Awareness

It is a fact that many farmers in the country have only vague ideas about organic farming and its advantages as against the conventional farming methods. Use of bio-fertilizers and bio pesticides requires awareness and willingness on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is also vital to increase productivity.

Farmers lack knowledge of compost making using the modern techniques and also its application. The maximum they do is making a pit and fill it with small quantities of wastes. Often the pit is flooded with rainwater and result is the top of the compost remains under composted the bottom becomes like a hard cake. Proper training to the farmers will be necessary to make vermi-compost on the modern lines.

Attention on the application of composts/organic manure is also lacking. The organic matter is spread during the months when the right moisture level is absent on the soil. The whole manure turns into wastes in the process. The required operation is of course labour intensive and costly, but it is necessary to obtain the desired results.

Output Marketing Problems

It is found that before the beginning of the cultivation of organic crops, their marketability and that too at a premium over the conventional produce has to be assured. Inability to obtain a premium price, at least during the period required to achieve the productivity levels of the conventional crop will be a setback. It was found that the farmers of organic wheat in Rajasthan got lower prices than those of the conventional wheat. The cost of marketing of both types of products was also same and the buyers of wheat were not prepared to pay higher prices to the organic variety (Rao, 2003).

Shortage of Bio-mass

Many experts and well informed farmers are not sure whether all the nutrients with the required quantities can be made available by the organic materials. Even if this problem can be surmounted, they are of the view that the available organic matter is not simply enough to meet the requirements.

The crop residues useful to prepare vermi-compost are removed after harvest from the farms and they are used as fodder and fuel. Even if some are left out on the farms termites, etc destroy them. Experiments have shown that the crop residues ploughed back into soil will increase productivity and a better alternative is conversion into compost.

The small and marginal cultivators have difficulties in getting the organic manures compared to the chemical fertilizers, which can be bought easily, of course if they have the financial ability. But they have to either produce the organic manures by utilizing the bio-mass they have or they have to be collected from the locality with a minimum effort and cost. Increasing pressure of population and the disappearance of the common lands including the wastes and government lands make the task difficult.

Inadequate Supporting Infrastructure

In spite of the adoption of the NPOP during 2000, the state governments are yet to formulate policies and a credible mechanism to implement them. There are only four agencies for accreditation and their expertise is limited to fruits and vegetables, tea, coffee and spices. The certifying agencies are inadequate, the recognized

green markets are non-existent, the trade channels are yet to be formed and the infrastructure facilities for verification leading to certification of the farms are inadequate.

High Input Costs

The small and marginal farmers in India have been practicing a sort of organic farming in the form of the traditional farming system. They use local or own farm renewable resources and carry on the agricultural practices in an ecologically friendly environment. However, now the costs of the organic inputs are higher than those of industrially produced chemical fertilizers and pesticides including other inputs used in the conventional farming system.

The groundnut cake, neem seed and cake, vermi-compost, silt, cow dung, other manures, etc. applied as organic manure are increasingly becoming costly making them unaffordable to the small cultivators.

Marketing Problems of Organic Inputs

Bio-fertilizers and bio-pesticides are yet to become popular in the country. There is a lack of marketing and distribution network for them because the retailers are not interested to deal in these products, as the demand is low. The erratic supplies and the low level of awareness of the cultivators also add to the problem. Higher margins of profit for chemical fertilizers and pesticides for retailing, heavy advertisement campaigns by the manufacturers and dealers are other major problems affecting the markets for organic inputs in India.

Absence of an Appropriate Agriculture Policy

Promotion of organic agriculture both for export and domestic consumption, the requirements of food security for millions of the poor, national self-sufficiency in food production, product and input supplies, etc. are vital issues which will have to be dealt with in an appropriate agriculture policy of India. These are serious issues the solution for which hard and consistent efforts along with a national consensus will be essential to go forward. Formulation of an appropriate agriculture policy taking care of these complexities is essential to promote organic agriculture in a big way.

Lack of Financial Support

The developing countries like India have to design a plethora of national and regional standards in attune with those of the developed countries. The adoption and maintenance of such a regulatory framework and its implementation will be costly.

The cost of certification, a major component of which is the periodical inspections carried out by the certifying agencies, which have freedom to fix the timings, type and number of such inspections appears to be burdensome for the small and marginal farmers. Of course, the fees charged by the international agencies working in India before the NPOP were prohibitive and that was a reason for the weak response to organic agriculture even among the large farms in the country. No financial support as being provided in advanced countries like Germany is available in India. Supports for the marketing of the organic products are also not forthcoming neither from the State nor from the Union governments. Even the financial assistance extended to the conventional farming methods are absent for the promotion of organic farming.

Low Yields

In many cases the farmers experience some loss in yields on discarding synthetic inputs on conversion of their farming method from conventional to organic. Restoration of full biological activity in terms of growth of beneficial insect populations, nitrogen fixation from legumes, pest suppression and fertility problems will take some time and the reduction in the yield rates is the result in the interregnum. It may also be possible that it will take years to make organic production possible on the farm.

Small and marginal farmers cannot take the risk of low yields for the initial 2-3 years on the conversion to organic farming. There are no schemes to compensate them during the gestation period. The price premiums on the organic products will not be much of help, as they will disappear once significant quantities of organic farm products are made available.

Inability to Meet the Export Demand

The demand for organic products is high in the advanced countries of the west like USA, European Union and Japan. It is

reported that the US consumers are ready to pay a premium price of 60 to 100 per cent for the organic products. The upper classes in India are also following this trend as elsewhere. The market survey done by the International Trade Centre (ITC) during 2000 indicates that the demand for organic products is growing rapidly in many of the world markets while the supply is unable to match it.

India is known in the world organic market as a tea supplier and there is a good potential to export coffee, vegetables, sugar, herbs, spices and vanilla. In spite of the several initiatives to produce and export organic produces from the country, the aggregate production for export came to only about 14000 tonnes. This also includes the production of organic spices in about 1000 ha under certification. Some export houses like Good Value Marketing Ltd and Burmah Trading Corporation are also engaged in exporting of organic fruits, vegetables and coffee from India. The country could export almost 85 per cent of the production indicating that demand is not a constraint in the international markets for organic products.

Vested Interests

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

Lack of Quality Standards for Biomanures

The need for fixing standards and quality parameters for bio-fertilizers and biomanures has arisen with the increasing popularity of organic farming in the country. There are a very large number of brands of organic manures, claiming the high levels of natural nutrients and essential elements. But most farmers are not aware of the pitfalls of using the commercially available biomanure products. While the concept of organic farming itself lays great stress on the manures produced on the farm and the farmers' household, many of the branded products available in the market may not be really organic. Elements of chemicals slipping into the manures through faulty production methods could make the product not certifiable as organic. The process of composting which is a major activity to be carefully done is achieved usually

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

Improper Accounting Method

An understanding of the real costs of erosion of soil and human health, the loss of welfare of both humans and other living things and the computation of these costs are necessary to evaluate the benefits of organic farming. These costs will have to be integrated to a plan for the implementation of organic agriculture.

A recent study shows the inappropriateness of the cost and return accounting methods adopted to find out the economics of the organic farming (Prakash, 2003). An economic evaluation of the bad effects of inorganic agriculture and their internalization through environmental taxes is proposed for a market based approach to promote organic farming in India.

Political and Social Factors

Agriculture in India is subject to political interventions with the objectives of dispensing favours for electoral benefits. Subsidies and other supports from both the Central and state governments, government controlled prices of inputs like chemical fertilizers, the public sector units' dominant role in the production of fertilizers, government support/floor prices for many agricultural products, supply of inputs like power and water either free of cost or at a subsidized rate, etc. are the tools often used to achieve political objectives. Any movement for the promotion of organic farming in India will have to counter opposition from the sections who benefit from such policies in the conventional farming system. The political system in a democracy like India is likely to evade the formulation of policies, which affect the interests of the voting blocks unless there are more powerful counter forces demanding changes.

In the absence of alternative employment opportunities and other considerations, the organized workforce particularly in the public sector fertilizer, pesticide and seed industries is also likely to oppose moves on the part of the government to promote organic farming on a large scale.

4.2 PROSPECTS

Indian agriculture should be able not only to maintain but also must strive to increase the production of foodgrains. It appears that given the availability of organic infrastructure, minimum efforts for conversion due to the low use of chemical farming methods and the limit of the public investment, organic farming can be progressively introduced. The potential areas and crops, which fulfill the above constraints, could be explored and brought under organic agriculture. The rainfed, tribal, north-east and hilly regions of India where the traditional farming is more or less practiced could be considered (Veeresh, 2003). Table - 11 gives the details of fertilizer consumption in the north-east and hilly regions of the country.

Table - 11 : Consumption of Fertilizer in India in 2001-02.

(NPK, Kg/ha)		
Sr. No.	State/Region	Quantity
1	Manipur	105
2	Jammu and Kashmir	65
3	Himachal Pradesh	41
4	Assam	39
5	Tripura	30
6	Meghalaya	17
7	Mizoram	14
8	Sikkim	10
9	Arunachal Pradesh	3
10	Nagaland	2
11	Rainfed Areas	31
	All India	90

Source : Fertilizer Statistics.

Agriculture production in these areas is still almost on the traditional eco-friendly lines and making the farmers aware of the methods of organic farming may not be very difficult.

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

An estimate indicates that about 600 to 700 million tonnes of biomass is available to be converted to manure. Such conversion increases the nutrient value from 0.3-0.4 to 1-2 per cent. Attempts can also be made to increase the supply of biomass by allocating a portion of the cultivated area to grow tree manure crops. These plants can be harvested to be used for making composts. Schemes can be devised to grow green manure crops in the public lands on the lines of the social forestry programmes.

Several alternatives for supply of organic soil nutrients like vermi-composts and biofertilizers exist. Technologies have been developed to produce large quantities of these nutrients. Crop specific bio-fertilizers for cereals, millets, pulses and oil seeds are also available. Vermi-composting and bio-fertilizer manufacturing can be undertaken to increase the supply of organic manure to meet the demand.

The basic rules and regulations for accreditation and certification of organic products are in place in India.

A Congenial socio-cultural environment prevails in India for the promotion of organic agriculture. The farmers of India had been practicing eco-friendly agriculture for centuries till the advent of the 'green revolution' which was based on the conventional farming methods prevailed in the western countries. Still many small and marginal farmers, because of many reasons, have not fully adopted the conventional farming and they follow more or less the traditional environment friendly system. They use local or own farm derived renewable resources and manage self-regulated ecological and biological processes. This has become necessary to cultivate the acceptable levels of crop, livestock and human nutrition products and above all to protect both the crops and humans from pests and diseases through the use of bio-chemicals and bio fertilizers. Such a situation is suitable for making the farming community aware of the organic farming methods to make the switch over less troublesome.

A country like India can enjoy a number of benefits from the adoption of organic farming. The price premiums for the products, conservation of the natural resources in terms of improved soil fertility and water quality, prevention of soil erosion, preservation of natural and agro-biodiversity are major benefits. Economic and social benefits like generation of rural employment, lower urban migration, improved household nutrition, local food security and reduced dependence on external inputs will be large gains in the Indian conditions. The protection of environment and the consequent increase in the quality of human life will be other contributions of organic farming.

As said earlier, there is a good demand for organic products in the domestic market, which is not matched by supplies. The linkages between the two do not exist which in turn discourage production. The wholesalers/traders play a major role in the distribution of organic produces as they originate from the small farms (Kumar and Jain, 2003). Large farmers have access to supermarkets and own stalls for distribution. Mumbai, Delhi, Kolkata, Chennai, Bangalore and Hyderabad are the major domestic markets for organic products.

Prospects for organic farming in India can be gauged from the earlier mentioned experiences of soyabean cultivation initiated in Madhya Pradesh. High premium prices both in the national and international markets and the lack of supplies in the latter reveal the opportunities for India. Similarly the case of organic cotton of India is judged as having bright prospects.

Organic cotton/eco-cotton/green cotton is the cotton grown without inorganic fertilizers, pesticides and defoliants and duly certified by a recognized certifying organization. India has tremendous potential to emerge as a world leader in organic cotton (Venugopal, et. al., 1997). Indian cotton textile industry is one of the oldest organized enterprises and is supported by supply of raw cotton cultivated in the country. Cotton based products come to about 35 per cent of the country's exports. The present level of cotton productivity is only about 300 kg lint/ha against a world average of 600 kg. The low productivity is attributed to a large area under rainfed farming – almost 65 per cent of the cotton area.

India has the largest area under cotton in the world, but it is only the third in terms of production. The productivity is low even after 75 per cent of the cotton area is covered by the high yielding varieties. The reason for low productivity among others is the diseases/pest attacks on the crop as a result of the conversion of the traditional varieties to the high yielding ones. India needs to increase cotton production to meet both the domestic and international demand. This has to come from an increase in productivity, which presently is very low.

India is the only producer of all the four species of cotton in the world. Not only this, the country produces the widest quality range of cotton suitable for spinning 6's to 12's count yarn which can meet the demand from both the domestic and international textile industries. During the first half of the last century, the country grew only the desi cotton and the American variety accounted for a small area only. The desi variety yields are low, but they require lesser moisture, resist pests and diseases to a considerable extent, and are suitable in dry lands. And this cotton was organically cultivated. The increasing demand for cotton pushed out the desi cotton from cultivation and was replaced by the high yielding varieties. The desi cotton is grown only on 25 per cent of the total area under cotton at present.

The conventional method of cultivation of cotton needs intensive production technologies requiring very high levels of inputs like fertilizers, insecticides, and water for irrigation. The inputs are often excessively used causing ecological problems besides diminishing rate of returns.

Use of pesticides in the cotton crop is very intense and several chemicals are used indiscriminately ignoring the environment. Even the chemicals, banned/restricted for use in the advanced countries, are used in the Indian cotton crop.

Organic cultivation of cotton under certification will be profitable as there is a strong demand for eco-cotton in many Western and Asian countries. There are about 12 countries producing eco-cotton. USA, Greece, Israel, Peru, Egypt, Turkey, China and Australia are important eco-cotton producing countries. Eco-cotton commands a price higher than 30 to 40 per cent of the conventional cotton. However, the cotton growers in the country will take up organic cultivation only if the yield loss if any as a result of the switch over is compensated by high prices and the technology is feasible and financially viable.

Organic cotton can be produced in India easily in those areas where cotton is raised under the dry farming conditions. These areas are under the desi variety and as such can be converted into organic cotton farming easily. But the potential areas are spread over several states of western and southern India. Coloured cotton was cultivated in Andhra Pradesh prior to 1950. High quality hand woven fabrics were made from desi cotton once upon the time. But white cotton has replaced the coloured ones during the last fifty years. Now there is a demand world over for organically produced coloured cotton and India is in a position to cater to the international market.

4.3 Conclusions

The ill effects of the conventional farming system are felt in India in terms of the unsustainability of agricultural production, environmental degradation, health and sanitation problems, etc. Organic agriculture is gaining momentum as an alternative method to the modern system. Many countries have been able to convert 2-10 per cent of their cultivated areas into organic farming. The demand for organic products is growing fast (at the rate of 20 per cent per annum in the major developed countries).

It appears that India is lagging far behind in the adoption of organic farming. So far, the only achievement seems to be the laying down of the National Standards for Organic Production (NSOP) and the approval of 4 accreditation agencies (all government bodies) whose expertise is limited to a few crops. The following are

some of the issues, which require attention at the government policy making levels if we want to lay the spadework for the spread of organic agriculture in the country.

- 1 Substantial financial support by governments (Central, state and lower level bodies) is absolutely necessary to promote organic farming. A major factor behind the progress made by the major organic countries has been the very liberal subsidies provided by the governments. In India, organic farmers do not receive the benefits of government subsidies as they are targeted at the conventional cultivation. Given the low risk bearing capacity, the need to make the organic farming an attractive proposition at least during the initial period, the likely prospect of loss of productivity for some time, and the non-existence of marketing channels for organic produces the financial support must be adequate.

The suggestion to begin the introduction of organic farming in the north-east region and in the dry farming areas of India is a well thought out proposition. However, it should be remembered that these regions are inhabited by the poorest and least advantaged groups whose dependence on agriculture for a livelihood is total. A programme for organic agriculture in these areas must be fully supported by the full compensation both in cash and kind to the farmers in the event of the loss of production they would suffer till it reaches the levels of the days prior to the adoption of organic farming. A fair, quick and efficient delivery system for such assistance, perhaps by keeping the government bureaucracy at a distance should also be in place beforehand.

- 2 Market development for the organic products is a crucial factor to promote domestic sales. Supplies do not match the demand for organic products in the country and the absence of proper links between the two has been pointed out for the tardy growth of organic farming in the country. An important role of the government in this direction is giving various supports to the producer and consumer associations to market the products.
- 3 The producer organizations must be encouraged to get accredited for inspection and certification in accordance with the NSOP. They can also have own standards and even

symbols. This may also reduce the costs of certification besides the simplification of the process.

- 4 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.
- 5 Identification of crops for cultivation on the organic farms is important. The examples of soyabean in Madhya Pradesh and cotton in the rainfed areas could be kept in view in the process.

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Annexure 1 : Area Under Organic Farming in the World

Sr. No.	Country	Organic Area (ha)	Percentage Of organic Area to total Agriculture area	Number Of Organic Farms
1	2	3	4	5
1	Argentina	3192000	1.89	1900
2	Australia	10500000	2.31	1380
3	Austria	258500	11.30	18292
4	Azerbaijan	2500	0.20	280
5	Belgium	22410	1.61	694
6	Belize	1810	1.30	—
7	Benin	81	—	119
8	Bolivia	19634	0.06	5240
9	Brazil	275576	0.08	14866
10	Bulgaria	500	—	50
11	Cameroon	2500	0.03	—
12	Canada	430600	0.58	3236
13	Chile	273000	1.50	300
14	China	301295	0.06	2910
15	Colombia	30000	0.24	4000
16	Costa Rica	8974	2.00	3569
17	Croatia	120	—	18
18	Cuba	8495	0.13	—
19	Cyprus	52	0.04	15
20	Czech Republic	218114	5.09	654
21	Denmark	174600	6.51	3525
22	Dominical Rep	14963	0.40	12000
23	Egypt	15000	0.19	460
24	El Salvador	4900	0.31	1000
25	Equator	60000	0.74	2500
26	Eastland	20141	2.00	369
27	Fiji	200	0.04	10
28	Finland	147943	6.60	4983
29	France	419750	1.40	10364
30	Germany	632165	3.70	14703
31	Ghana	5453	0.04	—
32	Greece	31118	0.60	6680

1	2	3	4	5
33	Guatemala	14746	0.33	2830
34	Guyana	425	0.02	26
35	Honduras	1769	0.06	3000
36	Hungary	105000	1.80	1040
37	Iceland	30070	—	—
38	India	41000	0.03	5661
39	Indonesia	40000	0.09	45000
40	Ireland	44886	0.68	997
41	Island	5466	0.24	27
42	Israel	7000	1.25	—
43	Italy	1830000	7.94	56440
44	Jamaica	205	0.04	7
45	Japan	5083	0.10	—
46	Kenya	494	—	—
47	Laos	150	0.01	—
48	Latvia	20000	0.79	225
49	Lebanon	250	0.07	17
50	Liechtenstein	690	17.00	35
51	Lithuania	6769	0.19	430
52	Luxembourg	2141	1.71	48
53	Madagascar	1230	—	300
54	Malawi	298	0.01	6
55	Malaysia	131	—	27
56	Mauritius	175	0.15	3
57	Mexico	143154	0.13	34862
58	Morocco	11956	0.14	555
59	Nepal	45	—	26
60	Netherlands	38000	1.94	1528
61	New Zealand	63438	0.38	983
62	Nicaragua	7000	0.09	2000
63	Norway	26673	2.62	2099
64	Pakistan	2009	—	405
65	Panama	5111	0.24	—
66	Papua New Guinea	4265	0.41	—
67	Paraguay	61566	0.26	2542
68	Peru	84908	0.27	19685
69	Poland	—	0.30	1787

1	2	3	4	5
70	Philippines	2000	0.02	500
71	Portugal	70857	1.80	917
72	Rep of Korea	902	0.05	1237
73	Romania	18690	0.20	1200
74	Russia	5276	—	—
75	Senegal	2500	0.13	3000
76	Slovakia	58706	2.40	82
77	Slovenia	5280	0.67	883
78	South Africa	45000	0.05	250
79	Spain	485079	1.88	15607
80	Sri Lanka	15215	0.65	3301
81	Suriname	250	0.28	—
82	Sweden	193611	6.30	3589
83	Switzerland	102999	9.70	6169
84	Syria	74	—	1
85	Tanzania	5155	0.01	991
86	Thailand	3429	0.02	940
87	Tunisia	18255	0.36	409
88	Turkey	57001	0.14	18385
89	Uganda	122000	1.39	28200
90	Ukraine	164499	0.40	31
91	United Kingdom	679631	3.96	3981
92	Uruguay	687481	4.00	334
93	USA	950000	0.23	6949
94	Vietnam	2	—	38
95	Yugoslavia	15200	0.30	—
96	Zambia	5688	0.02	72
97	Zimbabwe	40	—	10
Total		23393317		393784

Source : SOEL Survey, 2003 and Alam and Shah, 2003.

Annexure 2 : Yield of Cotton under Different Systems

(Kg/ha)

Year	Organic	Integrated Crop Management	Non-Organic
1993-94	464	807	1159
1994-95	560	740	652
1995-96	849	781	651
1996-97	898	710	623
Soyabean - as rotational crop			
1998-99	2769	1961	1199

Source : Sharma, PD, 2003.

Annexure 3 : Production Costs of Organic and Conventional Farming

Sr. No.	Operation/Inputs	Conventional	Organic
1	Land Preparation	2400	2400
2	Seed	1400	300
3	Seed inoculants	0	50
4	Sowing	500	500
5	Intercultural operations	700	400
6	Vermicompost/FYM	0	1000
7	Trichocompost	0	250
8	Basal Fertilizers	2220	0
9	Urea	400	0
10	Amrut pani (a fermented mixture of cowdung and cattle urine)	0	1000
11	DAP spray	125	0
12	Plant protection chemicals	0	0
13	Biological control agents	0	0
14	Trichcards	0	0
15	Chrysoperla spp.	0	0
16	Ha NPV	0	0
17	Harvesting	2000	1800
	TOTAL	11168	8850

Source : Sharma, PD, 2003.

Annexure 4 : Yield and Income from Organic and Conventional Farming Systems

Year	Status	Yield (Qtls/ha)	Premium 20%	Total (Rs)	Net Income (Rs)	Surplus/ Deficit over conven- tional cotton
	Conventional	10.00	20000	0	9000	0
First Year	Under conversion	5.00	10000	0	750	-8250
Second Year	Under conversion	5.75	11250	0	3750	-5250
Third Year	Organic	6.25	12500	2500	7000	-1500
Fourth Year	Organic	7.5	15000	3000	1050	1500
Fifth Year	Organic	8.75	17500	3500	13500	4500
Sixth Year	Organic	10.00	20000	4000	16500	7500

Source : Sharma, PD, 2003.

Annexure 5 : Important Highlights of NPOP

The National Programme for Organic Production adopted in 2002 contains the National Standards for Organic Products. Organic production has been defined as 'the practice of a production process that develops a viable and sustainable agro-eco-system in production environment'. The NPOP is based on the following principles:

FARM PRODUCTION

- 1 All cultivated plants should be made adaptable to the climate and soil in which they grow and such plants should develop resistance to pests and diseases.
- 2 The seed and the planting materials used must be organically cultivated.
- 3 The biological activity in the soil should be maintained and the fertility of the soil should be increased.
- 4 The organic material returned to the soil must come from organic farms and the farms should be self-sufficient to meet the demand for such materials.
- 5 Rotation of crops, activating natural predators, companion planting and the mechanical means of pest and weed elimination should be the means used to control the pests and weeds.
- 6 The cultivation practices should be in such a way that pesticide and weedicide contamination of inorganic chemicals should be prevented. It should also aim at the prevention of soil erosion.

STORAGE AND TRANSPORTATION

Storage of organic products should be in such a way that the attention given during the production is not lost by contact with the non-organic products. The organic products must be stored, transported and conveyed for the final consumption without losing their organic character.

PROCESSING, PACKAGING AND LABELLING

- 1 Pests and storage and processing stages should be controlled by physical barriers, sound, light, etc.
- 2 Processing methods should be based on mechanical, physical and biological means.
- 4 Packaging should aim at : prevention of erosion of the organic quality, use of bio-degradable material, no generation of wastes and control of pollution.
- 5 The label on the organic products should clearly mention whether the product is fully organic or under conversion and the geographic appellation should pertain to the geographic region of production.
- 6 All processed organic products should declare the ingredients used on the label.

IMPORTANT HIGHLIGHTS OF THE NATIONAL STANDARDS (NSOP) AS A PART OF NPOP.

The NSOP is formulated considering the basic standards evolved by the IFOAM. The agriculture and climatic conditions in India and its traditional methods of farming are also kept in view.

CROP PRODUCTION AND ANIMAL HUSBANDRY

- 1 The whole farm, including the livestock, should be converted to organic methods over a period of time which is called the conversion period.
- 2 The arrangement of all the crops and animal husbandry should aim at the harmonization both.
- 3 Accredited agencies are empowered to prescribe the plan of conversion.
- 4 All the prescribed standards shall be met during the period of conversion. If the whole farm is not converted, both the organic and conventional parts should be separate and distinct.

- 5 Inspection of the farm is a must during the conversion period for awarding certificates.
- 6 Simultaneous production of conventional and organic crops is not allowed unless they could be easily distinguished.
- 7 Organic production is based on continuity and should be made available on a long term basis.
- 8 Organic production should benefit the eco-system.
- 9 Only certified organic seeds and plant materials will be used.
- 10 The conversion period is dependent on the time required to restore the soil fertility and eco-system; It is the period in which all the actions to reach the goals take.
- 11 The basis for crop production in gardening, farming and forestry is consideration of the structure and fertility of the soil and surrounding eco-system and to provide a diversity of species while minimizing nutrient losses.
- 12 Sufficient quantities of biodegradable material of microbial, plant or animal origin should be returned to the soil to increase or at least maintain its fertility and the biological activity within it. Such biodegradable material should have been produced organically.
- 13 Organic farming systems should be carried out in a way that ensures those losses from pests, diseases and weeds are minimized. Use of a balanced fertilizer application, use of crops and varieties well adapted to the environment, fertilize soils of high biological activity, adapted rotations, companion planting, and green manures should be accepted.
- 14 All measures should be taken to minimize contamination from outside and within the farm.
- 15 Soil and water resources should be managed in sustainable manner with a view of their conservation.
- 16 Collection of non-cultivated materials of plant origin and honey should be in such a way that it should be a positive contribution to the maintenance of natural areas.

- 17 Management of animal husbandry should be governed by the physiological and ethological needs of the farm animals. The animals would be allowed to live by their basic behavioural habits and the good health and welfare of them should be the consideration in the selection of the management practices.
- 18 The establishment of organic animal husbandry requires an interim period, called the conversion period. All organic animals should be born and raised on the organic holding.
- 19 Animal breeds should be chosen which are adapted to local conditions and the aims should not be in opposition to the animal's natural behaviour and would be directed towards good health. The animal's distinctive characteristic should be respected.
- 20 The feed given to the livestock should be of 100 per cent organically grown and of good quality. The feed should have been produced on the farm itself or produced in the same region.
- 21 Transport and slaughter would minimize stress to the animal and the transport medium should be appropriate for each animal.

FOOD PROCESSING AND HANDLING

- 1 Handling and processing of organic products shall be optimized to maintain quality and integrity of the product and directed towards minimizing the development of pests and diseases.
- 2 Pests and vermin should be avoided by good manufacturing practices, which should be based on general cleanliness and hygiene.
- 3 100 per cent of the ingredients of agriculture origin shall only be certified organic.
- 4 Processing methods should be based on mechanized, physical and biological processes and the vital qualities of the organic ingredients should be maintained throughout processing.

- 5 Packaging materials used should be eco-friendly and should not generate wastes. Such materials should in no way reduce the organic quality of the product.
- 6 Labelling shall convey clear and accurate information on the organic status of the product.

