CHAPTER II

REVIEW OF LITERATURE

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A survey of literature was undertaken to be familiar with the subject matter concerned with the present problem, which proved helpful in planning and execution of the study. Organic farming and organic food is gaining gradual momentum across the world. Growing awareness of healthy living and environmental issue in agriculture has demanded production of organic food. Various experts from different disciplines have given meaning and definitions of organic food. They have also given the historical perspectives and certain myths related to organic food. The advantages and limitations of organic food are also discussed by various authors. Impact of chemical additives on human health and soil are also identified by various authors. The major areas of the related literature have been presented in this chapter under the following heads. The theoretical aspects and research studies have been presented together.

1. Development and significance of Organic farming and Organic food
2. Definitions of Organic food and Organic farming.
3. Pesticides and fertilizer content in food and their impact on health
4. Pesticides and fertilizer content and its impact on soil.
5. Organic food market and consumer's preference regarding Organic food.
6. Standards and certification of Organic food.
7. Logos of Organic food and certifying agencies

1. Development and significance of Organic farming and Organic food

"If no safe inputs
No Safe soil, air, water and food
No Safe life and future generation!!!!!!!!"

(Savaliya & Savaliya, 2004)

History of organic farming

According to **Dudani (1997),** agriculture was generally believed to have begun some 10,000 years back. The Sumerians were believed to have used sulfur compounds as insecticides before 25 B.C, while the Chinese were credited with the use of plant pesticides for treatment of seeds around 1200 B.C. He further added that in India perhaps the Neem tree occupied pride of place for insecticidal and medicinal value since antiquity. This found a place in the treatise of Kautilya on Polity- the Arthshashtra- which dated back to the 4th century B.C. There were several other scriptures on the subjects dating back from 6th century A.D onwards.

Sharma (2001) reported that the term 'Organic farming' was first used by Lord Northbourn in the book, 'Look to the Land'. Northbourn had a vision of the farm as a sustainable, ecologically stable, self-contained unit, biologically complete and balanced living. The term thus did not refer solely to the use of living materials (organic manures etc) in agriculture although obviously it included them, but with its emphasis on wholeness was encompassed best by the definition of pertaining to, or characterized by systematic connection or coordination of part of the one whole.

Organic farming is one of the most important ways of sustainable agriculture which is based upon a set of processes that lead to safe and healthy food without using any harmful chemicals. About its origin, **Chhonkar(2003)** reported that the importance of organic manure in agriculture was known since ancient times and found mention in ancient Hindu religious scriptures (Rig Veda 1, 161,10,2500-1500 BC, Atharva Veda II 8.3) He also added that Holy Quran mentioned that "at least one-third of what you take out from soil must be returned to it implying recycling of the post harvest residues".

Bhattacharya and Chakraborty (2005) of National centre of organic farming, Gaziabad also mentioned that organic farming was initiated in 10000 years back when ancient farmers started cultivation depending on natural sources only. He added that in Ramayana, it was mentioned that all dead things-rotting crops or stinking garbage returned to earth were transformed in to

wholesome things that nourish life. Mahabharata (5500BC) also mentioned of Kamdhenu, the celestial Cow and its role on human life and soil fertility. 'Kautilya Arthshashtra' (300 BC) mentioned several manures like oil cake, excreta of animal whereas, 'Brihad-Sanhita' described how to choose manure for different crops and the methods of manuring. They further added that organic farming had its roots in traditional agriculture practices that evolved in countless villages and farming communities over the millennium. They further stated major milestones in the area of organic farming as mentioned below.

Key milestone on organic farming in current period	
Sir Albert Howard (1900-1947)	father of modern organic Agriculture, developed organic composting process (mycorrhizal fungi) at Pusa, Samastipur, India and published document" An Agriculture Testament".
Rudolph Steiner (1922)	a German spiritual Philosopher built biodynamic farm in Germany.
J.I. Rodel (1950)	USA popularized the term sustainable agriculture and method of organic growing.
IFOAM	Establishment of 'International Federation of Organic Agriculture Movement", in 1972
One Straw Revolution	Release of the book by Masanobu Fukoka (1975), an eminent microbiologist in Japan.
EU Regulation	EU Regulation on Organic Food, 1991
Codex	Codex guideline on organic standard, 1999.

Ramnathan (2006) stated that the traditional agriculture practiced by our forefather farmers was essentially organic. People used animal excrement on cultivated soil as manure. Though many farmers in India had adopted Green Revolution-like ('conventional') agriculture, there were still a lot of farmers who

practice traditional forms of agriculture without modern varieties, synthetic fertilizers and pesticides. In some cases, these farmers practice extensive forms of agriculture. In other cases, traditional farms show high levels of land use intensity due to India's high population density. Therefore, traditional farmers were sometimes referred to as organic farmers 'by default'

Heckman (2007) professor in the Plant Biology & Pathology Department at Rutgers University reported the recent rapid growth of the organic movement had resulted in a loss of connection with the historical figures and roots of organic agriculture. He further added that Sir Albert Howard (1873-1947) who was regarded by most as the founder and pioneer of the organic movement, published the book, *An Agricultural Testament*, in which he described a concept that was to become central to organic farming—the importance of utilizing available waste materials to build and maintain soil fertility and humus content. According to what he called "the Law of Return," he strongly advocated the recycling of all organic waste materials, including sewage sludge, back to farmland. The period from 1979 to 1990 might be described as the era of recognition for organic farming at a national level in the USA. With a growing public interest in organic food and farming, interest in establishing standards for organically produced foods also increased. As a sign of the new times, in 1979, California passed a law establishing a legal standard for organic production

Green Revolution

The green revolution which was launched in the mid-sixties transformed the agricultural practices. Population of developing countries had been growing rapidly and demand for food had not been able to keep up with population growth. Thus, all the knowledge accumulated and practiced over such a long period was washed away with the advent of the accidental discovery of chemical pesticides which in combination with the chemical fertilizers gave way to chemical farming. In fact, so strong has been the impact that this has now come to be referred to as the conventional farming.

The Green Revolution increased food production and prevented India from a major food crisis. Modern agriculture largely depends on the use of fossil fuel based inputs, such as chemical fertilizers, pesticides, herbicides and energy intensive farm machinery. The application of such high input in the farm undoubtedly affected the quality of soil.

Kesavan and Swaminathan(2006), stated that The term 'green revolution' was coined by William Gaud in 1968 to describe the enhanced photosynthetic activity of the green pigment, chlorophyll, leading to more grain production. This involved not only effective utilization of solar energy and carbon dioxide from the atmosphere, but also water and several nutrients, particularly nitrogen, phosphorus and potassium from the soil. The pathway for the green revolution involved genetically altered plant forms, application of high doses of chemical fertilizers and copious irrigation. However, the luxuriant growth of plants attracted a variety of pests, and therefore, chemical pesticides needed to be periodically applied. In addition, they were also selected for photo insensitivity, so that they could be fitted into multiple cropping sequences.

Lukas (2007), mentioned that from the mid- and late-1960s onwards, the development and introduction of modern varieties together with the introduction of synthetic fertilizers and pesticides, an expansion of the irrigated area, and rural credit schemes resulted in a major breakthrough in agricultural productivity. This agricultural 'revolution' was known as the Green Revolution. Green Revolution- was referred to as 'conventional agriculture' or 'high-external input' agriculture in his research.

Rai (2008) mentioned in her lecture on organic agriculture that, the Green revolution technologies involving greater use of synthetic agrochemicals such as fertilizers and pesticides with adoption of nutrient- responsive, high-yielding varieties of crops had boosted the production output per hectare in most of the cases. However, this increased in production has slowed down and in some cases there were indications of decline in growth of productivity and production. Priorities in agriculture research were gradually moving from a focus on individual crop performance to a total system productivity with due

attention on product quality and environment safety. Environmental and health problems associated with agriculture had been increasingly well documented.

Sharma (2010) stated that India is doing gradually progress in the field of Organic Agriculture. 20 lacs acres land distributed among 18 districts of Andhra Pradesh had stopped using chemicals in their farm and made their land more sustainable and productive. This made changes in their existing farming method and increased production eventually. The soil had become more fertile and the production cost had decreased to 40%. This raised their income and improved their standard of living. In a span of just two years 386 families out of 467 families had paid all their pending debt. Thus, in coming years, organic farming would definitely create miracle in Indian agriculture.

Myths and Fallacies about Organic farming

There were number of myths and fallacies about organic farming, both in favour and against. The term chemical farming is referred to conventional (non-organic) method of farming.

According to **SATVIK (1999)** an organization working for organic food at Kolkota, following were some common myths related to organic farming.

1. Yields in organic farming are lower than chemical farming: When properly followed, yields in organic farming are in the long run, far greater than those obtained by chemical farming. In horticulture crops the effects are even better. In case of a chemical farm converting to organic, there is often some loss in yield and it takes a few years before yields increase and stabilize at a level often higher than that achieved in chemical farming.
2. Organic farming is not economic: While certain practices such as composting and mulching do entail, greater costs on account of labour, the overall cost of cultivation is usually lower than chemical farming.

The farmer has to be self-sufficient in his requirement for compost and pest control measures.

3. One can't supply enough nutrients by using compost: If one calculates the percentage of nitrogen, potassium and phosphorous in fertilizers and composts, the difference is indeed vast. Going by this "scientific" calculation, one might find that in lieu of 200 kgs. of mixed fertilizers, one needs over 30 tons of composts, fairly impossible to supply two to three times a year. In the organic farming, however, concept of feeding the plant does not exist. The attempt here is to feed the soil, keep it healthy and living and keep the process in motion. Much of the work is done by the numerous soil organisms and microorganisms that thrive in living soils. The various practices of organic farming ensure that soil fertility is maintained and this symbiotic relationship is to be kept alive and vibrant.
4. There is big money in organic farming: So far in India, most organic farmers have turned organic because of their belief. The "Organic market" exists for a small number of farmers who have access to a few specialized outlets. Otherwise it is difficult to see every farmer who is growing food organically getting premium for his product. An option for export has also opened in the last decade which organic farmers can explore only if they are "certified" as organic.
5. The non-users of chemical fertilizers and pesticides is organic farming: This is an important myth, that simply avoiding the use of chemical fertilizer and pesticides is organic farming. This is not true. Organic farming is about maintaining soil health ("feeding the soil" rather than "feeding the plant"). It entails producing the highest yields possible, in a sustainable, eco-friendly manner using a number of different techniques.

Fooks (2001) in her report mentioned following myths about organic farming.

1. Organic foods are no healthier than non-organic foods: food produced organically contains fewer contaminants. Some scientific studies have shown that there are more nutrients in organically produced food.

2. Organic farming increases the risk of food poisoning: Organic farming practices reduce the risk of pathogens such as E.coli in food as well as potentially reducing the risk of mycotoxin contamination. Thus organic farming can actually reduce the risk.
3. Organic farming uses pesticides that damage the environment: Organic farming systems rely upon prevention rather than cure, minimizing the need for pesticides.
4. Consumers are paying too much for organic food: Crop rotations, organic animal feed and welfare standards, the use of good husbandry instead of agri-chemicals, and the preservation of natural habitats all result in organic food costing more to produce. Non-organic food appears to be cheaper but in fact consumers pay for it three times over – first over the counter, second via taxation (to fund agricultural subsidies) and third to remedy the environmental pollution (or disasters like BSE) caused by intensive farming practices.
5. Organic food cannot feed a hungry world: Intensive farming destroys the fertility of the land and is unsustainable. Organic methods help labour communities to produce food sustainably.
6. Organic farming is unkind to animals: Animal health in organic farming is based on prevention rather than cure. Good husbandry and high standards of welfare ensure that animals are less susceptible to disease. Homeopathic remedies are recommended when an animal falls ill, but no animal is denied proper veterinary treatment, including antibiotics, if required.

According to Chhonkar (2003), the following are myths about organic farming and organically Produced food.

1. Organic food tastes better and are of superior quality: Regardless of whether the nutrients are from organic or inorganic source, plants absorbs the same in the form of inorganic ions: ammonium, nitrate, phosphate, potassium etc. Sensors in plant roots, if any to distinguish between nutrient ions coming from organic or inorganic source have to be still discovered. Once absorbed the nutrients are resynthesized into

compounds which determine the quality of produce eg. Flavour, shelf life etc., which is a function of genetic make up of the plant. There is no scientific evidence presented as yet to show that organically produced food is of better quality or taste and use of chemical fertilizers deteriorates it.

2. Organic food is more safe and nutritious: This is a general perception in public mind that organically grown food is more nutritious, healthy and safe. There are no consistent and valid reports of differences in the mineral contents of organic and conventional food. The hazards in food are mainly due to agro-chemical additives. In fact, microbes and not chemicals is the major source of the food-borne diseases such as typhoid, dysentery gastroenteritis etc. Animal waste can be effective nutrients source but pathogen risk must be seriously considered.
3. Organic farming is eco-friendly: It is advocated that organic farming is eco-friendly. It keeps the soil healthy and does not pollute environment. It is well known that nitrate is a main end product of manure decomposition and it is continuously released from organic matter undergoing decomposition. Since nitrate release is not synchronized with either crop demand or its uptake, it therefore tends to accumulate in excessive amounts in soil and poses environmental risk.
4. Organic farming improves soil fertility and chemical fertilizers deteriorate it: Long term fertilizer experiments conducted under varying agro-climatic conditions have shown that balanced application of chemical fertilizers over a period of three decades sustained crop productivity.
5. Organic farming sustains higher yields: It is generally propagated that the organic farming sustains higher yields as compared to conventional farming using chemical fertilizers and plant protection chemicals. Whereas there are dependable research evidence to show that balanced chemical fertilization have sustained crop yields on long-term basis, but people have still to get convincing and clinching evidence to show that higher crop yields could be obtained under organic farming system on long term basis.

6. Enough organics are available to replace chemical fertilizers: The biggest of the myths about the organic farming is that the country has enough organics available to replace chemical fertilizer to sustain present level of crop production. Katyal (2002) made projection on the availability of plant nutrients from organic sources of agriculture in India which shows, 7.75Mt total plant nutrients available from tapable organic sources. These figures are quite revealing which go on to show that all tapable nutrients from organic sources will be barely able to meet the deficit of nutrients in soil after crop removal at present level of crop production and fertilizer application.

Reasons to buy organic food

Weil (2005) had given 10 reasons to eat organic food which are as under

1. It is healthy. Organic food tends to contain higher levels of vitamin C, cancer-fighting antioxidants, and essential minerals such as calcium, magnesium, iron and chromium.
2. No nasty additives. Organic food doesn't contain food additives that can cause health problems such as heart disease, osteoporosis, migraines and hyperactivity.
3. It avoids pesticides. More than 400 chemical pesticides are routinely used in conventional farming and residues are often present in non-organic food.
4. No genetic modification. Under organic standards, genetically modified (GM) crops and ingredients are not allowed.
5. There is not a reliance on drugs. Organic farming standards prohibit the routine use of antibiotics and growth hormones in farm animals.
6. There are no hidden costs. As taxpayers, we pay for chemicals to be removed from our drinking water - including the pesticide runoff from conventional farms.
7. There are high standards. Organic food comes from trusted sources that are inspected to ensure compliance to organic standards.

8. Organic methods provide welfare for animals. Animal welfare is taken very seriously under organic standards.
9. It's good for wildlife and the environment. The UK government has said that organic farming is better for wildlife, causes lower pollution from sprays, reduces less carbon dioxide - the main global warming gas - and less dangerous wastes.
10. It's flavorful. Many people prefer organic food because they say it tastes better.

According to **Dr. Greene**, one of the nation's leading pediatricians (2007), there were the following seven reasons why families who drink milk should choose organic milk.

Organic milk

1. Produced without antibiotics. Antibiotic overuse is a major public health problem. One of the main places where antibiotics are used today is in agriculture. Organic milk comes from organic cows that have not been treated with antibiotics, so it doesn't contribute to the growing problem of bacterial resistance.

2. Produced without synthetic hormones. Hormones are powerful. Even trace amounts can cause dramatic changes in living beings. When you choose organic milk, you know that added synthetic hormones are not stimulating the cows' milk production.

3. Produced without harmful pesticides. Agricultural pesticides are now widespread. They can even be measured in raindrops falling from the sky, fog rolling over the hills, 'fresh' snow, and in water we drink. Organic agriculture reduces pesticide exposure because it comes from organic cows that are fed food grown without chemical pesticides.

4. High in Conjugated Linoleic Acids (CLAs). CLAs are important 'good fats' that have been linked to decreased heart disease and diabetes. In fact, in the May 9 issue of the Archives of Internal Medicine, researchers from

Massachusetts General Hospital and the Harvard School of Public Health reported low-fat dairy products, including milk, might lower the risk of type 2 diabetes in men.

Milk made from cows who pasture has higher CLA content. Since many organic farmers rely upon pasturing and give their cows fresh green grass whenever weather permits, organic milk often has a high CLA content.

5. Excellent source of calcium. Most of America's school children are failing to get the calcium they need each day for their growing bodies. Kids 4-8 years old need 800 mg per day. Kids 9-18 need 1,300 mg of calcium per day. Organic milk contains about 300 mg per eight-ounce glass and is one great way to help kids get the calcium they need. Organically flavored milks, such as chocolate and strawberry, are popular options for kids, too.

6. Organic milk is wholesome. Organic milk is a natural, whole food beverage - unlike most beverages promoted for kids that are packed full of artificial chemical ingredients. Many of them contain high fructose corn syrup, aspartame and/or artificial chemical dyes.

7. It's the right thing to do. Unlike factory cows, organic cows must have access to open air. Organic cows from some dairy farms are allowed to graze freely in organic pasture when it is in season. This kind of farming is kind to animals, supportive of wildlife, healthy for rural communities, respectful of our air, water and soil, and healthy for children.

Organic Trade Association (2007) had given 10 reasons to select organic food in the daily diet (www.ota.com)

1. Organic products meet stringent standards: Organic certification is the public's assurance that products have been grown and handled according to strict procedures without persistent toxic chemical inputs.
2. Organic food tastes great : Its common sense – well-balanced soils produce strong, healthy plants that become nourishing food for people and animals.

3. Organic production reduces health risks: Many EPA-approved pesticides were registered long before extensive research linked these chemicals to cancer and other diseases. Organic agriculture is one way to prevent any more of these chemicals from getting into the air, earth and water that sustain us.
4. Organic farms respect our water resources: The elimination of polluting chemicals and nitrogen leaching, done in combination with soil building, protects and conserves water resources.
5. Organic farmers build healthy soil: Soil is the foundation of the food chain. The primary focus of organic farming is to use practices that build healthy soils.
6. Organic farmers work in harmony with nature: Organic agricultural respects the balance demanded of a healthy ecosystem: wildlife is encouraged by including forage crops in rotation and by retaining fence rows, wetlands, and other natural areas.
7. Organic producers are leaders in innovative research: Organic farmers have led the way, largely at their own expense, with innovative on-farm research aimed at reducing pesticide use and minimizing agriculture's impact on the environment.
8. Organic producers strive to preserve diversity: The loss of a large variety of species (biodiversity) is one of the most pressing environmental concerns. The good news is that many organic farmers and gardeners have been collecting and preserving seeds, and growing unusual varieties for decades.
9. Organic farming helps keep rural communities healthy: USDA reported that in 1997, half of U.S. farm production came from only 2% of farms. Organic agriculture could be a lifeline for small farms because it offers an alternative market where sellers could command fair prices for crops.
10. Organic abundance – Foods and non-foods alike: Now every food category has an organic alternative. And non-food agricultural products are being grown organically – even cotton, which most experts felt could not be grown this way.

Conclusion

This section provided a brief summary about history of organic farming, meaning of green revolution, myths related to organic farming and reasons to include organic food and milk in the daily diet. . The literature review provided information about the existence of organic agriculture in past. It showed that the concept of organic farming was not new to India. Due to increased population and increased demand of food, farmers started using chemical fertilizers and pesticides in their farms. The Green Revolution increased food production and prevented India from a major food crisis. However, high-external input agriculture has had various negative impacts on farmers' livelihoods, which have become increasingly obvious over the long term, in particular since the early 1990s. Organic farming had its roots in traditional agriculture. India was the pioneers of organic farming. Today organic farming is looked upon as the answer to problems posed by conventional farming. It was observed from the literature that there were many misconceptions about organic food. A systematic research is required to clear doubts related to organic food.

2. Definitions of Organic farming and Organic food

Organic farming

Organic farming was not new to India. It was the only option to solve the world's agriculture problem. There was no single definition for organic farming as the term refers to a movement rather to a policy.

In 1980, a team of scientists appointed by the USDA concluded that there was no universally accepted definition of "organic farming." Their report stated:

> " Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and livestock feed, additives to the maximum extent feasible. Organic farming systems rely on crop rotation, crop residues, off-farm organic wastes, mechanical cultivation, mineral bearing rocks and aspects of biological pest control to maintain soil productivity and

tilth to supply plant nutrients and to control insects,weeds and other pests"

According to Beharrell and Mac Fie, (1991) "Organic farming refers to a particular farming system that uses organic manures, limited range of naturally derived chemicals. Organic farming uses no growth regulators, artificial feed additives, biocides or synthetic chemical sprays".

The following definition of "organic" was passed by the National Organic Standard Board (NOSB) at its April 1995 meeting in Orlando, FL. (http://www.ota.com/standards/nosb/definition.html)

> Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony.
>
> "Organic agriculture practices cannot ensure that products are completely free of residues; however, methods are used to minimize pollution from air, soil and water".
>
> "'Organic' label denotes products produced under the authority of the Organic Foods Production Act. The principal guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole".
>
> "Organic food handlers, processors and retailers adhere to standards that maintain the integrity of organic agricultural products. The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people."

Passage of the Organic Foods Production Act forced the USDA to develop an official definition. On December 16, 1997, the USDA Agricultural Marketing Service proposed rules for a National Organic Program .

> "A system that is designed and managed 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, where possible, cultural, biological and mechanical methods, as opposed to using substances, to fulfill any specific function within the system so as to: maintain long-term soil fertility; increase soil biological activity; ensure effective pest 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."

In the year 1997 the International Federation of Organic Agriculture Movements (IFOAM) defined organic agriculture as

> "a farming system, which relies on crop rotations, the recycling of farm-produced organic material i.e. crop residues, animal manure, legumes, green manure and off-farm organic wastes and on a variety of non-chemical methods for the control of pests, diseases and weeds. Synthetically compounded fertilisers, pesticides, herbicides, growth regulators and livestock feed additives are excluded or severely restricted. The products and methods of genetic engineering are also strictly prohibited."

Lampkin, et. al(1999) says that the term "Organic farming" is best thought of as referring not to the type of inputs used but to the concept of the farm as an organisms in which all the components- the soil minerals, organic matters, micro organisms, insects, plants animal and human- interact to create coherent self regulating and stable, whole reliance on external inputs, whether chemical or organic is required as far as possible

According to **Palaniappan and Annadurai (1999)**

> "The organic farming in real sense envisages a comprehensive management approach to improve the health of underlying productivity of the soil"

The only certified organic super market in UAE stated (2002) **(www.organicfoodsandcafe.com)**

> "The word 'Organic' means 'living', and in practical

terms, this means natural food that is grown and processed without chemical fertilizers, pesticides, herbicides or fungicides. Nothing unnatural is allowed so there are no growth hormones, antibiotics, preservatives, dyes, chemical coatings or irradiation allowed. There is no genetic engineering allowed in organic foods." and "Organic food is nothing else but good pure nutritional food – the way it used to be".

Chhonkar (2003) defined organic farming as

> "Organic agriculture avoids or largely excludes the use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives".

The European Union had published its own definition of organic farming in the document "Organic farming: Guide to community rules" which is as under

> "Organic farming involves holistic production management system for crops and livestock for emphasizing the use of management practices in preference to the use of off farm inputs, which is accomplished by using where possible cultural, biological, and mechanical methods in preference to synthetic materials".

Sharma (2004) defined organic farming as "a production system which avoids the use of synthetically produced compound fertilizers, pesticides, growth regulators and livestock feed additives" Also according to him the maximum extent feasible organic farming system rely upon crop rotation, crop residues, animal manure, legumes, green manures, off farm organic waste and utilize biological pets control to maintain soil productivity to supply plant nutrients and to control insects, weeds and other pests".

Bhattacharya (2004) reported that "organic farming relies on crop rotation, crop residues, animal manure, legumes, green manure, off farming organic waste and people".

Organic agriculture relies on the long-term stability of the agro-ecological system, which is therefore maintained and enhanced. The management of pests, diseases and soil fertility is based on biological methods. Rather than

externally acquired synthetic fertilizers, the farmer applies compost, vermicompost, animal manure and green manure, cultivates nitrogen-fixing leguminous crops and traditional deep rooting varieties, which are able to extract nutrients from the subsoil (**Palaniappan & Annadurai 1991 ; Sharma 2001 ; Dahama 2005**).

Narayanan (2005) defined organic farming as,

> "environment friendly ecological production system that promotes and enhances biodiversity, biological cycles and biological activities. It is based on minimum use of off farm inputs and management practices that restore, maintain and enhance ecological harmony".

Ramnathan (2006) comprehensively defined organic farming as "environment friendly ecological production system that promotes and enhances biodiversity, biological cycles, and biological activities"

Organic Food

The term "organic foods" refers to the methods used to produce the foods rather than to characteristics of the food themselves. The most common concept of "organically grown" food was articulated by **Robert Rodale (1972),** editor of *Organic Gardening and Farming* magazine, at a public hearing:

> "Food grown without pesticides; grown without artificial fertilizers; grown in soil whose humus content is increased by the additions of organic matter, grown in soil whose mineral content is increased by the application of natural mineral fertilizers; has not been treated with preservatives, hormones, antibiotics, etc."

Woese, et. al(1997) has defined

> "Organic products are those grown without the aid of chemical-synthetic pesticides and largely without the use of readily soluble mineral fertilizers within a diverse range of crop rotation and extensive soil tillage"

He further added that "Organic products as all products which were produced under controlled cultivation conditions in line with the provisions of the European Countries Regulations on organic farming .

Another definition given by organic valley in the year 2001 was

> "Organic food is produced by farmers who emphasize the use of renewable resources and t he conservation of soil and water to enhance environmental quality for future generation".

They further added that organic meat, poultry, eggs and dairy products come from animals that are given no antibiotics and growth hormones.

United States Department of Agriculture (USDA) defined organic food as

> "Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones. Organic food is produced without using most conventional pesticides; fertilizers made with synthetic ingredients or sewage sludge; bioengineering; or ionizing radiation. Before a product can be labeled "organic," a Government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet USDA organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too".
>
> **(http://www.ams.usda.gov/nop/Consumers/brochure.html)**

The USDA categories food products into:

- 100% organic: Must contain 100 percent organically produced ingredients.
- Organic: Must contain at least 95% organic ingredients.
- Made of organic ingredients: Must contain at least 70% organic ingredients.
- Have some organic ingredients: May contain less than 70% organic ingredients

Sresta had been founded with a vision of providing pure, healthy, wholesome foods to consumers and creating sustainable livelihood for the farmers. The company was headquartered in Hyderabad, India and was primarily focused on Organic & natural foods. Sresta was involved in field production of crops, processing, product development and marketing of Organic Products. They defined organic food in the year 2007 as

> "Organic food is cultivated without the use of pesticides, fungicides, herbicides or fertilizers."
>
> **(http://24lettermantra.com/aboutus.htm, 2007)**

According to **Wikipedia, the free encyclopedia,**

> "Organic foods are produced according to a certain production standard. crops, it means they were grown without the use of conventional pesticides, artificial fertilizers, human waste, or sewage sludge, and that they were processed without ionizing radiation or food additives"

Organic facts (2006) defined organic food as follows

> "Those food items that are prepared according to the norms set by an organic certifying body. On an overall basis, organic food is food prepared and processed without using any chemicals, that is, organic food production does not involve the use of chemical fertilizers, chemical pesticides, chemical preservatives, etc.
> **(http://www.organicfacts.net/organic-food/organic-food-basics/organic-food-faqs.)**

Kristie (2009) defined organic food as

> "Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones. Organic food is produced without using most conventional pesticides; fertilizers made with synthetic ingredients or sewage sludge; bioengineering; or ionizing radiation".

Conclusion

In this section, various definitions were explained given by different people and various organizations. To summarize all the definition it could be said that organic farming largely excludes the use of synthetic fertilizers, pesticides, growth regulators. It is environment friendly food production system. It relies on crop rotation and green manure. Organic food is something which is grown without the use of sewer-sludge manure, synthetic fertilizers, pesticides, genetic engineering growth hormones, irradiation and antibiotics.

A variety of agricultural products can be produced organically, including grains, pulses, meat, dairy, and eggs.

3. Pesticides and fertilizers content in food and their impact on health

The agricultural inputs fertilizers and pesticides are causing pollution of soil, groundwater and contamination of food commodities. The Nitrogenous and phosphatic fertilizers result in deterioration of water quality from accelerated eutrophication. Eutrophication of water surface leads to problems with its use for fisheries, recreation, industry or drinking due to increase in growth of undesirable algae and adequate weeds. From phosphatic fertilizers, heavy metals particularly Cadmium (Cd) pollute the soil.

All these have direct impact on health and cause various diseases. Nitrous oxide released from fertilizer is also responsible for ozone layer depletion and that result to Global warming. Pesticides are chemicals that by design are meant to kill or harm living organism. Anything that could kill or harm other living organisms has the potential to harm or kill human beings too.

The application of synthetic pesticides created health hazards in different ways. It could be through direct exposure to pesticides or it could be through pesticide residues in food and drinking water. In India and other developing countries pesticide residue levels in food and drinking water were higher than in developed countries. The dangers of pesticides through direct exposure were resulted due to poor literacy, lack of knowledge and awareness among

farmers regarding safe pesticide application and safe waiting periods, farmers' lack of financial assets to buy protective clothing, lack of regulation, inadequate safety standards, inadequate labeling, sale of substandard products, use of particularly harmful long-persisting pesticides. All these had been banned in developed countries since many years. Globally, Indian people had the largest levels of DDT accumulation in their adipose tissue **(CERC, 1989 ;Pimentel, et al. 1994; Agarwal, 1997; Patwardhan, 1999 ; Nair, 2000 ; Joshi, 2005; Lukas, 2007).**

Hareesha (1994) found a significant correlation between the education of farmers in Karnataka and their levels of awareness regarding the negative impacts of agro-chemicals. He also identified a lack of awareness and commitment among extension person regarding the education of farmers about negative effects of agro-chemicals and safer ways of using them.

Pesticides have been considered to be omni present as many of these seem to have a rather long life and they were not easily biodegradable. **Living earth and Food Magazine (1994)** stated that the pesticides have contaminated sources of water both underground and above ground including the oceans. They had also caused damage to beneficial soil microflora, animal life, fish, birds and the bees, contaminated food and created special risks for children and vulnerable populations. Other than this there had been resistance created in plants, pests and vectors of human diseases, threat to ozone layer apart from negative influence vectors of human diseases. Besides other ill effects on health, including intolerable risk of cancer in children. Some of the organochlorine pesticides seem to have the ability to mimic the human sex hormone estrogen causing abnormal sexual development

Pimentel, et al. (1994) stated that direct exposure to pesticides created severe health hazards for farmers resulting in illnesses and even deaths. WHO & UNEP estimated the number of human pesticide poisonings at one million with about 20,000 deaths per year.

Biswas, et al. (1996) and Conway, et al. (1991) reported that Nitrate had been clearly linked with gastric cancers while nitrate had been associated with methamoglobimaemia or the blue bay syndrome in infants below 6 months of age.

Agarwal (1997) mentioned that more than half of all pesticides used in Indian agriculture were banned or severely restricted in many developed countries. This could remain in ecosystems for 20-25 years. They accumulated in the human body without further transformation or excretion. They moved up the trophic level in the food chain and magnify in concentration. Many of them were immunosuppressive, carcinogenic, tumorigenic mutagenic, teratogenic and caused effects like impotence and premature deliveries **(Agarwal, 1997 ; Joshi, 2005).**

Additional health hazards arise from pesticide residues in surface and underground water resources. For example, the river Yamuna, which is the source of water supply for 70% of the population of Delhi, contained pesticides like DDT, lindane and endosulphan, some of them were carcinogen, in concentrations far above tolerance levels **(Agarwal, et al. 1999).** Drinking water treatment plants in India were generally not equipped to decontaminate drinking water from pesticides **(Agarwal, 1997 ; Nair, 2000)**, and in rural areas many people used underground and surface water resources directly for consumption.

Similar to this **Dudani (1997)** also reported that the use of chemical fertilizer had resulted in production of nitrate, nitro compounds apart from phosphate, metal which emanated from effluents including use of micronutrients and impurities from the agrochemical inputs. The entry of these inputs in water had created the phenomenon of eutrophication or excessive growth of algae which had seriously affected the growth of fish and other aquatic life.

Quijano (1997) stated in his report on "health impact of chemical farming" that approximately 25 million people were poisoned by pesticides in the countries of the third world. Many pesticide companies acknowledged the health problems associated with pesticides, yet market had expanded to US $

30.265 billion represented 5% growth over the previous year. He further added that it was not only the acute or immediate effects that make pesticides dangerous. The adverse effect of pesticides might manifest only after months or years of exposure. These chronic or long term effects might occur. Even low levels of exposure to pesticides could cause serious immune and metabolic disorders, neurological defects, reproductive anomalies, cancer and other diseases in animals and humans, Death rate of people was higher in areas with high pesticides usage compared to those living in areas with low pesticide usage. Certain Pesticides could disrupt the human endocrine system, which included the glands that control the releases of hormones in our body. He also stated that endosulfan pesticide found in food which belonged to chemical group called organochlorines. These chemicals could mimic the hormones in our body and had been associated with higher incidence of breast cancer, testicular and prostate cancer, reduction in male fertility and defects in male sex organs. Another pesticide belonging to this category was DDT. Residues of this pesticides long banned in developing countries had been found in number of vegetables and food products.

According to **Worthington (1998)** health impact studies had shown little results because the differences in terms of health effects were not large enough to be readily apparent. People stayed well on an organic diet but got violently ill as a result of consuming food grown with chemical fertilizer and pesticides then the difference would be perfectly obvious. However there was more subtle difference and 8% increase in the incidence of allergies would be much more difficult to detect and would be easy to overlook.

Chlorpyrifos, one of the most widely used organophosphorus pesticide had been reported as a developmental neurotoxicant specifically targeting the immature brain. Developmental neurotoxicity of chlorpyrifos was thought to involve both neurons and glia, increasing the vulnerability of the developing brain. The vulnerability increased from the gestational exposure through later periods of development which glial neuronal interactions influence brain architectural, circuitary and function. Exposures occurring during childhood

were as important as those occurring prenatally **(Pope, 1999 ; Barone, *et al.* 2000; cited in Mathur, et al. 2005).**

Nair (2000) stated that pesticide residues in food and drinking water had also adverse impacts on the health of both farming families and consumers, in addition to health hazards due to direct exposure to pesticides. Health problems caused by pesticide residues were the results of long-term exposure over many years. It was impossible to estimate the number of illnesses and deaths caused by pesticide residues. However, the extent of pesticide residues in India was alarming. Worldwide, 19% of the food samples contained pesticide residues below and 2% above tolerance levels, in India, 40 - 49% of the food samples contained residue levels below and 31-46% above tolerance levels. Fourty per cent of the insecticides consumed in India were organochlorine pesticides.

Williams, et al. (2000) stated that though microbiological health hazards were more important than toxicological dangers and might be more likely to occur in organic than in conventional farming, because of frequent use of organic fertilizers, there was currently no reliable data that could prove organic food was more likely to be contaminated with harmful microbiota. Further he added that there had been no controlled studies that had compared the effects of organic and conventional products on human life. **Wooes, et al. (1997)** supported that and stated that such a study would need to be carried out under very carefully controlled conditions over long period of time. All the factors that could influence human health would have to be kept constant for the test person in order to be able to identify the effects of different food sources.

According to **Joshi (2005)** only 1% of the applied pesticides were utilized for killing pests while the remaining 99% reached untargeted spots. And the application of synthetic pesticides not only destroyed target pests, but also natural beneficial predators. He further added that three million poisonings with 220,000 deaths per year. Most of these poisonings occurred in

developing countries, with India accounting for one third of all pesticide poisonings in developing countries **(Nair, 2000).**

Bhattacharya and Chakraborty (2005) reported that the indiscriminate use of pesticides concerns the presence of pesticide residue in our food. According to WHO, 14000 people die every year in the third world countries due to pesticide poisoning. Its immediate effect had appeared on environment and ecosystem also large scale death of birds was reported every year.

Elliot (2009) an editor of The Times reported in an article that Organic food is no healthier than the conventional food items. According to a report commissioned by the Food Standards Agency, the experts from the London School of Hygiene and Tropical Medicine carried out a study. They found that there was no significant benefit from drinking milk or eating meat, vegetables, fruit, poultry and eggs from organic sources, as opposed to the products of conventional farm systems. Their review indicated that there was no evidence to support the selection of organically over conventionally produced crops and livestock on the basis of nutritional supremacy.

Rupera (2009) reported that, Anand Agriclture University, Gujarat warned consumers to look before they cook any vegetables. A Survey conducted at AAU's laboratory in Anand, Surat, Vadodara, Padra, Nadiad and Bharuch had revealed that cabbage, Lady's finger and cauliflower were more exposed to pesticide contamination in the state.

Research studies

Saxena, et *al.* (1987) mentioned that a number of studies had shown alarmingly high levels of hazardous (including organochlorine) pesticides in food samples. A survey of blood samples of general population of occupationally unexposed population from Delhi showed levels of DDT several times higher than that from other countries. Total DDT ranged from

0.053- 0.663 ppm with a mean value of 0.301 ppm. Mean total DDT in males (0.344 ppm) was higher than of females (0.229 ppm).

Dua, *et al.* (1996) reported that Mean HCH and DDT contents in whole blood of general population of 37 males not involved in spraying from district Hardwar, UP were 21.50 mg/l and 20.79 mg/l respectively. 47 samples from the occupationally exposed persons, involved in spraying operation of HCH and DDT during Ardh Kumbh Congregation at Hardwar in April, 1992 for the control of mosquitoes and flies, analyzed for HCH and DDT contamination in whole blood was 68.0 mg/l and DD T was 58.43 mg/l i.e. 3.1 times and 2.8 times more as compared to general population. **(cited in Mathur, et al 2005)**

Barbara (1996) stated that USA and 20 other countries also showed that the sperm counts of men had declined by 50% since 1940 with tripling in testicular cancer. It was also estimated that in Europe one in six couples were experiencing infertility with a third of the causes caused by male partners low sperm count. Further she added that organic farmers living mainly on organic food had sperm counts nearly double than those of the national average.

In a study conducted in Delhi, samples of maternal blood, breast milk and cord blood from 25 mothers (23.4+ 1.085 years of age with a range of 18-40 years) and their new born from Irwin Hospital, Delhi showed the presence of t-DDT at an average level of 1.27, 0.27 and 0.14 mg/l respectively. Breast milk contained four and a half times more DDT than the maternal serum. Levels of different metabolites of DDT in maternal serum were more than those in cord serum. HCH isomers were present in smaller amounts than those of DDT residues. Average value of t-HCH in maternal blood, breast milk and cord blood was 0.327, 0.050 and 0.033 mg/l. b- isomer was the predominant isomer accounting for more than 60 percent of the various isomers **(Nair, *et al.* 1996).**

According to a survey conducted by Punjab Agricultural University the presence of DDT and HCH residue were found in wheat and maize flour and rice. Most of the samples contained DDT residues above the legal limit.

Another study conducted by National Institute of Nutrition, Hyderabad for the Consumer Education and Research Center, showed that organochlorine were found in different proportions in the food samples tested consisting of food grains, milk and milk products and packaged food commodities such as jam and coffee. Four of the pesticides tested were present beyond the Maximum Residue Limit (MRL) **(Quinjano, 1997).**

The Consumer Education and Research Centre (CERC) tested 16 samples of wheat flour in different parts of India and found that all samples contained the pesticide lindane, a highly persistent organochlorine pesticide that was required to be non-existent in food by Indian standards. Five samples contained DDT, a pesticide that was not permitted for use on crops. In addition, 12 samples contained residue levels of ethion above tolerance levels **(CERC, 2000).**

Jorhem and Slanina (2000) also studied the cadmium and other heavy metals contents of organic and conventional potatoes and carrot in Sweeden. They chose potatoes as they were the major source of Cd and heavy metals and carrot because of its popularity in the Swedish diet. They did not find any difference in Cd, Pb, Cr and Zn between organically and conventionally grown potatoes. Microbial influence were also very common with fruits and vegetables consumptions which could arise from industrial processing or soil microbes or animal manure used for growing crops.

A total of 96 serum and 46 adipose tissue samples collected from infertile women attending centers for reproductive medicine in Belgium from 1996-98 were analyzed for seven organochlorine pesticides and seven polychlorinated biphenyls. There was a strong association between adipose tissue and serum residues. The adipose tissue levels in ng/g of CB-138, 153, 180 and pp'- DDE (68.3 vs. 78.6, 145.7 vs. 90.9, 93.5 vs. 69.1, 470.9 vs. 1274.5) were explained by serum residues. The accumulation pattern for CB-153 and CB –180 in serum and adipose tissue were mirror images of each other **(Pauwels, *et al*. 2000).**

Kumpulainen (2001) found in his study on "nutritional and toxicological quality comparison between organic and conventionally grown food stuff", that many dangerous chemicals that used to allow in agriculture were now prohibited. Some of these could travel in air and remain for a very long time in the environment and therefore, pesticides which were now prohibited (DDT, organochlorine) and other environmental pollutants such as dioxins, furans, PAH compounds were found equally in organic and conventional fat and oil containing food. He further added that an American study found detectable levels of DDT in 17% of carrots tested twenty years after this pesticides was banned. With reference to heavy metals **Kumpulainen(2001)** reported that no differences in lead and mercury were detected between organically and conventionally grown potatoes and carrot.

Mohammad, *et al.* (2001),reported that a survey of 577 whole blood samples from school children in Peninsular Malaysia, extracted and analysed for the residues of 11 organochlorine and 2 organophosphorus pesticides revealed the presence of pesticide residues in blood in nanogram per gram - aldrin, nd-47.6; dieldrin, nd; endrin, nd; alpha-endosulfan, nd-0.6; beta-endosulfan, nd; endosulfan sulfate, nd; heptachlor, nd- 3.8; lindane, nd-5.7; p,p'-DDT, nd-3.4; o,p'-DDE, nd-1.4; p,p'-DDE, nd; chlorpyrifos, nd-10.3; diazinon, nd-103.0

Cyntheia, et al.(2003) reported about a study conducted by National Institute of Environmental Health Science which indicated that children who ate organic foods were exposed to "significantly lower" levels of Organophosphorous (OP) pesticides than those who ate conventional food. OP pesticides were used in this study because they were commonly applied to the crops processed into baby foods and juices. Thus buyers of organic baby foods could avoid the pesticide residues.

In a study from Canada, 251 cord blood samples collected from 1994 through 2001 for plychlorinated biphenyls (PCBs), dichlorodiphenyl dichloroethylene (DDE), hexachlorobenzene (HCB), chlordanes, lead and mercury showed significantly decreasing trends for PCBs (7.9% per year, $p<0.001$), DDE (9.1% per year, $p<0.001$), DDT (8.2% per year, $p<0.001$) and HCB (6.6% per year,

p< 0.01). No significant trend was detected for chlordanes **(Dallaire, *et al*, 2003).**

Greenpeace conducted a study in 2003 to find out the impact of pesticides on children's mental health and development. It indicates that factors contribute to the impact of pesticides on human beings were mainly three which were as follows.

- How hazardous or poisonous a pesticide is?
- How pesticides get into the body?
- How long the pesticides stay in the body?

In a study conducted in USA, plasma samples collected at birth between 1998 and 2001 from 230 mother and newborn paired enrolled in the Columbia Centre for Children's Environmental Health were analysed for 29 pesticides. Seven pesticides were detected in 48-83% of plasma samples (range, 1-270 pg/g) the organophosphates chlorpyrifos and diazinon, carbamates bendiocarb and 2- isopropoxyphenol (metabolite of propoxur) and fungicides-dicloran, phthalimide (metabolite of folpet and captan) and tetrahydrophthalimide (metabolite of captan and captafol). Maternal and cord plasma levels were similar, except for phthalimide and were highly correlated (p<0.001) **(Whyatt, *et al.* 2003).**

The Centre for Science and Environment (CSE) tested 34 samples of bottled water and found that 32 samples contained lindane, 29 contained malathion, and 24 contained DDT. Total pesticide levels were found to exceed European standards 34 times **(CSE, 2003, quoted in Dhar, 2004).**

Savaliya & Savaliya (2004) reported that the food, water and air were contaminated by excessive use of poisonous inputs like chemical fertilizers and pesticides. Majority of food was coming from agriculture and allied fields. So, the maximum emphasis should be laid on input and production system in agriculture. They also reported data of various agro-chemicals and their residues in different food matter which is as follows.

Residues in various food Products

Sr. No		% of Sample
1	DDT in Vegetables	100%
2.	BHC in vegetables	90%
3.	DDT in branded wheat flour	23%
4.	Ethion in Branded wheat flour	73%
5.	Lindane in Branded wheat Flour	100%
6.	Pesticides residue in dairy Product	72%
7.	Pesticides residue in cereals and pulses	50-60%

A study of 2,205 milk samples from 12 states showed residues of DDT and HCH in 85% and 82% of all samples respectively (Indian Council of Medical Research 1993, quoted in Agarwal 1997). The same pesticides were found in 100% of butter and 90-96% of meat samples from different states (CERC 1989). 85-100% of rice samples that were collected in different states of India contained residues of organochlorine pesticides **(Joshi, 2005).**

According to Yadav (2005), Anecdotal reports of high incidence of cancer had been coming from certain areas of Punjab since last few years. It was common knowledge that pesticide used in Punjab was amongst the highest in India. The report of Pollution Monitoring Laboratory (PML) of the Centre for Science and Environment (CSE) indicated that 15 different pesticides- a cocktail of 6-13 pesticides , all different were found from the 20 blood samples from villages of Punjab state. They selected 4 villages: Mahi Nangal, Jajjal, Balloh and Dher. They selected agricultural fields surrounded these villages and pesticides use was found quite significant. They randomly selected people from all the four villages. Blood (10ml) of these people were collected in residue-free heparinised 20 ml glass vials containing 200 USP units of heparin in 0.2ml solution with the help of sterilized syringe. The samples were analyzed for 14 organochlorine and 14 organophosphorous pesticides using a Gas Chromatograph based on US Environmental Protection Agency methodology. The results were,

	Mean level
Organochlorine	
DDT	0.0652 mg/l
Alderin	0.0062 mg/l
Alpha Endosulphan	0.0044mg/l
Beta Endosulphan	0.0002 mg/l
HCH	0.057mg/l
Organophosphorous	
Monocrotophos	0.0948mg/l
Chlorpyrifos	0.0662mg/l
Phosphamidon	0.0366mg/l
Malathion	0.0301 mg/l

Thus major contribution to total pesticide concentration in blood samples from Punjab was of Organophosphorous pesticides. Data also indicated that each person was exposed to and carried a body burden of multiple pesticides. The presence of higher levels of total pesticide residues in the blood of occupationally exposed population of Punjab might be due to direct exposure during application of pesticides and due to exposure through air, water and food.

Grace, et al. (2006) assessed pesticide-use by farmers in Thanjavur District in Tamil Nadu, South India. They found that 433 of 631 farmers used pesticides. 75% of them used 'moderately' or 'highly hazardous' pesticides, and 88% did not use any form of protection while handling pesticides. They further found that particularly hazardous pesticides were commonly used by farmers since "aggressive marketing strategies reinforced the myth that more potent pesticides were necessary to prevent crop loss"

Other then health hazards through direct exposure to pesticides, pesticide residues in food and drinking water also had adverse impacts on the health of farmers and consumers. Since health problems caused by pesticide residues were the results of long-term exposure over many years, it was impossible to estimate the number of illnesses and deaths caused by pesticide residues.

Many tested food samples in India contained residue levels far above legal limits. Food which contained a combination of different pesticides residues, even below the legal limits, could not be considered as safe, because little was known about the potential cumulative health effects. According to **Heaton (2001),** American researchers combined three pesticides at safe levels and found that this combination multiplied the toxicity by hundreds of times.

Briviba, et al. (2007) conducted a study on effect of consumption of organically and conventionally produced apples on antioxidants activity and DNA damage in human. He found that there was no significant difference among the organically grown apples with respect to the phenolic compound and in the baseline levels of endogenous DNA damage. Whereas **Weibel, et al. (2004)** found higher amount of phenolic compound in organic apples compared to conventional apple in his comparative study to assess the fruit quality.

Conclusion:

The available literature shows that though more than half of all pesticides used Indian agriculture are banned or severely restricted in many developed countries, pesticides residues were found in human blood samples. Various effects of pesticides were discussed. A lot of investigations had been carried out on organochlorine pesticide residue levels in human blood in India, but none of the reports gave information about organophosphorus pesticide residues in blood in India. However widespread use of organophosphorus pesticides means that people are continuously re-exposed to these pesticides and they might be present in the body. The dangers of pesticides through direct exposure have resulted due to poor literacy, lack of knowledge and awareness among farmers regarding safe pesticide application and safe waiting periods, farmers' lack of financial assets to buy protective clothing, lack of regulation, inadequate safety standards, inadequate labeling. Pesticide residues in food and drinking water had also adverse impacts on the health of both farming families and consumers, in addition to health hazards due to direct exposure to pesticides. Health problems caused by pesticide residues were the results of long-term exposure over many years. It is important to

create awareness among the consumers about the presence of pesticides residues and its impact on health.

4. Pesticides and fertilizer content and its impact on soil

Agricultural land, that feeds the world, is in serious difficulty and it is not at all certain that it will be able to produce enough food for the world's population, in perpetuity. Confusion reigns about what sustainability is? In organic agriculture, sustainability means continuous soil fertility. The beginning and end of sustainable agriculture is the soil and its fertility. Whatever human beings take from the soil, they need to return. It is possible through keeping the soil continuously fertile. Therefore the task is to renew the land resource and regenerate the soil. With continuous soil renewal and regeneration, one shall continue to nourish the soil and keep it fertile to produce food for future generation. One must learn how to "Grow Soil". In organic agriculture, Waste is recycled and turns into compost that is used to feed the soil and to keep it fertile.

Briones (1997) stated that organic farming covers all aspects of operating farms that promote environmentally, culturally and economically sound production of food fibers, herbs and fuel wood. Distinct features of organic farming were (a) Appropriate cropping pattern, (b) Use of organic materials as nutrient sources, (c) Non chemical methods for controlling pest and weeds. This helped to maintain soil quality and makes the soil provide adequate nutrients and hold enough water. This soil quality provided physical and chemical conditions favourable to plants.

According to Carandang(1999), the organic farming followed green manuring and crop rotation to nurture the soil and to minimize pest and disease problems. It also followed biodiversity in the farm to create a balanced ecosystem. Farmers improved the soil through appropriate cultivation for proper soil aeration, soil moisture and nutrient balance.

Ghosh (1999) reported that the increased use of chemicals under intensive cultivation had disturbed the harmony existing among soil, plant and microbial population.

Sharma (2001) mentioned that, higher levels of biological activity and increased microbial populations had been measured in cultivated soils managed organically. Aggregate stability and porosity was increased under organic management.

According to **Remund (2001)** pesticides and fertilizers used in conventional farming lead to a reduction of fauna and flora in the soil and vegetation. Therefore the ecological balance of the soil was interrupted. He further added that, in the long term, only organic farming could protect the ecology of the soil of arable land.

Savaliya and Savaliya (2004) mentioned that chemical fertilizers were effective for short run. It polluted substances in the soil, water and air. It also created the problems of physical condition of soil. **Bhatacharya and Chakraborty (2005)** supported this and further added that excess and indiscriminate use of non organic fertilizer had deteriorated soil badly with deficiency of macro and micro nutrients. Regular addition of organic manure improves the soil quality.

Rai (2008) stated that Organic farming systems rely on the management of soil. Organic matter were used to enhance the chemical, biological and physical properties of the soil. One of the basic principles of soil fertility management in organic systems was that plant nutrition depended on 'biologically-derived nutrients' instead of using readily soluble forms of nutrients; organic materials were used. Improved soil biological activity was also known to play a key role in suppressing weeds, pests and diseases.

Parrott and Masden (2003) reported that, chemical pesticides, fertilizers and hybrid seeds had destroyed wildlife and crop diversity, ruined the soil and poisoned people. He further added that organic and agro-ecological

approaches to agriculture were helping to conserve and improve farmer's most precious resource – the topsoil.

Research studies

Fließbach and Mader (2000) conducted a research on DOC trial: diversity and metabolic efficiency of microbial communities in organic and conventional soil. The soil was taken in early spring from the bio-dynamic, bio-organic and the conventional system as well as from the two unmannered control systems. Soil microbial biomass was estimated by fumigation extraction, soil respiration by CO2 evolution and microbial diversity was assessed by a substrate utilization assay. It was found that soil microbial biomass was significantly affected by the farming systems, with high values in organic systems and lower values in the unmannered system. Soil respiration showed minor difference between the system but the ratio of soil respiration and microbial biomass was significantly lower for the biodynamic systems and showed higher values for the unmannered conventional system. Thus soil quality is favoured by organic farming systems. And they were found to need less energy for their maintenance.

Remund(2000) assessed organic and conventional farm in the low-land of Switzerland. The farms were assessed for over two decades and the state of their arable land recorded as pictures. The soil management and weather condition were similar on all farms of the study. It was found that the land treated with pesticides and fertilizers was under the risk of erosion. In contrast, arable land of farms that were organically managed had a stable ecology, a good soil structure and very little erosion. Arable land, once heavily attacked by erosion, or even destroyed by it, would lose forever. Thus in the long term only organic farming can protect the ecology of the soil of arable land.

Hadatsch, et al. (2000) studied potentials of organic farming in the region of Marchfed (Austria) for solving environmental problems. Marchfed was one of the most important crop production regions in Austria. High input of agriculture

caused environmental problems, especially groundwater pollution by nitrate and pesticides, decline of soil fertility and ecosystem diversity. For the assessment, three conventional, one integrated and two organic farm were selected. It was found from the ecological assessment that organic farming had less negative impacts on the environment than conventional and integrated farming. The assessment consisted of two aspects, the effects of the production method and the number of landscape elements, which were recognized as a contribution to biodiversity. The production method organic agriculture was valued as less polluting and the number of landscape elements were about the same as in conventional and integrated farming.

Løes (2000) studied the potassium and phosphorus concentration in soil after long-term organic farming. He investigated five farms that had been organically managed for several years to study if the levels were stable over time or continued to decrease. At five dairy farms, topsoil (0-20cm) and subsoil (20-40cm) on all cultivated fields were sampled twice at an interval of 6-13 years. The farms were organically and bio-dynamically managed since 1987, 1979, 1986, 1984 and 1932 respectively. All soil samples were analyzed for ammonium-acetate lactate extractable P (P-AL) and K (K-AL), which was the common method of analysis for estimating fertilizer needs in Norway. It was found that the first to the second sampling, the average topsoil P-AL decreased on all farms, by an average of 1.3mg P per 100g dry soil. Top soil K-AL increased on two farms but elsewhere was rather stable. The P-AL values were generally well below conventional average, whereas the K-AL was generally comparable or lower at the organic farms.

Mølgaard, et al. (2000) reported that production of organic potatoes was faced with quality problems related to nutrient supply. They studied the qualities of organic potatoes. A special experimental layout was designed using large plots, where the same type of organic manure was used through the whole crop rotation in three replicates. Different type of cattle manure was investigated: composted deep litter, fresh deep litter, slurry and no manure. After the crop was lifted the yield were measured. A sample of 200 tubers from each plot was evaluated for external quality. A sample of 20 tubers was

cooked, and the taste was evaluated on a scale from 1-9. The content of nitrate, N, P and K in tubers was analysed. It was observed that cooking test demonstrated that a very fine quality could be achieved within a wide range of types and levels of manure. Only when using very high levels of manure poor quality resulted- provided that the manure was evenly distributed in the field. When slurry was used, there was a tendency towards less acceptable taste. The concentration of nitrate was higher and there was a tendency to darkening after cooking when using slurry. As nutrients were readily available in slurry, the yield was highest when using slurry.

Evanylo (2005) studied the impacts of compost, manure and commercial fertilizer on soil and water quality and crop production. He found that applying compost to soil provides an environmentally sound method of treating, handling, and disposing of waste products. Composting destroyed pathogens and weed seeds, stabilizes organic matter, and reduces the solubility and, hence, leaching potential of nitrogen; however, applying compost to soil to provide crop nitrogen needs might increase soil phosphorus concentrations to levels that pose an impairment risk to surface water quality.

Ganie, et al. (2008) reported in his study on organic farming for sustained productivity in mulberry sericulture that a significant increase in leaf yield was observed from a uniform number of mulberry trees where 10 kg of biofertilizer was applied along with 150:90:56 kg of NPK as against a control where exclusively only a similar dose of chemical fertilizer was applied. With the addition of organic manure, the mulberry farm had been found to improve soil health. Organic manure help to supply all the nutrients required by the mulberry plant. He further added that organically grown mulberry crops were believed to provide more healthy and nutritionally superior leaf for silkworms.

Conclusion

The literature shows that chemical fertilizers and pesticides disturbed the harmony existing among soil, plant and microbial population. These chemical fertilizers and pesticides created pollution for water, land and air. Many studies were conducted to assess the impact of fertilizers and pesticides on

soil outside India. India stands at the top with the highest quantity of pesticides being used. Farm animals were also treated with the antibiotics and growth hormones. Food chain which begins at farm and ends on dining table. There is a thrust to start sustainable farming in India to maintain balance with nature and maintain soil quality.

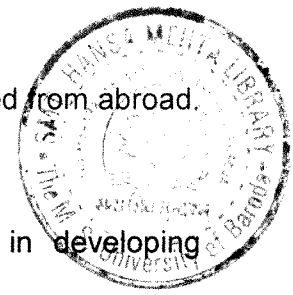
5. Organic food market and Consumers' preference regarding organic food.

Organic farming had developed very rapidly in the recent years. Market for organic food had been developing very fast in the developing countries since early 1970s. The market for organic food is increasing by more than 21%even in UK whereas in countries such as Denmark and Austria share of organic food is expected to be more than the share of conventional food in 10-15 years. Multinational company such as Amway, Nestle, Procter and Gamble and Heinz were actively marketing organic food products.

Morgan, et al. (1990) reported that both supply and demand uncertainty were major factors inhibiting the growth of organic food market.

Weaver, et al. (1992) stated that in the USA, more than half of the consumers were found to be willing to pay more for chemical, pesticide residue free food and a majority of the consumer were willing to pay up to 10 percent premium.

According to **Park and Lohr (1996)** the market for organic food in the United States had been growing at a rate of about 20 percent per annum and annual sales were $2 billion in 1994. However a number of problems areas had been identified such as localized supply, shortage and surplus, limited distribution channel, lack of information on price and availability, perception of high price by consumers and low prices by producers. In addition to this **Naik and Sharma (1997)**, mentioned that the European Union was currently the world's leading market for organic products with a retail value of 2.5 billion ECUs in 1993. Germany, France, UK and the Netherlands hold 52%, 13%, 11% and 8% shares respectively. The British market rose in value from $67million in 1987 to $251 million in 1994 but because of considerable gap between



demand and supply many of the organic products were imported from abroad. Germany and UK had largest deficit of fresh organic produce.

List of Products for export produced by organic farming in developing countries is as follows.

Country	Products
Argentina	Soya, olive oil, cereals, maiz, sunflower, cotton, meat, milk, cotton textiles
Belize	Cocoa
Bolivia	Grains, Cocoa
Brazil	Cotton
Burkina Fasco	Sesame seeds
China	Sesame Seeds and Pumpkin seeds
Costa Rica	Rice
Dominican Republic	Cocoa, coconut
Egypt	Cotton
Gambia	Sesame seeds
India	Tea, cotton, cotton yarn, species
Israel	Citrus Fruit, Melon, and vegetables
Madagascar	Coconut oil and palm oil
Mexico	Sesame seeds, pumpkin seeds, cereals and cocoa
Morocco	Oranges
Nicaragua	Cotton, Corn
Turkey	Fig, nuts and dried fruits
West Indies and Canary Island	Banana

Source: The Oil and oil seeds Journal cited in Naik and Sharma (1997)

Mahale (2003) further added that the premium on price that the farmers get on organic food in the market depended on the certification of his farm. If the farmer had paid the cost for certification and thus owns the certificate and export directly, the premium was around 50 percent. If he owned the

certificate and sold it to an exporter, the premium was around 25-30 percent. If he did not own the certificate, the premium was between 15 and 25 percent whereas in the local market the maximum retail price was a maximum of 30 percent above comparable conventional packed products and for fresh fruits and vegetables the difference might be up to 100 percent depending on the product.

According to **Mukherjee (2004),** marketing of organic produce remained a hindrance for its spread and propagation. The difficulties were from both the sides i.e. Producers as well as consumers. The supply side problems were as follows

1. The producers were scattered, so that accumulation of marketable surplus needed extra efforts.
2. Most of the producers had very small holding. Therefore the output was limited. The viable marketable surplus quantity had to be organized by special efforts.
3. All the producers tend to produce similar items so that variety was lacking.
4. Many of the produces were organic by default and lacked the basic marketing skill.
5. The middleman was not interested in treating organic produce in any different manner, while the organic procures at least expected a different treatment, if not a higher prices.

Demand side problems as experienced by the consumers were as follows

1. The Consumers were totally unaware of the existence and location of organic producers.
2. The consumers wanted to fulfill all the requirement from a single point supply source.
3. Like minded consumers were also strewn.

Bhatacharya and Chakraborty (2005) stated that organic farming had a place where there was a market to accept the produce at higher price as the

growing interest in organic farming practices was due to an exception of higher premium

Food Marketing Institute (2005) reported that the US retail sales of organic food alone rose 17 percent from $10.3 billion to $12.0 billion and there was strong connection between buying organic food and caring for children. In US 32% of buyers with children reported that the first time they purchased organic food was for an infant or newborn.

Caroll (2005) reported about booming bazaar of organic food in India that the large retail outlets had started selling organic food in their food sections. Food Bazar, the food division of Pantaloon Retail which was based on a comprehensive food and grocery store format and had 32 outlets and 200000 sq ft of retail space across India. The head of food division of food bazaar stated that though the organic range stocked was inadequate but it was a beginning. Organic range available in the shop was not complete because they were dependant on local, small brand initiative.

Thakur and Sharma (2005) stated that there was an increasing awareness, preference and demand for organic foods from consumers and organic produce was fetching much higher premium prices in the market as noted below

Price differentials of organic V/s non-organic products in the market obtained by the farmers			
	Product	**Organic Product (Rs)**	**Non Organic product (Rs)**
	Maize	11.25	6.00
	Unpolished basmati rice	80.00	35.00
	Wheat	22.50	8.00
	Rajma	48.00	24.00
	Unpolished pulses	41.20	22.00

Price differentials of organic V/s non-organic products in the market obtained by the farmers			
	Product	**Organic Product (Rs)**	**Non Organic product (Rs)**
	Cucumber	20.30	5.50
	Cauliflower	16.30	4.50
	Cabbage	12.50	4.00
	Bottle gourd	15.00	5.00
	Ghee	220.00	145.00

This showed that the organic produce fetched 3 to 4 times higher prices than those paid for non organic produce. This was due to the rising preferences and demand for organic food in India and abroad. They further added that there was a big "niche market" burgeoning for organic products due to their unpolluted, environmentally friendly, more tasty, highly nutritious, highly safe and fresh quality. Because of these qualities there was no competition between conventional and organic food market. Consumers were attracted to organic food due to all these qualities. Organic food items were value added products and they could be marketed directly to the consumers through health food stores and specialty counters and super store.

"Fabindia" was hoping to change this and venture into organic foods. According to head of FabIndia's Organic food business, the organic segment would grow from 1 percent in the first year (2004) to 5 percent in the third year (2007). Their goal was to be able to offer consumers a complete range of organic life style and they were constantly adding to their organic product range. They had started with 75 products initially and now had around 250 certified products. However supply of Organic food was also a great challenge because organic products were scattered across the country and they had to keep control on quality, storage, transport and shelf life. He further added that they were going to offer fresh fruit and vegetables and bakery products too. (www. Fabindia.com)

Lakshmi (2009) reported about the journey of organic entrepreneur who were bringing back natural living in its purest form. A Vadodara based organic entrepreneur trading in wheat grass powder, variants of amla powder and natural non alcoholic flower based scents believed that although it was a niche segment that actually buys organic products, they were opinion makers and this niche segment would change the way consumers looked at things that were harmful to the environment. Another manufacturer and distributor of green tea reported that the green tea was almost a lifestyle choice today as it was rich in antioxidants that eliminated damaging free radicals. A manufacturer of natural coffee stated that natural coffee did not smell like coffee and more importantly it did not contain substances that make caffeine addictive. Thus the demand for organic raw materials was not much but there was a huge demand for processed and value added products. Today organic food is an important part of urban life style.

Research studies

A study conducted in the USA analyzed various reasons concerned with organic food. It was found that all the key factors like nutrition, health, environment and safety ranked equally. The level of concern over residues was found to be high compared with dietary risk factors usually ascribed to fat and cholesterol intake- a major case of heart diseases were found. **(Jolly, et al. 1989, cited in Beharrell and Mac Fie. 1991)**

Swanson and Lewis (1993) conducted a study in Alaska to identify channels through which food, including organic produce was obtained and to identify tangible and intangible resources that might influence acquisition of fruits and vegetables and perception of quality. It was found that the respondents who purchased organic produce apparently saw it as an alternative to conventional products. They did not purchase organic produce exclusively. Nearly three-fourth of the respondents checked labels at point of purchase sign to determine the product was organic or not. Cost was a criterion for selecting among similar items. Level of concerns was highest for production factors. Purchaser of organic food were significantly more concerned about pesticide and herbicide residues. They were somewhat concerned about the

processing factors such as additives, preservatives etc. Overall quality was perceived better by 59.5%of respondents. Organic produce was perceived to be more expensive and had a poorer appearance than conventionally grown food items. Desire for certification was mentioned by both purchaser and non purchaser of organic food.

Naik and Sharma (1997) reported results of various studies conducted by Indian Institute of Management and Gall up MBA Pvt Ltd with the objective of understanding consumer awareness, attitude and preferences. The study included following aspects.

1. Consumer awareness of pesticide residue in food and their implication on health.
2. Consumer awareness about organic food.
3. Preference of consumers for organic food.
4. Price premium consumers are ready to pay for organic food.
5. Decision makers and influences of types food purchase.
6. Attribute considered important in food.
7. Purchase pattern
8. Channel Preference
9. Concern about marketing of Organic food products.

It was observed by Naik and Sharma(1997) that

(a) in Ahmedabad 35 percent of consumers considered pesticide level in food as higher than the permissible limits. About 93 percent of the consumers in Baroda were aware of pesticide residue in food. Most of the respondents' didn't know the harmful effects of pesticide residues on health of human being.

(b) About 97 percent of consumers in Baroda who were member of one or other NGO were aware of Organic food. Among others about 70 percent of the consumers were aware of organic food

(c) Awareness level were however low in Mumbai, Delhi and Bangalore. Only 25 percent of consumers were aware on unaided basis and 40 percent on aided basis. Knowledge about the organic products was picked up mainly through their prior experience in village life, visit to their relatives in village, friends, recommendation from doctor, naturopathy courses and from media.

(d) It was observed that in Ahmedabad the percentage of consumers who were ready to pay premium for organically produced vegetables increased for 60 to 72 after providing information regarding harmful effects of pesticide residues on health.

(e) Average premium the Ahmedabad consumers were ready to pay for vegetable was 25 percent. Consumers in Baroda were ready to pay on an average 15 percent premium for organic food and similar ranges were found in Mumbai, Delhi and Bangalore.

(f) The prime decision maker regarding the purchase of food item was housewives and they were concerned about their own and children's health and about the society in general.

(g) For cereals and pulses important attributes were- cleanliness, taste and nutrition. For fruits and vegetables- freshness, taste, nutrition, health aspect is important. Organic foods were considered as good for health, high on nutritional value, better tasting, safer for the environment. Users were emphatic about easy and faster cooking, more flavour and good taste offered by the organic food whereas, some consumers expressed concern about poor appearance of the organically grown food.

(h) With reference to Channel preferences, Consumers liked to purchase from the convenient location and reasonable prices. Ahmedabad consumers wanted all food items to be supplied not vegetables only. They also suggested that certification should be carried out by reputed agency. Whereas, consumers in Baroda wanted all items including oils to be organically produced and supplied.

Yardi and Soree (1997) conducted a research in Delhi to determine what people knew about organic products, whether they would be prepared to buy them and at what premium. They found that

- 36 percent of the older housewives and 27 percent of the younger ones knew that organic farms existed.
- 46 percent were prepared to try out organic products: 50 percent of the younger and 43 percent of the older ones
- A premium of 25-30 percent was acceptable. When premium was reduced from 50 percent to 25-30 percent, the percentage of "would buy definitely" increases from 22-28 percent among younger housewives while negative responses reduce from 27 to 14 percent.
- Only 30 percent indicated that they would buy over the phone, 59 percent were unable to decide as they wanted to see the product first.
- 75 percent were open to receive regular information about health and foods.

Studies in U. S generally suggest that higher income households were more likely to purchase organic produce. However, there also seem to be some exceptions. Willingness to pay for pesticide-free produce declined in higher income groups. People preferred to shop at natural foods super market with rose in income. But higher price differences between organic and conventional reduced the likelihood of choosing organics at the natural foods super market. Thus despite of high income, households did not show willingness to pay premium price of organic food items. Some segment with lower income was more frequent buyers of organic food. **(Thompson, 1998)**

Bordeleau, et al. (2002) conducted a study to collect people's definition of food quality and reasons to buy organic food. The respondents came from different countries mainly Canada, Denmark and Poland. The majority of people surveyed were university students between the ages of 18 and 30 years. It was found that majority of the respondents purchased organic food.

The most common reason for purchasing organic food was environmental concern in Denmark, Vancouver and amongst international students. The second most common reason for purchasing organic food was health. Almost all responses to the question about the term "healthier" were associated with toxicity of chemical contamination. While asking about the definition of food quality, the general responses included sensory, food safety and nutrients terminology. Some of the responses stated that food had to meet legislated food standards.

Mahale (2003) reported in his national study that despite of favourable inclinations, consumer preparedness in reality worked out to be much less positive. According to him a Consumer Cooperative (COCO) in Bangalore for the marketing of organic fresh fruits and vegetables had to close shop. The losses were too high despite a simple infrastructure and lots of volunteer work. Also similar to this a well known health food shop in Mumbai shifting to organic foods experienced virtually the same fate and a well planned marketing venture in Delhi had to stop the local marketing of organic products as its efforts over two years to raise consumer awareness resulted in a limited sale of organic foods and insurmountable losses.

A survey conducted by **Food Marketing Institution (FMI)** in the year 2005 indicated that half of the shoppers bought organic food when they went for shopping. The breakdown in the types of organic foods that shoppers purchase were as follows

Fruits and vegetables	35%
Cereals, bread and pasta	25%
Milk, yogurt and other dairy products	23%
Packaged products such as beverages	21%
Eggs	18%
Meat and poultry	17%
Soups and sauces	12%

Rab and Grobe (2005) studied consumers knowledge and perception about organic food. He found that consumers perceived organic food as "chemical free", natural, healthy, specialty food, eco friendly etc. Less than 20 per cent of the consumers reported that organic food is costly. While asking about the variety of organic food that the consumer buy, it was found that very few consumers bought all the categories in organic food. Thirty two percent of respondents bought any one category of the organic food(Vegetable, fruit, meat, grain others). Thirty nine percent of consumers look at the label while purchasing food.

According to **Prayukth (2005)** the production of Organic tea was 15000 kg in 1990 and it increased to 2,150,000kg in 2000. Cultivation started from Darjeeling during 1986 and gradually spread to the tea areas of Asam and then to South India. As of 2002, there were 42 tea gardens in the country that had taken up Organic tea cultivation in the area of 6000 hectares. Even though many farmers were switching over to cultivation of organic tea, there were still many hurdles to overcome before production could really increase. Other then the high labour requirement and low production the most important barrier for organic tea cultivation was the lack of good marketing channels which prevented planters from securing a good premium for their efforts.

The financial express reported (2008) that Organic food consumption in the country was low among educated and health conscious people in the metros due to its high cost. In its survey conducted by *The Associated Chambers of Commerce and Industry of India*(Assocham) on "Use of Organic Products vis-à-vis Non-Organic Products in Metros", the industry body said only one out of every 30 people in metros were customized to consume organic products, whereas 20% of farmers were engaged in organic farming. The industry chamber claimed that the price difference ranged from 35-40% due to the scarcity of organic products and poor marketing strategies. "About 300 retailers said consumers purchased organic products on health and environmental grounds. However, around 60% of those surveyed said the customers did not purchase foods that promote specific health benefits due to high cost," Also, over 58% retailers blamed unavailability of organic products

in stores for low consumption, it said adding that lack of credibility was the key barrier for consumption of food products claiming to promote health benefits.

"Though Indians were getting more and more conscious about health, organic products were yet to make a mark amongst the average Indian household. Marketers of organic food needed to not only educate consumers about the benefit it offered, but also built credibility for the offer and thereby buy consumers trust before they can expect any takers," Assocham president **Venugopal Dhoot (2001)** said.

According to **Ritcher, et al.(2000)**, in the past decade the European consumer had become better acquainted with and knowledgeable about the ideas of organic farming and organic products had become more popular with consumers. Despite the popularity of organic products and their general availability through the large retail chains in Europe this product range could only be considered to had a marginal share of the entire market volume with 1-2% of total food sales. They conducted a study on 2600 consumers of organic market, supermarket and big hypermarket of Switzerland, Germany and France to examine consumer behaviour of respondents with respect to their purchase of organic food. The objective of the study was

- Why were current consumers of Organic food not buying more frequently?
- What were the differences between the non-buyers, irregular buyer and regular buyers of organic food?

The result found that in all 3 region, fruits, vegetables as well as milk/milk products were the most frequently purchased organic products. For these three product groups a consumption index was calculated for every respondent . Based on consumption rate of organic food the respondent ware divided in to 3 groups (Non-buyers(0-10%), irregular buyers (10-40%) and regular buyer (>40%)of the whole food consumption.)

(a) In comparing three countries, consumers in Switzerland were less frequent non buyers and the French the most frequent non buyers of organic products.

(b) In comparing the three buying groups, there were stronger similarities between the profile of the regular and irregular buyers of organic food. Than

between the profile of either of this two group when compared with non buyers of organic food. (c) Irregular buyers of organic food products in contrast to regular buyers were more price conscious and more frequent mistrust organic symbols. Often they did not believe that the organic standards were actively enforced.

(d) In Germany and Switzerland regular and irregular buyers of organic food more actively seek out information about the origin and the production method of food products compared with non-buyers.

(e) In all these countries, regular buyers and irregular buyers used products label and the retail sales personnel as source of information on both the products origin and production method more often then non-buyers.

(f) In all three countries, regular buyers clearly had a better knowledge of the differences between the several cultivation systems and know more organic labels than irregular buyers.

(g) In comparison to the other groups, regular buyers saw themselves frequently as environmentally conscious buyers and were the least price conscious buyer. Most irregular buyers also considered themselves as environmentally conscious buyers and more frequently as health conscious buyers. Whereas, non-buyers of organic food saw themselves as healthy and as price conscious buyer of food.

Conclusion

Many studies had been conducted to study the attributes that affect the choice of organic food. There is a need to develop appropriate marketing channels for organic produce, including the establishment of direct links between producers and consumers. In this regard innovative forms of marketing should be explored. As a part of the marketing promotion effort, consumer education should be undertaken. Consumers are aware of non-toxic nature, healthy, more nutritive and safe quality of organic food. There is a need for imparting more knowledge and awareness of other useful traits and qualities of organic products to traders and consumers in marketing and sales promotion programmes to broaden the scope and volume of the market of organic food in future for the benefit of both the farmers and consumers. This would encourage the adoption of organic farming on large scale. There is a

need to study problems faced by producers, consumers and shopkeepers, so that one can find out proper solution by linking them.

6. Standards and certification of Organic food.

The largest Organic production is in Asia, certification to this organic production is required for exporting to other countries and for consumers, it is a mean to identify the genuine organic products. It will also help to enhance trade of organic products.

The important aspect of organic farming is certification program and it consists of standards, inspection and certification. This is the only method by which an organic product can be distinguished from conventional products. In organic agriculture, certification refers to independent third party certification, which means that the certification is not done by either the producer (1^{st} party) or buyer (2^{nd} Party). This process includes farm inspector and audit traits and certificate is valid only if it is done by accredited certifying agency. The standards of organic farming vary among countries due to environmental, climatic, social and cultural differences.

According to **International Federation of Organic Agriculture Movements (1995),** principal aims of organic farming as embodied in the IFOAM are

- To produce food of high nutritional quality in sufficient quantity.
- To interact in a constructive and life enhancing way with all natural systems and cycles.
- To encourage and enhance biological cycles within the farming system, involving micro-organisms, soil flora and fauna, plants and animals.
- To maintain and increase long-term fertility of soils.
- To use, as far as possible, renewable resources in locally organized agricultural systems.
- To work, as far as possible, within a closed system with regard to organic matter and nutrient elements.

- To work, as far as possible, with materials and substances which could be reused or recycled, either on the farm or elsewhere?
- To give all livestock live conditions which allow them to perform the basic aspects of their innate behaviour.
- To minimize all forms of pollution that might result from agricultural practice.
- To maintain the genetic diversity of the agricultural system and its surroundings, including the protection of plant and wildlife habitats.
- To allow agricultural producers a life according to the UN human rights, to cover their basic needs and obtain an adequate return and satisfaction from their work, including a safe working environment.
- To consider the wider social and ecological impact of the farming system.

According to **United States Department of Agriculture (USDA)** the producers that sold less than $5000 worth of organic products a year did not have to be certified, although they must follow NOP requirements. The regulations require that products labeled

- "100 percent organic" contain only organic ingredients
- "Organic "contain at least 95 percent organic material. Product in this or the 1st category can (but are not required to) display the USDA organic seal.
- "Made with Organic Ingredients" contain 70-95 percent organic ingredients and might list up to three of them.
- Products with less than 70 percent organic ingredients might not use the term "Organic" other than to list specific organic ingredients.

(www.ams.usda.gov/nop/)

According to **Ong Kung Wai (1997)** a certification programme was a tool for the consumer and the farmer or processor. He stated positive and negative aspect of certification. Negatively one could say that "certification was needed because of the lack of trust and understanding between the producer and consumer". Whereas, on positive side, one could say that "Certification creates or enhances trust between parties" In general, the need for

certification develops where there was a large "distance" between producers and consumers. The distance could be geographic, economic (the way distribution was organized) and sometimes even cultural. According to him Positive aspects of certification were as follows

1. It offers a positive distinction for organic products and avoid confusion.
2. It helps to identify weakness and strengths of production system.
3. It helps to collect accurate data to describe the organic movement.
4. It helps in market planning and lobbying
5. It requires transparency, keeping the middle man honest in the process and strengthen the position of primary producers.
6. It also gives organic agriculture a more credible position to the outside world other then just the consumers.

Negative aspects of certification were as follows

1. It adds another layer of value added service to the cost of organic products.
2. The third party independent certification norm is neither always cost effective nor appropriate.
3. Small farmers were most likely to suffer, both from the higher per capita cost of third party independent certification as well as non access to organic market and premium prices if they were not certified.
4. Developing market economies generally can not bear the additional cost without prices for organic products becoming affordable for only the rich.

According to **Dudani (1997)**, despite of vast scientific information and infrastructure available in the country, APEDA and other private exporters were now relying on private overseas certification agencies with rather impossibly high cost involved. This has almost blocked exports of "organic coffee" which was of the order of $7.12 million for the year 1996-97 only about 2 percent of the imports in USA. Incidentally organic sales in USA in 1996-97 was US $ 3.5 billion while in UK sales in 1994 was over US $251 million and 70 percent of this was through imports from Europe. This indicated the urgent need and scope for organic exports not only of tea and coffee but also several

other exotic fruits and vegetables and also milk and milk products (including infant milk based foods). In this effort one of the most important bottleneck, apart from infrastructure would be lowering the present high cost of certification and making these fully indigenous based.

Government of India (2000) also followed the same pattern for labeling. Addition to that , Govt of India stated that organic product should not be labeled as GE(Genetically Engineered) or GM(Genetically Modified) free in order to avoid potentially misleading claims about the end products and "India Organic" logo would be use for certifies organic products only if certified by a government approved accreditation agency.

Scholar (2000) reported that the certification of coffee as organic differs in several manners from certification of other products. A three year project of ITC on production and marketing of gourmet coffee which was completed in cooperation with producers in brazil, Burundi, Ethiopia, Papua, New Guinea and Uganda as well as the importers, roaster and organizations in USA, Europe and Japan. The projects given information about the preparation for certifying coffee from Ethiopia which indicates that certifying coffee as "organic" was different from certifying other products for various reasons. It was costly as the chain from field to cup was very long. Use of local inspectors and certifiers might reduce the costs. The many labels for sustainability confused the consumers. A super label has been considered but was unlikely to be introduced in the near future and in many countries coffee was organic but not certified.

Zimmermann (2000) reported that the consumers and agricultural issues had been an important focus of WWF Switzerland for many years. WWF was one of the driving forces behind the new ecology oriented agricultural policy in Switzerland and the development of a national decree for organic production. The WWF nutrition campaign had always supported sustainable food such as regional and organic products. Recently new WWF guide on food label an overall view of important food labels and provided the consumers with the necessary information to choose the products with the best environmental

performance. The guide created a situation of competition between the actors which led to a further improvement of the label criteria and the market transparency.

An organic certification directory 2003 was published and there were 364 certification bodies across the world as shown in table But they were unevenly spread. 290 of them were located in European Union, USA, Japan, Canada, and Brazil. The IFOAM accreditation programme launched in 1992 by initiating International Organic accreditation service (IOAS).

According to **IFOAM (2004)** , Globally there were 60 standards which included IFOAM basic standards, CODEX Alimentations Commission guidelines, EU Regulations 2029/91, NOP of USA , Japan Agricultural standards etc.

According to **Bhattacharya and Chakraborty (2005),** it was estimated that there were around 76,000 hectare of organic farm land (certified) in India and 2.4 million hectare certified forest area for collection of wild herbs. But the actual area under organic was more. The state Uttaranchal and Sikkim had declared their state as "Organic state". In Maharashtra since 2003 about 50000 hectares was under organic farming of the 1.8 crore hectare of cultivable land in the state. Also 10,000 ha of this was certified area. The organic area in Karnataka state was 1513.25 ha which was certified and 4750 ha was not certified. Most of the area in non-economic zone was being practiced with organic farming. In Nagaland 3000 ha were under organic farming and the state of Rajasthan had 5613.3 ha organic. The states like Tamilnadu, kerala, Madhya Pradesh, Himachal Pradesh, Gujarat were promoting organic farming vigorously. They further added that Under the NPOP, documents like National standards, accreditation criteria for accrediting, inspection and certification agencies, accreditation procedure, inspection and certification procedures had been prepared and approved by National Steering Committee(NSC). Under NPOP programme, The Govt of India had developed National Standard for organic exports. The ministry of Agriculture, the principle had accepted this standard for domestic purpose also. The scope of this standard were

- Lay down policies for development and certification of organic products
- Facilitate certification of organic products confirming to the National Programme containing the standard for organic production.
- Institute a logo and prescribe its award by accrediting bodies on products qualifying for bearing India organic label.

A National Steering Committee(NSC) comprising Ministry of commerce, ministry of Agriculture, APEDA, Spice Board, Coffee board, Tea Board and various other Government and private organizations associated with the organic movement was monitoring the overall organic activities under the NPOP. In 2005, NPOP standards had got equivalency with the standards of EU commission. Now Indian standard was acceptable in European countries. Efforts for equivalency with NOP(USA) was under process.

There were 12 accredited certifying agencies in the country and the list is below. Tentative tariff according to **Bhattacharya and Chakraborty (2005)** was as below

- Travel and Inspection Rs.12000-19000/day (depending on small farmers, co op, estate, manufacturers, large and medium sized processors)
- Report preparation Rs.5000
- Certification Rs. 5000

List of accredited certifying and inspection agencies in India		
Sr.No	Name of certifying and Inspection Agencies	Address
1	Association for promotion of Organic Farming (APOF)	Alumni Asso, Building Bellary Oad, Hebbal, Bangalore-560024 Phon: 080-23516060
2	Indian Society for Certification of organic products (ISCOP)	"Rasi Building" 162/163, Ponnaiyaraja-puram, Coimbtore, Tamilnadu-641001 Phone-0422-2471181
3.	Indian Organic Certification	Thottumugham, P.O Aluva-683105

List of accredited certifying and inspection agencies in India		
Sr.No	Name of certifying and Inspection Agencies	Address
	Agency (INDOCERT)	Cochin, Kerala State Phone-0484-2630909
4.	Skal Inspection and Certification Agency	Mahalaxmi Layout, No-191, 1st Main Road, Banglore-560086
5.	IMO control Pvt Ltd	26, 17th Main HAL, 2nd, A stage, Bangalore-560008 Phone-080-25285883
6.	Ecocert International	54 A-Kanchan Nagar, Nakshetrawadi, Aurangabad-413002 Phone-0240-2376336
7.	Bioinspectra	C/o Indocert Thottumugham, P.O Aluva-683105 Cochin, Kerala State Phone-0484-2630908
8.	SGS India Pvt Ltd	250, Udyog Vihar, Phase-IV, Gurgaon-122015 Phone-0124-2399757
9.	International Resources for Fair Trade (IRFD)	Sona Udyog Unit no-7, Parsi Panchayat Road, Andheri (E), Mumbai-400069 Phone-022-28235246
10.	One cert Asia	Agrasen Farm Vatika Road, Off Ton Road, Jaipur, Rajasthan
11	National Organic Certification Association (NOCA)	Pune

Source: Bhattacharya and Chakraborty (2005)

The Ministry of Commerce launched the National Organic Programme in April 2000 and Agricultural and Processed food Products Exports Development Authority (APEDA) was implementing the National Programme for organic production (NPOP) **(Gouri, 2004).**

7. Logos of organic food and certifying agencies

Organic or chemical-free food would hopefully become an everyday option instead of an expensive one. The easiest way to tell if a manufactured or packed product is organic is to look for the Certifying Authority code number, listed below, on the packaging. Organic food as produced in a way that is kinder to animals and to the environment. Many people preferred to eat organic food, even though it is sometimes more expensive. Certification is the process by which a farm is officially certified as 'organic'. One agency certifies farms as 'biodynamic organic'. This guarantees customers that the produce from the certified farm is in fact organic and free from chemicals, pesticides, and insecticides.

The certification process involves contacting a certifying agency, contracting with them for an inspection of your farm by their inspector, and upon passing their inspection, an issuance of a Certified Certificate. These certificates are subject to renewal. If one wishes to enter the global international export market, their farm must be certified organic. Increasingly the domestic market in India is also insisting upon certified organic produce. India is working with international organic farming agencies to facilitate an internationally recognized set of standards to be used during the inspection of farms desiring organic certification. Contact information for some of the certifying agencies with offices in India is listed below. This is a fast growing field, with new offices opening in India every year.

Food companies that follow organic rules had to work hard to earn the right to display an organic logo on their products. Organic farms and factories were inspected by independent organizations, to make sure that the standards were upheld.

The Soil Association is the leading organic organisation in the UK, and if you see its logo on a product you could be sure that the product is organic. The Soil Association has inspectors that visit farms and factories.

The commitment of **ORGANIC INDIA** is to promote holistic sustainable development for all beings through organic agriculture. They are committed to service, sanctity and integrity, and to operating an ethical and sustainable business that harms none and benefits all. ORGANIC INDIA is a global leader in promoting organic products and in supporting

sustainable farming, wild crafting and village/tribal agricultural communities in India. All ORGANIC INDIA facilities and processing centers have been awarded SQF (Safe Quality Food), HACCP (Hazard Analysis & Critical Control Points), GMP (Good Manufacturing Practices), ISO-9001 and Kosher certifications, and EU (EU Organic Certification), Skal, ECO-Cert and USDA (United States Department of Agriculture) certified for organic production.

Indian National Standards for Organic Production & India Organic Logo is governed by **APEDA**, which provides national standards for organic products through a National Accreditation Policy and Programme. The aims of the National Programme for organic production include: (1) To provide the means of evaluation of certification programmes for organic agriculture & products as per internationally approved criteria. (2) To accredit certification programmes. (3) To facilitate certification of organic products in conformity to the National Standards for Organic Products. (4) To encourage the development of organic farming and organic processing. APEDA is the Indian Government certifying agency. It has drawn up the national set of standards

for organic farms in India. It is also the accrediting authority for all organic certifying agencies in India. A list of Inspection and Certification Agencies of India Accredited under the National Programme for Organic Production (NPOP) is available on their website at http://www.apeda.com/organic/agencies.html. The address of APEDA is Agricultural and Processed Food Products Export Development Authority (India) (APEDA) NCUI Building, 3 Siri Institutional Area, New Delhi 110 016 India

Tel: +91 11 651 4572, Fax: +91 11 651 9259, Email: chairman@apeda.com
Web site: http://www.apeda.com/

ECOCERT is a control and certification organization, whose activities are governed accordingly by the public authorities and legislation. ECOCERT is accredited for structure and procedures by COFRAC (French committee for accreditation), in accordance with guide standard ISO 65 (EN 45011), which requires independence, competence and impartiality. The address of Ecocert is

ECOCERT SA, Dr Alexander Daniel, Sector 3, 6/3 & 4 Hindustan Gut 102 Walmi-Waluj Road, Aurangabad - 431 002 India, Tel: +91 240 377 120 Fax: +91 240 376 866, Email: danielav@md3.vsnl.net.in/ , Website: http://www.ecocert.be/

IFOAM is the worldwide umbrella organization for the organic movement, uniting more than 750 member organizations in 108 countries. It is working actively with member countries to develop an internationally recognized set of standards for organic farm certification.

International Federation of Organic Agriculture Movements (IFOAM)
Mr. Bernward Geier, Oekozentrum Imsbach, 66636, Tholey - Theley, Germany, Tel: +49 6853 919 890, Fax: +49 6853 919 899
Email: headoffice@ifoam.org , Website: http://www.ifoam.org/

DEMETER International is the only agency currently certifying Biodynamic farms.

DEMETER International

Ute Bucholski , Demeter-International e. V.,

Brandschneise 1, D-64295 Darmstadt, Germany, phone ++49-6155-8469-99, fax ++49-6155-8469-11,

ute.bucholski@demeter.de, www.demeter.net

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Tel: +91 80 528 5883, Fax: +91 80 527 2185

Email: imoind@blr.vsnl.net.in,

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Phone: 91484630908, Email:

indocert@vsnl.com,

Website: http://www.indocert.org/

Naturland - India

Dr. Prabha Mahale

M-13/27, DLF City II

122002 Gurgaon, Haryana, India Tel: +91 124 256 0886

Fax: +91 124 238 8900

Email: india@naturland.de

Website: http://www.naturland.de/

OneCert Asia Agri Certification Private Limited

Agrasen Farm, Vatika Road, Off Tonk , Jaipur-303 905, (Rajasthan)

Contact Person: Mr. Sandeep Bhargava, Phone No. : - 0141-2720202 to 0141-2770342, Telefax No: - 0141-2720202, Email: info@onecertasia.in

Website:

WHEN YOU NEED TO BE SURE SGS

http://www.onecert.net/

SGS India Pvt. Ltd.

250 Udyog Vihar, Phase IV

Gurgaon - 122 015 India, Tel: +91 124 639 9990, Fax: +91 124 639 9764

Email: vipul_kapoor@sgs.com, Website: http://www.sgs.com/

Skal INTERNATIONAL

SKAL International Ltd.

Ms Fatima Povo, 501, A N Chambers, Turner Road, Bandra West , Mumbai - 400 050 India

Tel: +91 22 640 0449, Fax: +91 22 641 3297,

Email: fpovo@vsnl.com , Website: http://www.skalint.com/

Organizations working for organic food

NAVDANYA

Navdanya started as a program of the Research Foundation for science, Technology and Ecology (RFSTE), a participatory research initiative founded by world-renowned scientist and environmentalist Dr. Vandana Shiva, to provide direction and support to environmental activism. 1984 was the year of the Punjab Violence and the Bhopal tragedy. This violence demanded a

paradigm shift in the practice of agriculture. Navdanya was born of this search for nonviolent farming, which protects biodiversity, the Earth and our small farmers.

Navdanya means nine crops that represent India's collective source of food security. The main aim of the Navdanya biodiversity conservation programme was to support local farmers, rescue and conserve crops and plants that were being pushed to extinction and make them available through direct marketing. Navdanya was actively involved in the rejuvenation of indigenous knowledge and culture. It has created awareness on the hazards of genetic engineering, defended people's knowledge from biopiracy and food rights in the face of globalization. It has its own seed bank and organic farm spread over an areas of 20 acres in Uttaranchal, north India.

SRISHTI

SRISTI, which means creation, was born in 1993 essentially to support the activities of the Honey Bee Network to respect, recognize and reward the creativity at grassroots. Based in Ahmedabad, Gujarat, SRISTI (Society for Research and Initiatives for Sustainable Technologies) was a registered charitable organization that was devoted to empowering the knowledge rich-economically poor people by adding value in their contemporary creativity as well as traditional knowledge. It has helped establish GIAN, NIF, MVIF and AASTIIK.

SRISTI was set up to provide organizational support to the HBN. The objectives were: systematically documenting, disseminating and developing grassroots green innovations, providing intellectual property rights protection to grassroots innovators, working on the in situ and ex situ conservation of local biodiversity, and providing venture support to grassroots innovators. SRISTI manages the Honey Bee database of innovations, and supports the publication of the Network's newsletter in three languages, English, Hindi and Gujarati.

Lately SRISTI had being focusing on more concerted ways of hitherto neglected domains like women's knowledge systems, value addition through a natural product laboratory, and innovations in education.

Navdarshanam

Navadarshanam ("New Vision") was a small organization, a registered charitable Trust operating near a small village 50 km south of Bangalore, India. It investigates ecological and spiritual alternatives to the modern way of living and thinking.

Navadarshanam was an exploration of alternatives to the modern way of living and thinking. Its origin could be traced to a Study Circle that used to meet in Gandhi Peace Foundation and the Indian Institute of Technology at Delhi in the 1970s and 1980s. A decade of study, introspection and discussion among these concerned individuals led them to the conviction that the urban-industrial way of life was leading to alienation of the individual from self, nature and the Creative Power, resulting in ecological destruction, increasing poverty, unemployment and unmanageable levels of social disintegration and violence. To get away from this vicious cycle, they felt the need to explore alternatives to the modern way of living and thinking. In particular, they felt the need to explore the possibility of a new kind of science and technology: a science that would recognize the realities of the spiritual dimensions, and concomitant technologies that would enhance rather than destroy ecology. Central to this way of thinking was the recognition that there exist forces which were invisible to our physical senses, but were nevertheless the centres of power in shaping our universe and in taking care of its ecological balance.

Dharani

Dharani was the Organic Store on the premises of ISKCON. It sells organic fruits, vegetables, unprocessed food like honey and processed food like jam,

marmalades, chayawanprash and others. All the products sold here were completely organic, unadulterated by chemical fertilizers.

ISKCON started Dharani with the objective of promoting organic food and organic farming. It hopes to bring about a greater understanding among the people about the importance of eating and living healthy. Some of the products sold at Dharani were from ISKCON's 100 acre organic farm in Srirangapatana, near Mysore. But most of them were from the the farmers whom ISKCON was encouraging to practice organic farming

JATAN

Jatan was a pioneering organization promoting organic farming in Gujarat, India since 1985. They were supporting farmers who were interested in doing organic farming. They organize various camps, seminar for the benefit of the farmers. Various training programmes were also designed by them which help farmers and provide information about organic farming. It has also started an outlet to sell organic food. JATAN was a non profitable organization and working with the support of friends and farmers. No financial support has been received from government. Whatever they earn from the sell of organic food they use it for the welfare of farmers. Farmers also rely on JATAN. In Gujarat JATAN was another name for organic food. The process of certification for the organic farm was very expensive and which was not affordable by the poor farmers. Jatan started giving certification to the farms doing organic farming at nominal fees. The certification process used by Jatan was designed to have a low carbon footprint because the appraisal was local. The certification process uses over 70 criteria judging social, ecological, and health matters as a percentage, described as the Sajiv Kheti index of the farm. Certification should be considered as an educational process and not as a policing and inspection process. For Jatan, it was an opportunity for communication amongst farmers, consumers and traders.

Conclusion:

The Indian Agriculture was traditionally organic and organic farming practices were performed by the farmers till the middle of the last century(1950). The green revolution was ushered in India during sixty and had succeeded in transforming the Indian economy from a situation of severe food shortage into one where the country had not only become self-reliant in food production but had also been able to generate a sizable surplus for export. During this period the production of food grain had increased four folds. But indiscriminate and excessive use of chemicals during this period had affected agriculture and affected soil health, human health and environment health. In the name of growing more to feed the earth, people had taken the wrong road of unsustainability. The truth however was that while a vast percentage of India's population was hungry, underfed and malnourished, India already grew sufficient food to feed its entire population. Yet between 25- 35% of our population was classified as hungry. The reason for this was not insufficient food but improper distribution of food and handling systems are inefficient .

Chemical fertilizers and pesticides disturbed the harmony existing among soil, plant and microbial population. These chemical fertilizers and pesticides create pollution for water, land and air. More than half of all pesticides used Indian agriculture were banned or severely restricted in many developed countries, pesticides residues were found in human blood samples. The dangers of pesticides through direct exposure were resulted due to poor literacy, lack of knowledge and awareness among farmers regarding safe pesticide application and safe waiting periods, farmers' lack of financial assets to buy protective clothing, lack of regulation, inadequate safety standards, inadequate labeling. Pesticide residues in food and drinking water had also adverse impacts on the health of both farming families and consumers, in addition to health hazards due to direct exposure to pesticides. Health problems caused by pesticide residues are the results of long-term exposure over many years. It was important to create awareness among the consumers about the presence of pesticides residues and its impact on health.

Surprisingly Indians were very much unconcerned about the quality of the food they consume. Despite numerous and regular reports in the media about the presence of pesticides and other chemical contaminants in food and water, Indians had not started search and demand for food grown in a non-toxic way. People also very isolated from the food production process - many of us did not have the idea where our food comes from or how it was grown.

There is a need to develop appropriate marketing channels for organic produce, including the establishment of direct links between producers and consumers. In this regard innovative forms of marketing should be explored. As a part of the marketing promotion effort, consumer education should be undertaken. Consumers are aware of non-toxic nature, healthy, more nutritive and safe quality of organic food. There is a need for imparting more knowledge and awareness of other useful traits and qualities of organic products to traders and consumers in marketing and sales promotion programmes to broaden the scope and volume of the market of organic food in future for the benefit of both the farmers and consumers. This would encourage the adoption of organic farming on large scale.

After reviewing the extensive literature it was found that although many studies had been conducted to study the attributes that affect the choice of organic food, but none of the study shows link between producers, shopkeepers and consumers. There is a need to study problems faced by producers, consumers and shopkeepers. So that one could find out proper solution by linking them. Many researches had been conducted on organic farming and its impact on soil, there is a dearth of information on comparison on organic food and conventional food. It was also noted that there were very few studies conducted in India on organic food. Therefore, a need was felt to conduct a study on organic food to find out consumer's problem, their satisfaction, extent of use and its food quality.