Chapter: II

Review of Literature
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2.1 Introduction:

This chapter is divided into two sections. The first section discusses the marketing model of 'Youth Self Help Group' developed by Mrs. Vasudha Sardar at Pargaon village near Pune. And the second section presents the brief overviews on agronomic, sociological and ecological aspects of organic farming of the relevant studies conducted by various agricultural universities researchers, scientists, agronomist, environmentalist, journals, and institutes or organizations.

2.2 Model of 'Youth Self Help Group':

The organic products are produced by the 'Youth Self Help Group' at Pargaon a village which is 35 km away from Pune city (Maharashtra State, India). The 'Youth Self Help Group' is a small voluntary association of people of various age groups (whose mindset is young) preferably from the same socio-economic group. It is a group of micro farmer entrepreneurs who have adapted organic farming. They voluntarily came together to produce organic farm products. This 'Youth Self Help Group' programme aimed at enhancing and sustaining the income of participating farmers through organic farming practices and appropriate marketing.

The organisation of 'Youth Self Help Group' was successful, as this proved to be effective and boosted the confidence of the farmers who were able to fetch a fair price for their produce. They mutually agreed to contribute to common direct strategy of ethical trade. This has resulted in promoting all round inclusion of small and marginal farmers and has ensured their survival. The 'Youth Self Help Group' has promoted direct sales to the consumers with maximum reliance on self regulating agro-eco system of organic farming, as well as contributed to the development of the families of the farmers and built solidarity amongst farmers. Cohesion within a group provides them with a sense of identity, status, security and also provide them access to credit and institutional support services which otherwise might have denied to them. The 'Youth Self Help Group' is direct interface between farmers and consumers and eliminates middleman between them. They have successfully avoided the gender discrimination amongst themselves.

The history of this model is as follows Mr. Sardar an engineer in Mumbai city was in ill health during 2000. The Doctor prescribed him a chemical free and nutritious diet. It was not possible to procure organic vegetables, fruits from
the Mumbai city market in those days. Therefore, Mrs. Vasudha Sardar, his wife took a bold step to leave Mumbai city, the capital of Maharashtra State (India) and settled at a village called Pargaon (near Pune from state of Maharashtra, India) where her father was a famous landlord. He was well known for his innovative ideas and experiments conducted in farming business and live stock management since 1960s. Mrs. Sardar, daughter of this landlord, aimed at: farming with the ‘Youth Self Group’ themselves in organic farming business, development of peoples’ consciousness towards healthy food and, sustain health of soil and eco system. She was determined to avoid use of inputs which had adverse effects. She decided to educate and empower the farmers by providing them best water management techniques and developed suitable cropping pattern for the region. She has addressed the issues of rural development and nature conservation effectively. She has shown the way of commercial organic farming to the farmers at Pargaon and has developed the model of direct sale of organic products to the customers. The flow chart of the ‘Youth Self Help Group’ organic food direct sales model is as follows:

Chart 2.1 Organic Food packaging, transporting and marketing flow chart:

The ‘Youth Self Help Group’ and direct sale model was successful immediately after 2000 as the members of the family had come together and developed the work culture and had know labour issues. This group had set marketing linkages exclusively for organic products, and reduced the demand supply gap. This group had developed their own transporting system which was run by themselves and thus had reduced per unit cost of transportation. They had
formed a group of growers who could grow the organic vegetables. The Youth Group has played the cropping pattern for the group and had produced in close proximity to each other whose farming practices were uniform on the whole and were organised under same management and marketing system. Their growing interest was in organic and the ethical production and trade. The ethical trading involves being people centred that means no child labour, reasonable and safe working conditions, gender equality in income and working conditions. They had freedom to organise environmentally focused and sustainable agricultural practices.

Organic Farming at Pargaon and the ‘Youth Self Help Group’ has proved to be a bridge between; rural-urban areas, and between the producers and customers of organic food products. The ‘Youth Self Help Group’ realized that if organic farming had to become viable, there was a need for planning of cropping pattern, collective and co-operative farming, as also proper marketing and distribution; in addition to proper cultivation and inter-cropping pattern. The ‘Youth Self Help Group’ started the organic farming activities with a group of 25 farmers.

The leader Mrs. Sardar organized the farmers together, explained them the economic cost and benefits in the short run and in the long run associated with both, organic and chemical fertilizer based farming, and prepared a plan for mutually beneficial organic farming business. Each farmer in the group is given separate crops for cultivation, so that there is no internal competition amongst them. In fact, there is co-operation in the group. In addition, inter cropping is practiced on their farms, which not only keeps pests away, but the lands for grazing. Farmers get additional income from these crops. The natural cycle is maintained and as a result, birds are attracted due to a variety of crops being grown. The birds eat worms which would have destroyed the crop. Secondly, beneficial micro organisms are retained, which also help in crop growth and pest resistance. Organic farming has a positive effect on the ecosystem, as it proves vital in supporting the survival of wildlife in the lowlands. It even provides safe pasture.

However, cultivation alone is not sufficient for sustaining a system. So Mrs. Sardar has also developed a marketing and distribution system. Her group has a section of regular consumers, who are acquainted with beneficial effects on health, of eating naturally grown food. Her group organizes delivery on specific days at specific areas, in rotation. This is already informed to the
consumers, as well as the farmers. This has eliminated middle men and hence reduced the commission cost which would have normally gone to the middle men. This has naturally increased the net income of the farmers.

But still she is disappointed with the dropout of few farmers from the group who were unable to cope up with the alternative method of farming as it is not economically viable in the short run and the most important problem they faced is about the labour inputs. Labour is important to the production process, and an became an impediment to the adoption of organic agriculture. Compared to large-scale mechanized agricultural systems, organic farming appears more labour intensive. Many techniques used in organic farming require significant labour (e.g., strip farming, non-chemical weeding, composting) Even the family members later did not cooperate in term of labour inputs required on organic farm. Out of 25 farmers only 6 farmers continued with organic farming.

The ‘Youth Self Help Group’ of 6 households, in addition to organic fruits and vegetables, also developed their dairy. They have maintained indigenous cows in the dairy. From the dairy the special fertiliser called “Jeevamrutam” is prepared. “Jeevamrutam”, a liquid mixed with cow dung (5 liters), cow urine (5 liters), jaggary (1kg), flour of cereals (1kg) and water, feeds the plantations by drip after brewing in tanks for 7 days. The yield went up to 2.5 times more, besides the drop in cultivation cost on account of organic farming”. The ‘Youth Self Help Group’ reported that water evaporation levels came down drastically after this shifting from fertilizer-based farming to organic farming. Consequently, consumption of power for water exploitation for their orchards and vegetable farm land in 25 acres came down to 3 hours from 7 hours a day.

The ‘Youth Self Help Group’s dedication towards organic farming is an inspiration for other organizations. Although the enthusiasm and response of few farmers may have dwindled over the years, the ‘Youth Self Help Group’ has stood by their work in the field of organic farming, and has bettered the life of the farmers who have participated in the struggle of turning towards an alternative system of organic farming for getting economic benefits.

Like ‘Youth Self Help Group’ of sellers the ‘Youth Self Help Group’ of customers having awareness of food safety issues and organic product need to be created. The slogan should be Know Your Farmer, who produces organic products on organic certified land.
2.3 Economic Benefits of the Model:

1. Reduce Transportation Cost:

The present model reduces the cost of transportation of each participated farmers because they carry their organic product to the market through one tempo instead of separate. So, they save the transportation cost, which directly impacts on cost of production.

2. Increase in Income:

According to the participated organic farmers they earn good income due to they are not cultivated same product. Each farmer in the group is given separate crops for cultivation, so that there is no internal competition amongst them. In fact, there is co-operation in the group.

3. Reduce the Cost of Certification:

Organic certificate is necessary for organic farmers. But the cost of getting organic certification from any institute or organisation is high, which is beyond the capacity of every individual farmer. Meanwhile, participated farmers get group certificate which required less cost on the part of individual farmer.

4. No Agent or Middle Men:

Another important benefit of this model is that they have eliminated middle men in the process of selling product as result they reduced the commission cost which would have normally gone to the middle men. This has naturally increased the net income of the farmers. They organize delivery on specific days at specific areas, in rotation and also already informed to their consumers.

2.4 Review of Various Studies:

This section presents the brief overviews on agronomic, sociological and ecological aspects of organic farming of the relevant studies conducted by various agricultural universities researchers, scientists, agronomist, environmentalist, journals, and institutes or organizations. These are as follows:
2.4.1 Effects of Green Revaluation:

- LaSalle et al. (2008) and Gianessi (2009) asserted that Green Revolution Agriculture (GRA) was introduced and transferred to all the countries with a wrong conviction that organic farming alone will not be able to meet the growing global population and their needs. This has unwittingly culminated in a myriad of negative impacts to the environment and to the society.¹

- Panneerselvam, Halberg, Vaarst and Hermansen (2011), showed that the technologies that powered the Green Revolution such as the use of high-yielding varieties, chemical fertilizers and pesticides, coupled with the expansion of the area under irrigation transformed India from a net food importer in the 1950s and 1960s to a self-sufficient nation in the 1980s. However, the techniques that were used to increase agricultural yield have led to significant surface and ground water contamination, an increased incidence of pests and diseases, and loss of biodiversity. Increased production costs and indebtedness are other problems faced by farmers in India. All these problems have created an interest in organic agriculture among farmers, researchers, policymakers and other stakeholders.²

- Liebhardt (2001) and Baker et al. (2002) indicated that Green Revolution Agriculture (GRA) is not cost-efficient. Industrial agricultural methods can reduce labour costs by substituting herbicides, insecticides, synthetically-produced fertilizers as well as farm machinery for application and crop maintenance. However, the energy costs, health costs of the environment and people are much lower in alternative farming systems than the intensive chemical farming.³

- According to International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD-2008), the negative and serious consequences of the Green Revolution led researchers to question the industrial farming as a viable approach to address problems of soaring food prices, hunger, social injustice and environmental degradation in the developing world.⁴
• Bockstaller et al. (1997) and Dore et al. (2007) asserted that the negative impacts of chemical farming and its un-sustainability motivated the innovative farmers all over the world to rediscover the traditional self reliant and eco-friendly alternative sustainable farming techniques.\(^5\)

• Sreenivasa (2012) indicated that organic farming should be taken as means of enhancing soil fertility, soil health and productivity without causing environmental pollution. High cost of chemical fertilizers, indiscriminate use of pesticides which affected human health, biodiversity in addition to environmental pollution and global warming due to rise in carbon pool, methane etc. are causing major concern to the society in general and farmers in particular.\(^6\)

• According to Pretty (2008), Bradford and Wichner (2009), today there is an urgent need of sustainable agricultural technologies and practices that (1) do not have adverse effects on the environment i.e. partly because the environment is an important asset for farming (2) are accessible to and effective for farmers (3) lead to both improvements in food productivity and have positive side effects on environmental goods and services. Sustainability in agricultural systems incorporates concepts of both resilience i.e. the capacity of systems to buffer shocks and stresses, and persistence i.e. the capacity of systems to continue over long periods. This culminates in many wider economic, social and environmental outcomes.\(^7\)

• Chandrasekaran, Annadurai and Somasundaram (2010) showed that about 60 per cent of our agricultural land currently under cultivation suffers from indiscriminate use of irrigation water and chemical fertilizers. The gravity of environmental degradation resulting from faulty agricultural practices has caused alarm among the concerned farmers, scientists and conversationalists and greater viable and sustainable farming systems have become a necessity. There has been a series of scientists and policy conference on this issue. One such alternative agriculture system which will help to overcome the problems of soil degradation and declining soil fertility is organic farming and ecological agriculture.\(^8\)

• According to Wali (1992) and NRC (1993) in recent years, the negative environmental and soil impacts of High External Input Agriculture
(HEIA) have become increasingly obvious. At the same time, many disadvantaged communities of smallholders are being forced to exploit the resources available to them so intensively that, environmental degradation is setting in. Hence, it is important to seek new approaches to agricultural development, which will benefit small farmers, half degradation of natural resources and restore degraded soils and ecosystems.9

- World Commission on Environment and Development (WCED, 1987) called attention to the immense problems and challenges facing world agriculture for meeting present and future food needs, and to the need for a new approach to agricultural development.10

- According to NPCS Board of Consultants & Engineers (2008) after the green revolution was launched in India, substantial increase in the production of food grains was achieved through the use of improved crop varieties and higher levels of inputs of fertilizers and plant protection chemicals. But it has now been realized that the increase in production was achieved at the cost of soil health and that sustainable production at higher levels is possible only by the proper use of factors, which will help to maintain the fertility of the soil. In fact, about 60 per cent of our agricultural land currently under cultivation suffers from indiscriminate use of irrigation, water and chemical fertilizers. The gravity of environmental degradation resulting from faulty agricultural practices has caused alarm among the concerned farmers, scientists and conservationists and greater viable and sustainable farming systems have become a necessity. There has been a series of seminars and policy conference on this issue. One such alternative agriculture system, which will help to overcome the problems of soil degradation and declining soil fertility, is organic farming and ecological agriculture.11

- Lichtenberg (1992), Pretty (1995), Sivotwa et al. (2008), LaSalle et al. (2008), and Ericksen et al. (2009) summarized the adverse environmental and social impacts of modern agriculture. These are as follows:

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

According to Ram (2003) in modern agricultural farming practices, along with irrational use of chemical inputs over the past four decades have resulted in not only loss of natural habitat balance and soil health but have also caused many hazards like soil erosion, decreased groundwater level, soil Stalinization, pollution due to fertilizers and pesticides, genetic erosion, ill effects on environment, reduced food quality and increased the cost of cultivation, rendering the farmer poorer year by year.

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

Reddy (1988) has pointed out that the modern agriculture is like a cracked earthen pot, which cannot be put to good use any more. New policies
must be able to create the conditions for development based more on locally available resources and local skills and knowledge.  

- World Health Organisation (WHO) estimates that globally at least three million peoples are poisoned by pesticides every year, of whom, 20,000 die.  

- Kuchler (1997) pesticide residues have varying effects on human health. Pesticides can induce several allergies, asthma, genetic mutations, birth defects, nutritional deficiencies, as well as serious damage to organs such as liver, kidneys and the nervous system. Further, they can lead to biomagnifications and bio-accumulation.  

- Miller (1970) “Pesticides are a serious dilemma, being simultaneously knights and villains many of the long range effects of man-made chemicals on the eco-sphere are not predictable and even the relatively, simple cases are not completely understood”.  

- Palekar S. (2007) claims that “Green revolution had poisoned air water and food because of the application of fertilizers and pesticides. It also polluted the soil forcing the farmer to add more and more fertilizer and had finally denuded the land to the extent that productivity has started coming down. The repeated use of fertilizer and pesticide pushed farmers into debt trap, and, unable to come out of the clutches of money lenders, many farmers committed suicide.”  

- Oskam et al., (1992), Wossink and Rossing (1998) conclude that pesticide use can well have negative agronomic effects, including phytotoxicity (manifested as damaged crops and especially likely to occur in the case of over-dosage of herbicides), resistance, adaptation, the development of secondary pests, and changes in output quality.  

- Rao (1999) has pointed out that agriculture is the base of economic policies and is the ultimate driver of national economic growth and poverty alleviation in many developing countries including India. The industrial agriculture however, that increased grain production and farmers profit by a large margin, is being driven by significant
externalities with long standing hidden cost such as loss of natural resources, effects on human health and on agriculture itself.21

- Kapoor (2012) found that "Many of our farmers are underpaid, malnourished, are frequently using chemicals that harm their health, and rely on practices that seriously degrade their land. Not only this, the food that they are producing is often coated in harmful chemicals, has little taste and is low in essential nutrients." "Organic farming, when practiced properly, reduces the input costs for fertilizers, pesticides and seeds, dramatically improves farmer health and enhances the fertility and resilience of their land," and "Of course, it also gives you tastier, safer and more nutritious produce".22

- Rao (1999) reveals that green revolution technologies involving greater use of synthetic agro-chemicals such as fertilizers and pesticides with adoption of nutrient responsive high yielding varieties of crops has boosted the production per hectare in most cases. However, this increase in production has slowed down and in some cases there are indications of decline in productivity. Moreover the success of the green revolution in recent decades has often masked significant externalities, affecting natural resources and human health as well as agriculture itself.23

- Banerjee G. and Banerji S. (2010) indicated that Green revolution technology has brought many ill effects of farm sector like, desertification, water logging and salinity. All these compounded for seeking for an alternative sustainable farming system organic to modern farming system. The Green revolution can’t go with the environmentally sound and sustainable system of farming.24

- Conway and Barbier (1988) feel that the Green revolution has encountered major problems of equity, stability and sustainability, necessitating a new phase of agricultural research and development.25

- Lucas and Debuque (1993) “It has become increasingly clear to farmers, NGOs, international agencies, academics and Governments that the conventional practice of farming, based on the Green revolution in Asia, is fatally flawed. The unsustainable nature of conventional agriculture is
manifesting itself in terms of stagnant or declining yields, increasing ecological degradation, and worsening socio-economic conditions”.

- Sayarat Chaturvedi (2012, The Economic Times) states that industry and the Central government have painted a picture of success about GM crop saying it has led to an increase in production and that the costs of cultivation have gone down. But the ground reality is starkly different. Moreover, there is no evidence as yet that GM crops can actually increase yields.

- M S Swaminathan (2013, The Economic Times) said that it is time to rethink the widespread use of chemicals in farming, which has badly affected land and water resources of the state. "There are environmental and marketing issues confronting Punjab's agriculture today. There are issues of farmers' debts and need for diversification and crop rotation," so more and more farmers must adopt organic farming and the government must help the farming community to get rid of the challenges of marketing. The wave of organic farming will usher in the "evergreen revolution" in country.

- Ramanjaneyulu (2012, Times of India) pointed out that while use of chemical pesticides and fertilizers increased the cost of production, the price of crops was not increasing. "As a result farming is no longer a sustainable occupation." Further he said that several studies had pointed out that the uses of chemicals have poisoned food and groundwater. "There are 67 pesticides that are banned in all countries except India".

- Chandrasekaran, Annadurai and Somasundaram (2010) stated the ills of green revolution as follows:
  - Reduction in natural fertility of the soil
  - Destruction of soil structure, aeration and water holding capacity
  - Susceptibility to soil erosion by water and wind
  - Diminishing returns on inputs (the ratio of energy input to output halves every 10 years)
- Indiscriminate killing of useful insects, microorganisms and predators that naturally check excess crop damage by insect pests.
- Breeding more virulent and resistant species of insects
- Reducing genetic diversity of plant species
- Pollution with toxic chemicals from the agrochemicals and their production units
- Endangering the health of the farmers using chemicals and the workers who produce them
- Poisoning the food with highly toxic pesticide residues
- Cash crops displacing nutritious food crops
- Chemicals changing the natural taste of food
- High inputs increasing the agricultural expenses
- Increasing the farmers work burden and tension
- Depleting the fossil fuel resources
- Increasing the irrigation needs of the land
- Big irrigation projects often resulting in soil salinity and poor drainage
- Depleting the ground water reserves
- Lowering the drought tolerance of crops
- Appearance of difficult weeds
- Heightening the socio-economic disparities and land holding concentration
- High input subsidies leading to inflationary spirals
- Increasing the political and bureaucratic corruption
- Destroying the local culture (commercialization and consumerization displacing self-reliance)
- Throwing financial institutions into disarray (as impoverished farmers demand write-off of loans)
- Agricultural and economic problems sparking off social and political turmoil resulting in violence.
• According to Thapa U. and Tripathiy P. (2010) green revolution technologies such as greater use of synthetic agrochemicals like fertilizers and pesticides, adoption of nutrient responsive, high-yielding varieties of crops, greater exploitation of irrigation potentials etc. has boosted the production output in most cases. However, continuous use of these high energy inputs indiscriminately now leads to decline in production and productivity of various crops as well as deterioration of soil health and environments. The most unfortunate impact of Green Revolution Technologies (GRT) on Indian Agriculture is as follows:\(^{31}\)

1. Imbalance in production
2. Dependency on synthetic chemical fertilizers
3. Increase in secondary & micronutrient deficiencies
4. Increase in pesticide use
5. Unscientific water management and distribution
6. Reduction in productivity
7. Reduction in quality of the produce
8. Extinction of gene pool
9. Environmental pollution
10. Imbalance in social and economic status

All these problems of Green Revolution Technologies (GRT) lead to not only reduction in productivity but also deterioration of soil health as well as natural ecosystem. Moreover, today the rural economy is now facing a challenge of over dependence on outside inputs and day-by-day increase in price of these inputs. Further, Indian Agriculture will face the market competition due to globalization of trade as per World Trade Organization (WTO).

• National Academy of Science (1987) report estimated that pesticides may be the cause of an extra 1.4 million cancer cases among Americans over their lifetimes, while pesticide poisoning among farm workers in California ranks as the highest rate of occupational illness in the state.\(^{32}\)
Vogt (2000) summarized that scientific and agricultural debates in Germany discussed the increased use of mineral fertilizers and the corresponding neglect of organic manuring as a major cause of several problems:

- Inappropriate use of mineral fertilizers was disturbing plant metabolism, especially because cultivars at that time were not yet adapted to higher nitrogen levels in soil. Weakened plants could be attacked more easily by pathogens and insect pests, and effective pesticides had not yet been developed.

- Physiologically acidic mineral fertilizers acidified the soil, leading to diminished root growth, disturbances in the soil’s mineral balance and degradation of soil structure.

- Soil compaction caused by the use of machinery and reduced organic manure lowered the soil’s water-retaining capacity, causing drought problems.

- Soils experienced a decline in fertility – referred to as ‘soil fatigue’ (Bodenmüdigkeit) – that could not be explained by harmful organisms or the lack of nutrients; this was attributed to a disturbed balance among soil organisms, with the resulting accumulation of harmful organic substances.

- The use of the previous harvest as seeds often led to a decrease in yields that could not be explained by plant diseases, pests or mineral deficiencies. Higher nitrogen levels in soil and plants prevented the complete ripening of the seeds; such immature seeds interfered with the plant’s development the following year.\(^{33}\)

According to FAO (1997), a rough calculation indicates that the loss of soil nitrogen caused by water erosion is of the same order of magnitude as the use of N fertilizers in the world.\(^{34}\)

Narayanan (2005) has made an analysis on conventional Green Revolution practices using petroleum-based and chemical inputs have been shown to cause continual loss of soil nutrients, soil organic matter and food nutrient content. These practices consume vast quantities of
natural resources to prepare, distribute, and apply fossil fuel inputs, and can justly be defined as degenerative farming. With increased population pressures and declining ecological support systems of healthy soil and water, the only sustainable and restorative option available is one based on the biologically-enhancing production models of organic farming.

- Narayanan (2005) showed that the negative effects of modern chemical based farming system were first experienced by those countries, which introduced it initially. So, naturally, it was in those countries organic farming was adopted in relatively large scales. Organic farming involves management of the agro-eco system as autonomous, based on the capacity of the soil in the given local climatic conditions.

- Reddy (2010) assessed the manufactures of fertilizers and pesticides, the two major inputs of green revolution technologies, need fossil fuels and expensive energy, and are associated with serious environmental and health problems. It is perhaps owing to these input issues and their negative impact, that the Intergovernmental Panel on Climate Change (IPCC) has noted that agriculture as practised today (conventional agriculture, modern agriculture or green revolution agriculture) accounts for about one fifth of the anthropogenic greenhouse effect, producing about 50 percent and 70 percent, respectively of the overall anthropogenic methane and nitrogen oxides emissions.

- IAASTD (2008) observed that the negative and serious consequences of the Green Revolution led researchers to question the industrial farming as a viable approach to address problems of soaring food prices, hunger, social injustice and environmental degradation in the developing world.

- Pimentel et al. (2005) and Pimentel (2006) have made an analysis on a study of Rodale Institute’s Farming Systems Trial from 1981 to 2002 shows that fossil energy inputs for organic corn production were about 30 percent lower than for conventionally produced corn.

- USDA (2003) analyzed that the Green Revolution Agriculture (GRA) practices have shown to reduce returns by 25-30 percent in few years by increasing the amounts of costly and toxic artificial inputs. Unfortunately,
once started, the intensive chemical system of farming is very difficult to escape the vicious cycle of non sustainability.\footnote{30}

- Badgley and Perfecto (2007) found that the environmental price of Green Revolution Agriculture (GRA) includes increased soil erosion, surface and groundwater contamination, release of greenhouse gases, increased pest resistance, and loss of biodiversity.\footnote{31}

- Jaswanth Singh, R. D. Singh, S. I. Anwar and S. Solomon (2011) in their paper entitled that ‘Alternative Sweeteners Production from sugarcane in India: Lump Sugar (Jaggery)’. Importance of sweeteners has long been recognized in Indian diets. Sweetness and flavour are very important as regards consumers’ acceptability. The sugar and jaggery are the main sweetening agents which are added to beverage and foods for increasing palatability. Over the years, food habits of human beings have been greatly influenced by research and developmental activities and also due to their health consciousness. Despite witnessing pressure of industrialization, the jaggery industry has flourished in different states of the country viz., Maharashtra, Uttar Pradesh, Tamil Nadu, Karnataka and Andhra Pradesh. The increasing trend of their production is of much significance to learn about peoples’ liking towards jaggery in rural areas mainly due to its nutritional and medicinal values. About 25.30% of sugarcane produced in the country is utilized for production of jiggery and khandsari and this industry serves as very important means of subsistence and livelihood for masses. The technology and equipment for production of quality jaggery and its value added products have been developed. Due to its nutritional and medicinal values, the jiggery has great export potential in the world.\footnote{32}

2.4.2. Productivity:

- Kshirsagar (2008) has revealed that organic farming is a system of farm management to create an eco-system which can achieve sustainable productivity without the use of external inputs like chemo-synthetic fertilizers and pesticides.\footnote{33}

- According to Stockdale et al., (2000) the development and implementation of well-designed crop rotations is central to the success of organic production systems.\footnote{34}
• Willer (2008) has observed that over the last 25 years, consumption and production of organic products have been growing at a rapid pace. The world acreage of certified organic agriculture is estimated to be 31 million hectares.\textsuperscript{45}

**2.4.3. Labour Cost:**

• Lampkin and Padel (1994) noted that, in many European countries, labour costs on organic farms are high, although some of those costs cover marketing and processing activities.\textsuperscript{46}

• Projects in the UNDP study (1992) showed that labour requirements to be high on some organic farms, especially on plantations, as well as on those organic farms where labour-intensive methods were used, such as composting. In cases with a high opportunity cost for labour (such as on plantations), higher total costs in the organic projects were seen.\textsuperscript{47}

• Werf (1993) found that median labour used on the seven Indian organic farms was lower than on the non-organic farms.\textsuperscript{48}

• Pimentel \textit{et al.} (1973) Pimentel \textit{et al.} (2005) indicated that conventional and mechanized form of agriculture is extremely energy intensive, requiring fossil fuels to power the machines that allow humans to farm on such a large scale.\textsuperscript{49}

• Jansen (2000) reveals that Organic Agriculture (OA) commands a higher price premium than Conventional Agriculture (CA) because of its appeal to consumers who desire chemical-free foods and because of the labour costs associated with the farming efforts required.\textsuperscript{50}

• Pimental et al., (2005) indicates that one of the major issues of developing countries is the problem of unemployment especially for a large sector of less skilled group. Organic farming requires over 15 percent more labour than traditional farming and therefore provides rural job opportunities.\textsuperscript{51}
• El-Hage Scialabba and Hattam (2002) indicate that in changing to organic farming practices, many aspects of the operation, including labour demand, social structures, and decision-making processes change, and that organic systems often require more labour input to replace external energy and capital inputs. Further, as a result of crop diversification, different planting and harvesting schedules associated with crop rotation practices, distributes labour demand through the season. These practices stabilise employment, reduce turnover, and reduce problems related to migrant labour as well as spreading the overhead costs per employee more evenly over the year. Finally, diversity in agricultural production and value added products can increase income-generating opportunities and spread the risks of failure over a wider range of crops and products.52

• Chandrashekar (2010) mentioned that organic food production costs are higher in the developed countries as organic farming is labour intensive and labour is costly in these countries. However, in a country like India, where labour is abundant and is relatively cheap, organic farming is seen as a good cost effective solution to the increasing costs involved in chemical farming. Currently most of the organic farmers in India are still in the transition phase and hence their costs are still high. As these farmers continue with organic farming, the production costs are expected to reduce, making India as one of the most important producers of organic food.53

• Strochlic and Sierra (2007) observed that the economics of organic farming is related to the effects in terms of human society. Organic farming is labour and knowledge intensive whereas conventional farming is capital intensive, requiring more energy and manufactured inputs.54

• Guruswamy and Balanaga (2010) showed that organic farming is labour and knowledge-intensive where as conventional is capital intensive, requiring more energy and manufactured inputs.55

which shows the organic food industry generated more than five hundred thousand American jobs in 2010.\textsuperscript{56}

2.4.4. Yield:

- Julia \textit{et al.}, (2008) examined that in the long run, organic farming offers more advantages compared to conventional farming, because it not only promises higher yields but also ensures higher yield security and reduces dependence on external inputs, thus making poor households less crisis-prone.\textsuperscript{57}

- Ramesh \textit{et al.} (2005) has found that organic farming could give higher or equal yields of different cropping systems compared to chemical farming after an initial period of three years. The so-called transition effect, in which the yield declines in the first 1-4 years of transition to organic agriculture, follows a yield increase when soils develop adequate biological activity.\textsuperscript{58}

- Dubgaard (1994) studied the economic analysis of organic farming. His results showed that the yield differences were most noticeable for intensive crops such as wheat and potatoes with organic yields around half the conventional averages.\textsuperscript{59}

- Borlaug N. (2002) said that, “Switching on food production to organic would lower crop yields. We can use all the organic that are available but we are not going to feed six billion people with organic fertilizers”.\textsuperscript{60}

- Rickson \textit{et al.}, (1999) asserted the survey evidence suggests that organic farmers find their farm work to be more satisfying than conventional farmers.\textsuperscript{61}

- Pimentel \textit{et al.}, (2005) showed that some government programs in Sweden, Canada, and Indonesia have demonstrated that organic farming can reduce pesticide use by 50 percent to 65 percent without sacrificing crop yields and quality along with 50 percent lower expenditure on fertilizer and energy use.\textsuperscript{62}
Ingham E. (2011) found that “the farming systems trial clearly documents in a replicated, scientific fashion, that many of the current myths are not true. Organic agriculture does not result in the grower losing money, does not result in lower yields, or more expensive management practices”.

Lotter (2003) reports that repeated studied have found that organic farms withstand severe weather conditions better that conventional farms, sometimes yielding 70-90 percent more than conventional farms during drought.

Cornell University (2005) concluded that organic farming produces the same corn and soybean yields as conventional methods over the long-term averages, but consumed less energy and used zero pesticides. The results were attributed to lower yields in general but higher yields during drought years.

Lampkin and Padel (1994), gathered a number of studies on the economics of organic agriculture in developed countries, found that organic farm yields were within an “acceptable range”. They also found that organic yields were higher than those on farms prior to 1950, claiming that this dispelled the notion that organic agriculture is “going back to the past”.

Another finding in Lampkin and Padel (1994) was that, contrary to popular belief, yields on organic farms in the 1990s were significantly higher than those on farms before the 1950s, thus dispelling the notion that organic agriculture is “going back to the past”. Part of this progress can, presumably, be attributed to new plant varieties and better knowledge on how to manipulate biological processes within agricultural systems.

Lampkin (1994) summarized various studies conducted on economics of organic farming in different crops in South and West of England and parts of Scotland and Wales. They concluded that the organic farming systems were more diverse in terms of enterprise mix; have lower yields and higher labour costs which were not compensated for fully by reduced input costs. Higher/premium prices are essential if organic farmers are to achieve similar incomes to their conventional counterparts.
• A review by Badgley et al. (2007) points out that organic agriculture is misjudged concerning crop production and its potential to supply sufficient food. According to their review, only small yield reductions occur through organic agriculture in developed countries, but organic yields are higher than conventional yields in developing countries. This conclusion is supported by a large number of other papers, which may be taken as evidence of its scientific reliability.\textsuperscript{69}

• According to Pimentel \textit{et al}, (2005), the USA’s Rodale institute has been running a study over 20 years that has consistently shown that organic agriculture delivers almost equal yields, is more environmentally friendly, and uses less energy than non-organic farming.\textsuperscript{70}

• Daniel J., Patil V. and Najan A. (2010) indicates that organic farming gives 20 percent smaller yield using 50 percent less fertilizer and 97 percent less pesticide.\textsuperscript{71}

2.4.5. Production Cost:

• Roberts \textit{et al}. (1979) has compared data from 15 organic farms in the western Corn Belt with the USDA data on representative conventional farms in the same area. In most cases, the net returns were higher on the organic farms. Both the studies have shown that production costs were lower on the organic farms.\textsuperscript{72}

• Rajendran (2002) observed that the crops like rice, organic cultivation appears to be less economical as compared to other crops. However there is more scope for minimizing the economic cost and environmental loss, under organic farming system in the long-run.\textsuperscript{73}

• According to Alvares \textit{et al}. , (1999) and Sharma (2005), most organic farming practitioners have reported that it was not the premium price of the organic produce but the reduced expenditure on inputs and similar yields to their neighbouring conventional farmers that motivated them towards organic farming.\textsuperscript{74}

• Lockeretz \textit{et al}. (1978) has compared the economic performance of 14 organic crops in the Midwest with that of 14 conventional farms. The
farms under study were paired based on the physical characteristics and types of farm enterprises. The market value of crops produced per unit area was 11 per cent lower on the organic farms. But since the cost of production was also less, the net income per unit area was comparable for both the systems.75

- Venkateshwarlu (2007) a comparative study showed that on economics of crop production under Organic Farming System (OFS) and Inorganic Farming System (IFS), the production cost was gradually declining in OFS. Further, it is not easy to assign economic values for soil health, reduced pollution and improved resilience and reduced green house gas emissions.76

- IGNOU, (2007) reported that once the farm is established organic, the yield enhances and the cost of production declines. Accordingly, there may be a deficit in net income under organic farming compared to conventional one up to third year. As input cost declines, the net income increases progressively fourth year onward.77

- Klonsky (2011) showed that the differential costs of producing a wide range of organic and conventional crops in California. Using a carefully-constructed model of each production activity, she calculates the cost of providing fertility, weed control, pest control, disease control and other cost to each crop. Somewhat surprisingly, the total costs of producing two organic crops like lettuce and strawberries are lower than the conventional alternative.78

- IGNOU, (2007) study undertaken by Central Institute for Cotton Research, Nagpur India indicated that the cost of cultivation under organic farm was about 21 percent lower than that under conventional farm mainly due to no use of chemical fertilizers and insecticides.79

- Lansink et al. (2002) compared efficiency measures of organic and conventional farms in Finland. They suggested that organic producers have higher technical and sub-vector efficiencies than conventional farms in their own reference groups, but overall efficiency measures suggest that organic farms are using less productive technology.80
• Morris (2001) highlights that total costs for operating most organic farming systems are lower than those for comparable conventional farms, and there are differences in the relative importance of individual cost elements. The restrictions on the use of fertilisers, pesticides and feed concentrates on organic farms result in reductions in these costs of production.

• Prasad K. and Gill M. (2009) explained that organic agriculture is a production system that avoids or largely excludes the use of synthetic compound fertilizer, pesticides, growth-regulators and livestock-feed additives, and thus offers some solutions to the problems currently besting the agriculture sector of industrialised of natural resources, minimize the cost of cultivation, provide healthy food, augment farm profit and improve soil health.

• Latacz-Lohmann and Foster (1997) highlighted that organic agriculture as a sector faces high initial set-up costs in terms of developing an appropriate infrastructure for the provision of information and advice and the marketing of its products. There is clearly a ‘chicken-and-egg’ argument here: organic production is only feasible and financially attractive once there is an established infrastructure, but an infrastructure will only develop once there is a reliable supply.

• Padel and Lampkin (1994) showed that the replacement of external inputs by farm derived resources normally leads to reduction in variable input costs under organic management. Expenditure on fertilizers and pesticides is lower than in conventional systems in almost all the cases.

• Peterson (1999), Reganold et al (2001) and Hanson et al (1997) studies have shown that the common organic agricultural combination of lower input costs and favourable price premiums can offset reduce yields and make organic farms equally and often more profitable than conventional farms.

2.4.6. Profitability:

• Thakur and Sharma, (2005) on comparative economics of Organic Farming System (OFS) vis-à-vis Inorganic Farming System (IFS) have favoured OFS, in terms of both higher yield as well as profitability.
• Brumfield (2000) observed that the economics of sustainable and conventional farming systems and conclude that organic systems are more profitable than conventional systems with organic price premiums, but are not economically viable without price premiums.\(^87\)

• Padel and Uli (1994) reviewed several studies on costs and returns of organic farming in various crops in Germany. Their study revealed that the organic farming under German conditions was equally profitable with conventional farming. Lower yields for arable crops were compensated by reduced costs of inputs and premium prices for most the crops. Many farmers explained that financial stability was the main reason for converting to organic farming. Introduction of support schemes for conversion and continuing organic farming also made a significant impact on the profitability.\(^88\)

• John (1994) reviewed the various field experiments conducted on organic farming in Canada. Many sample farms recorded yields that were the same or slightly below conventional farms. Even though some market regulatory problems exist in case of organic products, the prices for them were higher (about 30 percent) than the conventional products. Overall, the study concluded that 72 per cent of farmers strongly convinced that 'organic farming is as profitable as conventional'.\(^89\)

• Shirsagar (2008) studied the impact of organic farming on economics of sugarcane cultivation in Maharashtra. The study was based on primary data collected from two districts covering 142 farmers, 72 growing Organic Sugarcane (OS) and 70 growing Inorganic Sugarcane (IS). The results concluded that OS cultivation enhances human labour employment by 16.9 per cent and its cost of cultivation is also lower by 14.2 per cent than IS farming. Although, the yield from OS was 6.79 per cent lower than the conventional crop, it is more than compensated by the price premium received and yield stability observed on OS farms. Overall, the OS farming gave 15.63 per cent higher profits than IS farms.\(^90\)

• Shiva, et al (2004) presents a cost-benefit analysis of rice and wheat in organic and chemical farming practices, the results of a study undertaken
in 2002. “The studies showed that net profits were higher in the organic farming system as compared to chemical farming”.

- According to Scialabba E., Hattam (2002) and Eyhorn (2007) organic agriculture reduces the vulnerability of the farmers to climate change and variability. First, organic agriculture comprises highly diverse farming systems and thus increases the diversity of income sources and the flexibility to cope with adverse effects of climate change and variability, such as changed rainfall patterns. This leads to higher economic and ecological stability through optimized ecological balance and risk-spreading. Second, organic agriculture is a low-risk farming strategy with reduced input costs and, therefore, lower risks with partial or total crop failure due to extreme weather events or changed conditions in the wake of climate change and variability.

- Badgley C. and Perfecto I. (2007) expressed their views on many studies indicate that higher organic profits are made despite higher costs of production and somewhat lower yields because of the price premium. USDA data indicate that organic soybean producers earn higher profits even in years when yields are slightly lower largely because of the higher market prices received for organic food-grade soybeans.

- Welsh (1999) reported that organic farmers are more profitable in the drier states of the United States, like due to their superior drought performance.

- Fliessbach et al. (2009) showed that organic agriculture helps farmers achieve economic independence and financial stability by reducing reliance on external inputs prices of which are beyond farmers’ control and by ensuring that one or some crops on the farm will survive even in case of a pest attack or climatic stress. Instead of chemical inputs, organic farmers use recycled waste, nitrogen-fixing plants, improved cropping systems and landscapes, and integrated crop and animal farming systems, over which they have some control.

- Mader et al. (2002) indicted that organic agriculture promotes the use of home-grown fertilizers produced by livestock or other sources, which are less expensive than agrochemicals. Furthermore, because they are
produced on-site, these inputs do not require financing and up-front cash for their purchase. In this way, farmers are able to increase their profit margins, reduce dependence on outside suppliers and avoid financial risk by eliminating the need to rely on high-interest loans. Moreover, locally produced, non-synthetic inputs improve organic matter in the soil, which helps maintain soil fertility and enhances long-term productivity ensuring sustainable income over the long term.

- Badgley C. and Perfecto I. (2007) assessed that the few existing studies on the economics of organic farming show that organic farming can be profitable and profitable farms enhance local economies (both rural and urban), not only through the increased income of the farmer but through increased job opportunities.95

- The new research of American Society of Agronomy (2011) shows the analysis of 18 years of crop yield and farm management data from a long-term University of Minnesota trial, an organic crop rotation was consistently more profitable and carried less risk of low returns than conventional corn and soybean production, even when organic prime premiums were cut by half.96

2.4.7. Economic Benefits:

- Cacek (1984) reported that crop diversity in organic farms can have other economic benefits as diversity provides some protection from adverse price changes in a single commodity.97

- Dahama (2003) states that the economic value of an organic waste or residue to farmers is the value of the increase in crop yield and crop quality that is derived from its use.98

- Brenner (1991) said that if environmental balance is maintained such that crops, trees, animals and man can live more harmoniously. Reducing the use of pesticide can provide the growers with direct economic benefits by decreasing the cost of inputs, thereby increasing net returns.

- Suresh and Kunnal (2004) indicated that in organic farm average cost of cultivation per acre of paddy was lower only marginally, the net return
increased by over 40 percent suggesting that a properly planed organic farming is beneficial not only from environmental point of view but also from economic margin.\textsuperscript{99}

Nepal Singh (2012), a farmer from Southern Haryana "I Say Organic is giving us better rates for our produce, and clearly labels it, making it far more worthwhile to farm organically".\textsuperscript{100}

Pratap (2012) the nationwide survey of conventional farmers showed, that the continuing rising costs of agricultural inputs and degradation of natural resources, farming increasingly unprofitable. Farmers are seeking new ways to increase farm income. While income considerations are predominant, environmental benefits, health aspects and farmers empowerment are other important factors influencing farmers shift to organic farming.\textsuperscript{101}

According to FAO (1998) the following general social benefits are associated with organic production systems:

1. The site specific nature of organic agriculture means that indigenous plant species and indigenous knowledge are important. Further, farmers may welcome a management system more aligned to their own traditions and not driven by the production paradigm (i.e. maximising yields through the use of artificial inputs).

2. Relying on local knowledge of complex interactions and variations of conditions from place to place tends not to favour large production areas. With the tendency for reduced farm size, equitable access to land may be enhanced.

3. Consistent labour requirements associated with crop diversity can provide income stability.

4. Fair trade, where buyers demonstrate a concern for social justice by buying fair trade products, is part of the ethic of organic agriculture and is in the IFOAM guidelines. Currently, fair trade does not necessarily imply
organic production, but organic produce can also be fair trade certified. Organic certification does consider reasonable wage conditions in the standards, but it is not clear if organic is clearly aligned with fair trade principles, although it is supported.

5. Improving the situation of women in agriculture is an important issue, particularly availability of work, gender distribution of labour and positions of greater responsibility.

6. Using local inputs can potentially bring benefits to the community through stimulating the local economy and reducing the need to purchase external inputs on credit.\textsuperscript{102}

- Save and Sanghavi (1995) observed that after their intensive experiments with organic farming and narrating the results to the informed, it is time that the governments and farmers are brought around. They firmly state that the economic profitability of organic farming can be proved. Four crops of banana grown by the natural way on the same farm by them are compared with those produced by the conventional way. While the natural farm yielded 18 kg of banana in the first round, the conventional one gave 25 kg. 30 kg was the yield at the second round on both the farms. However, on the third round, the natural farm gave 25 kg, the conventional one yielded only 20 kg. The results on the fourth round were stunning - the plants on the conventional farm died out; but the natural ones gave 15 kg on an average. Thus, the aggregate output was 88 kg on the natural farm and 75 kg on the conventional one.\textsuperscript{103}

2.4.8. Food Security and Stability:

- Badgley et al., (2007) pointed out that organic farming has now been tagged not only for minimizing externalities but also for its cost effectiveness. Organic methods have potential to produce enough food to sustain current human population and an even a larger population without increasing the agricultural land area while reducing the detrimental effects of conventional agriculture.\textsuperscript{104}

- Howard (1945) mentioned that the birthright of all living things is health. This law is true for soil, plant, animal and man: the health of these four is
one connected chain. Any weakness or defect in the health of any earlier link in the chain is carried on to the next and succeeding links, until it reaches the last, namely, man.

- The widespread vegetable and animal pests and diseases, which are such a bane to modern agriculture, are evidence of a great failure of health in the second (plant) and third (animal) links of the chain. The impaired health of human populations (the fourth link) in modern civilised countries is a consequence of this failure in the second and third links.

- This general failure in the last three links is to be attributed to failure in the first link, the soil: the undernourishment of the soil is at the root of all. The failure to maintain a healthy agriculture has largely cancelled out all the advantages we have gained from improvements in hygiene, in housing, and medical discoveries.

- To retrace our steps is not really difficult once we set our minds to the problem. If we are willing to conform to natural law, we shall rapidly reap the reward not only in a flourishing agriculture, but in the immense asset of an abounding health in ourselves and in our children’s children.\(^{105}\)

- Soil Association (2002) shows comparison of the quality of foods from different agricultural systems must begin with a foundation of food safety, given its prominence in the public perception of organic food.

  59 Percent – no chemicals/additives/pesticides
  47 Percent – natural
  41 Percent – healthy
  37 Percent – expensive
  35 Percent – good for the environment
  35 Percent – GM free\(^ {106}\)

- Rani, Anjugam and Muralidharan (2013) indicate that the adoption of organic agricultural production system which is supportive to preventive public health and achievement of sustainable development has become essential. This will enable to meet huge food demand and have toxin- free agricultural produce.\(^ {107}\)
• Rundgren (2002) provides a balanced analysis of organic farming and its potential contribution to food security. The key points from this analysis are outlined below:

1. Increased productivity, particularly in areas prone to food shortages.
2. Safe food that supports a varied diet.
3. Increased income or return on labour.
4. Reduced costs of production.
5. Risk reduction through diversification.
6. Increased awareness of the need for sustainable production and consumption and the need to protect the environment.
7. Supports innovation and recognises and integrates of traditional and indigenous knowledge.
8. Long term sustainability.

• Amir Khan (2012, The Hindu) reported that nutritious food contributes to our physical and mental growth, our well-being, our ability to fight diseases, etc. But if we consume large amounts of pesticide along with our food, then along with nutrition we are also consuming poison, and that defeats the very purpose of eating the food in the first place.

• FiBL and IFOAM (2012) highlighted the two major publications in 2011 from the United Nations Conference on Trade and Development (UNCTAD) and UN special reporter on food supported the view that organic agriculture is a good farming system and development concept for achieving sustainability in agriculture.

• Kirchmann et al., (2007) mentioned that organic farms recycle only on-farm waste and approved food waste, it has been claimed that instead of promoting nutrient cycling, organic farming may prohibit adaptation of other more effective solutions for nutrient use in agricultural systems.

• Smallwood (2011) said that “America’s farming techniques affect the health of our families, our communities, and our planet. The Farming
Systems Trial shows that organic farming is the healthiest and safest way to feed the world, provide much-needed jobs, reduce our greenhouse gas emissions and protect precious natural resources.\textsuperscript{111}

- Kihlberg \textit{et al.}, (2006) expressed his views that wheat grown in organic and conventional experimental fields was milled and baked for sensory evaluation for over 2 years. The differences between years dominated differences between farming systems, except that bread made from conventional flour had significantly higher elasticity and moistness.\textsuperscript{112}

- UNDP and UNCTAD (2008) issued a report which stated that “organic agriculture can be more conducive to food security in Africa than most conventional production systems, and that it is more likely to be sustainable in the long-term”. The report assessed 114 projects in 24 African countries, finding that “yields had more than doubled where organic or near-organic practices had been used” and that soil fertility and drought resistance improved.\textsuperscript{113}

- UN Food and Agriculture Organisation (2000) summarised that ‘It has been demonstrated that organically produced foods have lower levels of pesticide and veterinary drug residues and, in many cases, lower nitrate contents’.\textsuperscript{114}

- Eyhorn (2007) indicates that organic agriculture is not only a specific agricultural production system, it is also a systemic and encompassing approach to sustainable livelihoods in general, where due account is given to relevant factors of influence for sustainable development and vulnerability, be this on physical, economic, or socio-cultural levels.

- Avery (2007) assessed that Canada reveals the more than half think organic food is more nutritious; two-thirds believe organic food is safer than conventionally grown food; and 9 out of 10 believe organic fruits and vegetables are grown without pesticides of any kind.\textsuperscript{115}

- Edward-Jones and Howells (2001) showed that organic farming shares the fundamental objectives of agricultural sustainability and is deserved to be assessed as a mainstream part of sustainable agriculture.\textsuperscript{116}
According to World Commission on Environment and Development (WCED-1987), some have considered organic farming and sustainable agriculture synonymous, because they are both based on sustainability of agro-ecological systems. Sustainability can be defined as meeting the need of the present without compromising the ability of future generations.\textsuperscript{117}

Wilcox C. (2011) urged that when the Soil Association, a major organic accreditation body in the UK, asked consumers why they buy organic food, 95 percent of them said their top reason was to avoid pesticides. They, like many people, believe that organic farming involves little to no pesticide use.\textsuperscript{118}

Zundel et al (2007) showed that organic agriculture offers a unique combination of environmentally-sound practices with low external inputs while contributing to food availability.\textsuperscript{119}

UNEP-UNCTAD (2008) analysed that organic agriculture is a sustainable and environmentally friendly production method, which has particular advantages for small-scale farmers in developing countries. Practical experiences, a large number of reports, and outcomes of many intergovernmental meetings have highlighted the trade and sustainable development opportunities offered by organic agriculture for developing country farmers, particularly smallholders. Organic agriculture contributes to poverty alleviation and food security with a combination of many features, most notably by: Increasing yields in low-input areas over time; Conserving biodiversity and nature resources on the farm and in the surrounding area; Increasing net income and/or reducing costs of externally purchased inputs Producing safe and varied food; and Being sustainable in the long term.\textsuperscript{120}

Woodward (1996) indicates that can organic agriculture feed the world? In answer to this question, one may ask, is conventional agriculture successfully feeding the world? Even the high-input– high-yielding systems are currently failing to feed the world, not because of problems with productivity, but because of problems with food distribution, social organization and serious concerns for poverty, racism and gender.\textsuperscript{121}
According to Woodward (1995), Vasilikiotis (2000), Leu (2004), Tudge (2005), Badgley and Perfecto (2007), there are recent claims that sufficient food can be produced by organic agriculture, expressed in terms such as ‘organic agriculture can feed the world’. The following three arguments have been put forward:

i) Lower production of most crops can be compensated for by increased production of legumes, in particular of grain legumes, while a change to a diet based mainly on vegetables and legumes will provide enough food for all (Woodward, 1995).

ii) Realities in developing countries must be taken into account: ‘Increased food supply does not automatically mean increased food security for all. Poor and hungry people need low-cost and readily available technologies and practices to increase food production’ (Pretty et al., 2003).

iii) ‘Organic agriculture can get the food to the people who need it and is therefore the quickest, most efficient, most cost-effective and fairest way to feed the world’ (Leu, 2004).

These arguments confuse the original scientific question with other realities interacting with food sufficiency, such as change in dietary composition, poverty, finance, markets, distribution system, etc. However, the basic scientific question remains and requires a stringent review and evaluation of the production potential of organic and conventional systems.

2.4.9. Impact on Health and Environment:

Cacek et al., (2009) has pointed out that organic farming benefits the society substantially by reducing pollution and conserving energy, soil nutrients, fish, wildlife and insuring the supply of food for the future generations. However, virtually no credible data are available to policymakers on the magnitude of these benefits; they are unable to compare organic farming with other policy alternatives. In areas where organic farming is known to be economically feasible, policy barriers to
conversion should be identified, evaluated and addressed. Organic farming is an attractive alternative for both farmers and policymakers.\textsuperscript{123}

- Mahendra Dev and Painuly (1994) showed that new bio-chemical technology in agriculture, however, has many negative impacts on the environment. There has been a significant increase in the use of chemicals like fertilizers and pesticides since the 1960s. There is enough cause for worry on the environmental consequences of these chemicals. Particularly in the 1980s, it was realized that for the sustainable development, alternative farming practices are needed.\textsuperscript{124}

- Ramesh \textit{et al.}, (2005) studied that the major factors that lead to growing interest in the alternative forms of agriculture in the world are: increasing consciousness about conservation of environment as well as health hazards associated with agrochemicals, and consumers’ preference to safe and hazard-free food. Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment. The demand for organic food is increasing steadily in both the developed and developing countries at an annual average growth rate of 20-25 percent.\textsuperscript{125}

- According to Lampkin (1990), organic farming will help in environmental protection, conservation of renewable resources, improved food quality and orientation of agriculture towards the areas of market demand.\textsuperscript{126}

- Woranoot (2009) indicates that organic agriculture which comprises of various valuable principles and values of health, ecology, care and fairness in its movement is an interesting tool for rural development. With the high prices and growing market trend, organic farming has been in the spotlight of policymakers as well as developmental organizations that hope to use organic farming as a tool to deliver benefits to people involving in agriculture.

- USDA Organic (2011) stated that organic is a labelling term that indicates that the food or other agricultural product has been produced through approved methods. These methods integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological
balance, and conserve biodiversity. Synthetic fertilizers, sewage sludge, irradiation, and genetic engineering may not be used.

- Pillai M. (2011) motioned that a type of farming that restricts the use of chemical fertilizers and chemical pesticides and relies more on crop rotation and green manure is known as organic farming. In Europe, organic farming is known as ecological agriculture. Organic farming helps to sustain the mineral resources of the soil and prevent soil pollution through chemical contamination.

- Bhattacharya and Chakrabortty (2005) indicated that a very valid and relevant reason for advocating organic farming practices is the adverse effects on human health and environment engendered by the inorganic farming practices.

- Banerjee G. and Banerji S. (2010) conclude that modern production technology has proved its un-sustainability. The green revaluation cannot go with the environmentally sound and sustainable system of farming. One may have to explore several alternatives for sustaining production without sacrificing environment and ecology. One of the alternatives is organic farming.

- Guruswamy and Balanaga (2010) conclude that organic farming is found to be superior than conventional farming method on account of increased human labour employment, lower cost of cultivation, higher profits, better input use efficiency and reduced risk leading to increased income, enhanced self reliance and livelihood security of the farmers. Further organic farming has positive impact on soil, human health improvement, conservation and water use efficiency demonstrating substantial potential for sustenance of soil and water resources.

- According to Scottish Agricultural College (2005), organic farming is not only about managing the soil – plant environmental interaction in a holistic manner – it also has food quality, human health, animal welfare and socio-economic aims. As a result of these principles and philosophies, organic food has a strong brand image in the eyes of the health, environment and socially conscious consumer. Organic agriculture
is therefore, is not only driven by farmers’ philosophical approaches to agriculture, but is also drawn by consumer demand.\textsuperscript{130}

- Robertson \textit{et al}, (2000) published a study on global warming potential (GWP) of a range of agricultural production systems showed conventional tillage to contribute significantly to global warming. Organic farming systems, while performing better than conventional, had a much higher global warming potential (GWP) than no till systems.\textsuperscript{131}

- Henning \textit{et al}. (1991) mentioned that organic farming is both a philosophy and a system of farming, grounded in values that reflect an awareness of ecological and social realities and the ability of the individual to take effective actions. In practice, it is designed to work with natural processes to conserve resources, encourage self-regulation through diversity, to minimize waste and environmental impacts, while preserving farm profitability.\textsuperscript{132}

- Lampkin (1997) analysed that the aim of organic farming is: “to create integrated, humane, environmentally and economically sustainable production systems, which maximize reliance on farm-derived renewable resources and the management of ecological and biological processes and interactions, so as to provide acceptable levels of crop, livestock and human nutrition, protection from pests and disease, and an appropriate return to the human and other resources”.\textsuperscript{133}

- Scialabba and Hattam (2002) provide a good summary of the environmental benefits of organic agriculture:

1. Soil:

   Organic matter content is usually higher in organically-managed soils, indicating higher fertility and stability of organic soils as well as moisture retention capacity, which reduce the risk of erosion and desertification. Organically-farmed soils have significantly higher biological activity and a higher total mass of micro-organisms, making for more rapid nutrients recycling and improved soil structure. While the proportion of soluble nutrient fractions is lower on organically managed soils, there is no decrease in organic yields since higher biological activity and higher mycorrhizal root colonization counteract nutrient deficiency.
2. Water:
Organic agriculture poses no risk of ground and surface water pollution through synthetic pesticides. Nitrate leaching rates per hectare are significantly lower in organic agriculture compared to conventional systems.

3. Air:
Organic agriculture enables ecosystems to better adjust to the effects of climate change and has a major potential for reducing agricultural greenhouse gas emissions. Organic agricultural strategies, by recycling organic matter and tightening internal nutrient cycles, contribute to carbon sequestration.

4. Energy:
Organic agriculture performs better than conventional agriculture on a per hectare scale, both with respect to direct energy consumption (fuel and oil) and indirect consumption (synthetic fertilizers and pesticides). Efficiency of energy use of organic farms is high.

5. Biodiversity:
Agriculture genetic resources, including also insects and micro-organisms, have all been shown to increase when land is farmed organically. Wild flora and fauna within and around organic farms are more diverse and abundant than in conventional or integrated agriculture.

6. Ecological services:
Organic agriculture offers vast food resources and shelter for beneficial arthropods and birds, thus contributing to natural pest control. Organic agriculture contributes to the conservation and survival of pollinators, thanks to the banning of synthetic chemical pesticides and herbicides and the enhanced ecosystem diversity.

7. Landscape:
Organic agriculture systems create diversified landscapes, which contributes to functional diversity and aesthetical values. The establishment of semi-natural habitats within organic systems and the avoidance of pesticide use contribute to maintaining the biological connectivity and the larger ecological web, which benefit both agriculture
and nature conservation. It can therefore be reasonably concluded that (well managed) organic agricultural systems provide better environmental benefits (or less environmental harm) in most respects, when compared with conventional farming systems. Organic systems can counteract resource depletion (soil, water, energy, nutrients), contribute positively to climate change and can help to maintain and enhance biodiversity.\textsuperscript{134}

- Stolze et al., (2000) studies indicated that lower CO2 and NH3 emissions resulting from organic farming when evaluated on a per-hectare basis, but research results vary when related to the output, often being higher than in conventional systems.\textsuperscript{135}

- Adil M. (2002, The Economic Times) said that every year, millions of tonnes of fertilizers are dumped into the biosphere, polluting natural resources and endangering consumers with residual chemicals. For India, organic farming seems to be a very easy solution for solving two problems like preserving the regenerative capacity of the earth, and gaining access to international markets for exports of organic products.\textsuperscript{136}

- Rawat (2013) highlights the survey undertaken by Associated Chambers of Commerce and Industry of India (ASSOCHAM) the survey showed that there has been a major shift in for organic products, especially fruit and vegetables in the cities as about 62 percent of metropolitans buy organic, an increase of 95 percent in the last 5 years, the report on "Rising demand of organic products in Metropolitan cities" is based on a survey done on 1,500 lead retailers selling non-organic and organic products. In the survey, about 1,000 retailers cited that health and environment grounds are the main reasons for purchasing organic products by customer. The spending pattern on organic products jumps three folds in the last 5 years.\textsuperscript{137}

- Sally M. (2013, The Economic Times) indicates that rising awareness of healthy food apart from increase in disposable income has ensured that nearly 62 percent of households in the upper end segment prefer to have organic products.\textsuperscript{138}
• Lowenstein (2012, Business Line) said that organic farming can provide food security and feed the world. Further he said that India could show the way in organic products in 30 years, especially in sustainable agriculture and food safety.\textsuperscript{139}

• Altieri and Nicholls (2004), IFOAM (2008) and Watson et al., (2008) examined that environmental awakening was largely a consequence of the agrochemical efficiency era, when the adverse impacts such as deteriorating quality of cultivated soils, erosion, pollution of both the groundwater and watercourses and coastal seas with concomitant changes in the terrestrial and aquatic ecosystems, became evident both within and outside the agro ecosystems. This created social pressure to reduce environmental impact by promoting organic production that relies on nature benign agricultural practices. The aim is to secure ecosystem health by preserving soil fertility through conservative soil management practices, intercropping, cover crops, mulching, flaming, reduced tilling and crop rotation. These measures are also essential for the control of weeds as the use of chemical herbicides is banned. Pests are controlled biologically with predator insects.\textsuperscript{140}

• According to Pollan (2006) organic production was an early solution to the environmental disbenefits of food production. With the focus on the environment, it has not met with the demands for productivity globally and by all production organisms. Another emerging problem can be traced back to the consumers ‘keen interest in organic products. This has created business opportunities to provide niche products with high premium and profits for the agrifood corporations. Consequently, organic products have become increasingly part of the mainstream global food trade where production is controlled by the large agrifood corporations.\textsuperscript{141}

• IFOAM (2007) highlighted that the main concern of the proponents of organic production deals with environmental issues. Organic production means fewer or no synthetic agrochemicals, cleaner waters supplies, better soils.\textsuperscript{142}

• Ramesh, Panwar and Rao (2010) indicating that growing awareness of health and environmental issues associated with the intensive use of
chemical inputs has led to interest in alternate forms of agriculture in the world. Organic agriculture is one among the broad spectrum of production methods that are supportive of the environment.¹⁴³

- Lockeretz *et al.*, (1981) presented a research paper that found organic farms to be highly efficient and economically competitive while using less fossil energy and suffering less soil erosion than neighbouring conventional farms.¹⁴⁴

- Lockeretz and Madden (1987) observed that the public’s concern regarding the environmental and food safety implications of agricultural chemicals was paralleled by growing concern among farmers regarding their effects on their own health and that of their families and livestock. This concern was an important reason for farmers to convert to organic farming.¹⁴⁵

- Veeresh (1999) opines that both high technology and sustainable environment cannot go together. Organic farming is conceived as one of the alternatives to conventional agriculture in order to sustain production without seriously harming the environment and ecology. However, he says that in different countries organic farming is perceived differently. While in the advanced countries, its focus is on prevention of chemical contamination, we, in countries like India are concerned of the low soil productivity. Even the capacity to absorb fertilizers depends on the organic content of the soil. The principles of organic farming are more scientific than those of the conventional. India's productivity of many crops is the lowest in the world in spite of the increase in the conventional input use. The decline in soil nutrients, particularly in areas where the chemical inputs are increasingly being used in the absence of adequate organic matter is cited as a reason for low productivity.¹⁴⁶

- Smallwood (2012) showed that report which was published by the Rodale Institute in 1981 on 30 years study that comparison of organic and conventional farming methods found that organic farming is the "healthiest and safest way to feed the world, provide much-needed jobs, reduce our greenhouse gas emissions and protect precious natural resources. Following are some of the most important findings of the study:
• Organic farming yields matched or surpassed conventional yields.

• In years of drought, organic yields outperformed conventional ones. In fact, organic corn yields were 31 percent higher than conventional ones during droughts.

• Organic farming uses 45 percent less energy.

• Organic farming is more sustainable because its methods build rather than deplete soil organic matter. Soil health increased in the organic systems studied but remained unchanged in conventional ones.

• Conventional agricultural systems produce 40 percent more greenhouse gases.

• Organic farming was nearly three times more profitable than conventional farming. Between 2008 and 2010 the economic data collected showed that an average net return per acre per year for organic systems of $558 compared to $190 for conventional ones. This amount reflects, in part, the increased demand for organically grown food and subsequently higher cost to consumers.¹⁴⁷

Therefore, the institute has announced that organic farming can not only feed the world but can improve health.

• Pimentel et al. (2005) showed that heavy agricultural reliance on synthetic chemical fertilizers and pesticides is having serious impacts on public health and the environment. The estimated environmental and health care costs of pesticide use at recommended levels in the United States run about $12 billion every year.¹⁴⁸

• According to the U.S. Department of Health and Human Services President’s Cancer Panel report (2010), exposure to chemicals commonly used in non-organic agriculture has been linked to many types of cancer including those affecting the brain, breast, colon, lung, ovarian, pancreas,
kidney, testicles, and stomach, as well as cancer of the central nervous system.\textsuperscript{149}

- Parr et al. (1992) indicated that the capability of soil to produce safe and nutritious crops in a sustained manner over the long-term, and to enhance human and animal health, without impairing the natural resource base or harming the environment.\textsuperscript{150}

- Doran and Parkin (1994) indicated that the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health.\textsuperscript{151}

- According to Miller and Wali (1995), Warkentin (1995), since soil quality emphasizes maintenance or improvement in the natural resource base, it has become an integral component of sustainable agriculture.\textsuperscript{152}

- Hewlett and Melchett (2008) indicate that organic agriculture has capacity to reduce energy inputs and to feed the rural and urban poor. They also suggests that organic farming can offer a solution to many of the current failures of non-organic farming, such as dependence on high-energy use, high levels of greenhouse gas emissions, and widespread pollution.

- Azeez (2009) indicates the study by United Kingdom Soil Association found that average organic farming practices removed about 2,200 kg of CO\textsubscript{2} per hectare per year.\textsuperscript{153}

- According to Organic Farming Research Foundation (2012), if the nation is to have a sustainable food supply well into the future, organic farming must become the leading form of agriculture. The demonstrated benefits to soil and water, organic farming has proven benefits to human health, to the nation’s economic prosperity and to the health of the planet. A review of the research finds:
  - Organic Farming Improves Soil and Water Quality
  - Organic Farming Enhances Biodiversity and Pollinator Health
  - Organic Farming Sequesters More Carbon, Slowing Climate Change
  - Organic Farming Reduces Toxic Chemical Exposure
2.4.10. Soil Fertility:

“A nation that destroys its soil destroys itself.”
- Franklin Roosevelt (U.S. President, 1937)

People in cites may forget the soil for as long as a hundred years, but mother nature’s memory is long and she will not let them forget indefinitely. The soil is the mother of man, and if we forget her, life eventually weakens.

-Henry A. Wallace (Secretary of Agriculture, 1936)

- According to Palekar (2007) conventional farming is more dangerous than organic farming and conventional farming is more exploiters of farmers’ economy and soil fertility than organic farming.\(^{155}\)

- Cardelli et al., (2004) states that organic farming system emphasis on the use of organic matter for enhancing soil properties, minimizing food chain associated health hazards and attaining closed nutrient cycles, the key factors for sustainable agriculture.\(^{156}\)

- Escobar and Hue (2007) observed that the successive improvement in soil quality in organic farming constitutes an important hidden benefit as it helps reducing cost of future fertilizer needs.\(^{157}\)

- Satalkar B. (2011) stated that organic farming is a technique used in farming without the use of any chemicals or synthetics. Aim of organic farming is to produce crops which have the highest nutritional values with least impact on nature. Crop rotation, green manure, use of natural fertilizers and biological pest control form the crux of organic farming. It
is a proactive ecology management strategy. This strategy enhances the fertility of the soil, prevents soil erosion and at the same time protects the humans and animal kingdom from the side-effects of chemicals and synthetics.

- Jay D, Vilas P and Alka Najan (2010) showed that organic fruits and vegetables contain more antioxidants and have higher nutrient levels than conventional produce. Because the soil quality is greater, organic farms are yielding healthier, brighter, testier crops.**

- Reddy S. (2010) highlights that the major reasons for shift towards organic farming include sustained soil fertility reduced cost of cultivation, higher quality of produce, sustained yields, easy availability of farm inputs and reduced attacks of pest and diseases.***

- According to Babalad and Hanchinal (2012), organic system showed greater soil health benefits, reduced cost of production, found better than inorganic practices and enhanced profit margins with quality food. They also indicate the research evidence from Rodale Institute showed greater organic matter content in the soil which resulted in improved performance of maize and soybean in organic system as better during drought years than by conventional system. The organic animal and legume based systems retained more carbon in soil resulting in annual soil carbon increase of 981 and 574 kg per ha respectively compared to 293 kg per ha in conventional system. In maize production, the inputs of energy 28 percent and 32 percent less for the organic animal and legume production systems respectively than conventional systems.****

- Stolze et al. (2000) showed 20 comparison trials on-farm investigations, organically managed soils usually have higher total contents of soil organic matter and significantly higher biological activity than those farmed conventionally.*****

- Hanchinal (2011, Times of India) said that "organic farming will help farmers in improving soil fertility and health of agro-ecosystem. It requires less financial inputs and can be practised by using the available natural resources".******
• Funtilana (1990) said that for sustaining the productivity of the crop, maintaining the soil health and healthy ecosystem, there is need for adoption of an alternative farming system, may be the organic farming.  

• Rodale Institute (2011) after 30 years of a rigorous side-by-side comparison, the institute confidently concludes that organic methods are improving the quality of our food, the health of our soils and water, and the conditions of our nation’s rural areas. Organic agriculture creates more jobs, provides a liveable income for farmers, and can restore America’s confidence in our farming community and food system.

• According to Lampkin (1999), the term “organic” 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 matter, microorganisms, insects, plants, animals, human interact to create coherent. Self regulating and stable whole reliance on external inputs whether chemical or organic is reduced as far as possible organic farming is holistic production system.

• Rahudkar and Phate (1992) viewed the experiences of organic farming in Maharashtra. Individual farmers growing sugarcane and grapes, after using vermin-compost, saw the soil fertility increased, irrigation decreased by 45 percent and sugarcane quality improved. Thus, the net profits from both the sugarcane and grape crops are high in organic farms.

• According to UNEP-UNCTAD (2008), organic agriculture aims at a sustainable production system based on natural processes. Key characteristics are that organic agriculture relies primarily on local, renewable resources makes efficient use of solar energy and the production potential of biological systems, maintains and improves the fertility of the soil, maximizes recirculation of plant nutrients and organic matter, does not use organisms or substances foreign to nature (e.g. GMOs, chemical fertilizers or pesticides), maintains diversity in the production system as well as the agricultural landscape and gives farm animals’ life conditions that correspond to their ecological role and allow them a natural behaviour.
• According to Otutumi et al., (2004), several lines of evidence have shown that organic farming can improve soil quality.\textsuperscript{168}

• Lichtfouse E. (2009) analysed that starving people in poor nations, ill and fat people in rich nations, increasing food prices, climate changes, increasing fuel and transportation costs, flaws of the global market, worldwide pesticide pollution, pest adaptation and resistance, loss of soil fertility and organic carbon, soil erosion, decreasing biodiversity, and desertification are current acute problems that threatens our planet.\textsuperscript{169}

• According to Pimentel D., Hepperly P., Hanson J., Douds D., and Seidel R. (2005) various organic technologies have been utilized for about 6000 years to make agriculture sustainable while conserving soil, water, energy, and biological resources. Among the benefits of organic technologies are higher soil organic matter and nitrogen, lower fossil energy inputs, yields similar to those of conventional systems, and conservation of soil moisture and water resources (especially advantageous under drought conditions). Conventional agriculture can be made more sustainable and ecologically sound by adopting traditional organic farming technologies. The following are some of the benefits of organic technologies identified in this investigation:

- Soil organic matter (soil carbon) and nitrogen were higher in the organic farming systems, providing many benefits to the overall sustainability of organic agriculture.

- Although higher soil organic matter and nitrogen levels were identified for the organic systems, similar rates of nitrate leaching were found to those in conventional corn and soybean production.

- The high levels of soil organic matter helped conserve soil and water resources and proved beneficial during drought years.

- Fossil energy inputs for organic crop production were about 30% lower than for conventionally produced corn.
- Depending on the crop, soil, and weather conditions, organically managed crop yields on a per-ha basis can equal those from conventional agriculture, although it is likely that organic cash crops cannot be grown as frequently over time because of the dependence on cultural practices to supply nutrients and control pests.

- Although labour inputs average about 15 percent higher in organic farming systems (ranging from 7 percent to 75 percent higher), they are more evenly distributed over the year in organic farming systems than in conventional production systems.

- Because organic foods frequently bring higher prices in the marketplace, the net economic return per ha is often equal to or higher than that of conventionally produced crops.

- Crop rotations and cover cropping typical of organic agriculture reduce soil erosion, pest problems, and pesticide use.

- The recycling of livestock wastes reduces pollution while benefiting organic agriculture.

- Abundant biomass both above and below the ground (soil organic matter) also increases biodiversity, which helps in the biological control of pests and increases crop pollination by insects.

- Traditional organic farming technologies may be adopted in conventional agriculture to make it more sustainable and ecologically sound.

- Aher, Swami and Sengupta (2012) recent research concluded that organic farming is better equipped to feed us now and well into the ever changing future. As organic yields match conventional yields, organic outperforms conventional in years of drought, organic farming uses 45 percent less energy and is more efficient, conventional systems produce 40 percent more greenhouse gases, organic farming systems are more profitable than conventional and most important organic farming systems build rather than deplete soil organic matter which supports the soil micro, meso and macro fauna and makes the soil a living body; making it a more sustainable system. Organic agriculture offers a
unique combination of environmentally-sound practices with low external inputs while contributing to food availability.

More inorganic fertilizers consumption is a good indication of agricultural productivity but depletion of soil fertility is commonly observed in soils. This continuous and massive application of the agrochemicals causing degradation of environment in terms of reduction in soil fertility, water pollution and indirectly significant contribution to the global warming, climate change and ozone layer depletion.\textsuperscript{171}

- According to Snapp et al. (2010) and Kong et al. (2007), organic practices of using crop rotations and biological sources of fertilizer build soil organic matter which holds both water and nutrients in the soil. Excessive tillage and the use of synthetic materials including fertilizers, pesticides, and fumigants destroy soil structure and interfere with microbial and root exudates that help hold soil particles together. Additionally, use of synthetic nitrogen fertilizers has been implicated in reducing the amount of organic carbon and nitrogen that is sequestered by the soil.\textsuperscript{172}

- Organic Farming Research Foundation’s (2012) scientific literature shows that organic farming practices build soil quality, maintain water quality, support biodiversity, and have potential to mitigate global climate change while supporting an economic bright spot. It’s easy to see that organic farming practices are good for human health, economic prosperity, the environment and for slowing climate change. Healthy soil, which organic farming enhances, is the basis of a healthy nation.\textsuperscript{173}

- NRC (1993) and USDA-NRCS (1996) showed that traditional agricultural practices have had enormous direct and indirect consequences on productivity, profitability, and environmental quality throughout America. Organic farming increases the number of jobs in the agricultural sector, increases agricultural profitability, improves the health of soil and water, and reduces damage from global climate change. The many benefits of organic farming are important to multiple sectors of society: farming, business, major employers, government policy makers, health professionals, universities, municipal governments, environmental advocates, and individuals.
• Morgera E., Caro C. and Durán G. (2012) assert that Soil erosion is a main cause of loss of yield capacity and fertility. Long-term comparisons between conventional and organic farms have found that organic methods improve the fertility and overall health of the soil. Organically managed soils also demonstrate better moisture-retention capacity than those of conventional farms, which is important in arid climates and to reduce the risk of desertification. Soil conservation is therefore one of the key concepts in organic agriculture.174

• Government of India (2001), Organic farming prohibits the use of harmful chemicals and promotes the use of renewable organic resources to maintain the soil productivity and to control the crop diseases and pests.175

• Lockeretz W. (2007) asserts that organic production methods are described as management practices that seek to nurture ecosystems and achieve sustainable productivity by maintaining and enhancing soil fertility, recycling plant nutrients for fertilization, using biological and mechanical controls and removal of pest and disease management; and basing livestock husbandry on a harmonious relationship between land, plants and livestock and on the respect for physiological and behavioural needs of livestock.176

2.4.11. Organic Certifications:

• Santacoloma (2007) argues that farmers in developing and transition countries still face institutional and economic constraints to reach the stage of being certified organic producers, making it particularly costly for smallholders to participate in this market.177

• According to Twarog (2006), organic agricultural products can be divided into two categories: uncertified and certified. Uncertified organic goods are produced organically but are not certified as organic by a certification body. On the other hand, products checked and certified as organic are produced and processed by using organic methods in accordance with organic standards. In order to notice consumers, the standard label will be shown on the package of certified products which are more expensive than conventional agricultural produces.
- Giovannucci (2006) stated that organic certifications and inspection systems were established to ensure that the process of cultivation, e.g. using pesticides and fertilizers, crop protection, is free from contaminants or synthetic chemicals that may harm the health of ecology, producers, consumers and all parties involved.

- Setboonsarng (2006) indicates that the organic certification systems can be classified into three types depending on the size of markets: first-party, second-party and third-party certification. In the context of today’s global trade, however, the third-party certification, by public or private certifiers, is required before a product can be labelled as organic and sold globally, thus this type of certification is an efficient tool for organic agricultural development.

- EC (2007) and IFOAM (2008) observed that organic production is strictly regulated by national and international laws. Requirements vary from country to country, but generally involve a set of production standards for farming and processing that include avoidance of synthetic chemical fertilizers, pesticides, antibiotics, food additives etc., genetically modified organisms, irradiation and the use of sewage sludge, use of farmland that has been free from chemicals for a number of years, keeping detailed written audit trail, and maintaining the organic products strictly separated from other, non-certified products.

- Pandey and Singh (2012) indicate that access to certification cost involved therein and a time lag of three years (conversion stage) often constrain farmers especially small land holders in India from adopting organic farming. Organic produce needs certification to ensure that all synthetic inputs are prohibited and soil building approaches are followed. Certification authenticates organic produce for consumers and validate price margin of the product in the market. The certification process aims at converting the growing area to comply with requirements of standard within a period of 3 years. For this reason, farmers who adopt organic management need to wait for up to three years under certification procedures that requires purging of chemical residues.
2.4.12. Market for Organic Products:

- According to the Organic Trade Association (OTA 2008), organic food sales have averaged 20 percent growth per year since 1990. This growth is remarkable considering that total food sales averaged about 3 percent growth over the same period.

- ERS-USDA (2007) claims that organic food sales are becoming increasingly important in the U.S. food market with a current share of 2.5 percent of total U.S. food sales.\(^{181}\)

- Michelsen et al., (2001) examined that the lack of processing and marketing infrastructure within the organic sector is indeed considered a major obstacle to the further development of organic farming.\(^{182}\)

- Kapoor R. (2012, The Business Line) writes about the off-shore demand for organic food market is one of the major drivers of organic agriculture in India, due to relatively increased returns with lesser input costs. According to ICCOA (International Competence Centre for Organic Agriculture) estimates approx 1.5 per cent of all agricultural acreage in India is expected to be organic certified by 2012 and through its strong organic export programmer, India will hold 2.5 per cent of the global market.\(^{183}\)

- Lampkin et al. (2000) stressed that both direct producers support and public support policies are essential for the growth of the organic sector.\(^{184}\)

- According to UNEP-UNCTAD (2008), organic agriculture offers developing countries a wide range of economic, environmental, social and cultural benefits. Global markets for certified organic products have been growing rapidly over the past two decades. In 2006, sales were estimated to have reached some 30 billion Euros, a 20 percent increase over 2005, and are expected to increase to 52 billion Euros by 2012. While sales are concentrated in North America and Europe, production is global, with developing countries producing and exporting ever-increasing shares. Due to expanding markets and price premiums, recent studies in Africa, Asia
and Latin America indicate that organic farmers generally earn higher incomes than their conventional counterparts.\textsuperscript{185}

2.5 Summary:

The section first gives the detail information about how to develop ‘Youth Self Help Group Model’ at a small village; their marketing strategy and also economic benefits are achieved by the model. Therefore, the section second takes in to account views, field experiments, studies and evaluation of organic farming by agricultural universities, researchers, scientists, agronomist, environmentalist, and different national and international organizations.
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