

COMPARATIVE STUDY OF ORGANIC AGRICULTURE AND CONVENTIONAL AGRICULTURE

Ankita Yadav*

ABSTRACT

Agriculture is the backbone of human society and it is essential for the survival of human beings. At present there are two main forms of agriculture that are practiced around the World namely, conventional farming and organic farming. As the population is increasing the demand for food is also increasing and traditional agriculture is unable to meet the demand for healthy food. Due to this, the farmers are shifting from conventional farming to the concept of organic farming. Organic farming which is also known as ecological farming is an agricultural system that uses fertilizers of organic origin such as compost manure, green manure and bone meal and places emphasis on techniques such as crop rotation and companion planting. It originated early in the 20th century in reaction to rapidly changing farming practices. Organic farming can be beneficial on biodiversity and environmental protection at local level but it has lower yields compared to conventional farming. As compared to chemical and fertilizer utilised products, organic products are more nutritious for health. On the other hand conventional farming uses synthetic chemical fertilizers, pesticides for maximizing the yield of a crop. This form of agriculture causes increased greenhouse gas emissions, soil erosion, water pollution and also negative effect on human health. The main focus of this paper is to provide an overview and comparison of the organic agriculture with respect to conventional agriculture. Many studies have revealed that organic farming is a superior practice and is environment friendly soil friendly, and beneficial for human health. To promote organic agriculture among farmers we need an appropriate National agriculture policy, government financial support to farmers, processors, traders and creating awareness amongst consumers.

Keywords: *Organic Farming, Organic Health, Biodiversity, Conventional Agriculture, Environment Friendly.*

Introduction

Agriculture is a significant sector of any economy and is the primary source of food for human sustenance. Agricultural practices have evolved throughout human history. Initially, subsistence farming was dominant, and traditional methods were used. Later, modern agriculture emerged, incorporating the use of agricultural machinery and chemical fertilizers. However, with the growing negative environmental impact of conventional agriculture, organic agriculture emerged as an alternative.

The global agricultural sector faces numerous challenges, including the need to produce sufficient food to meet the increasing demands of a growing population, while simultaneously minimizing environmental degradation and ensuring human health. Organic agriculture and conventional agriculture represent two distinct farming systems that have gained prominence in recent years. Organic agriculture emphasizes ecological sustainability, biodiversity conservation, and the exclusion of synthetic inputs, whereas conventional agriculture relies on modern technologies, synthetic fertilizers, and pesticides to maximize productivity.

* Research Scholar, Department of EAFM, University of Rajasthan, Jaipur and Assistant Professor (EAFM), B.B.D. Government College, Chimanpura (Shahpura), Jaipur, Rajasthan, India.

Organic agriculture involves growing crops without using chemical fertilizers and pesticides. It adopts natural methods like use of green manure, crop rotation, etc. It is a sustainable farming system that uses ecologically based pest control and organic fertilizers derived largely from animal and plant waste and nitrogen fixing cover crops.

The concept of organic agriculture was introduced in the early 19th century. Sir Albert Howard, F.H. King, Rudolf Steiner and others believed that the use of animal manure, cover crops, crop rotation and biologically based pest control led to better agricultural systems [1].

Organic farming was actually started as a response to the environmental degradation caused by the use of chemical pesticides and synthetic fertilizers. In other words organic agriculture is a new system of agriculture that repairs, maintains and improves the ecological balance.

Health, ecology, fairness and care are the principles from which organic agriculture develops and on the other side conventional farming is based on the principles of efficiency and maximization.

“India organic” is a certification mark for organically produced food products which are manufactured in India. This certification mark certifies that an organic food product confirms to the national standards of certifying agency named APEEDA (Agricultural and Processed food Products Export Development Authority).

Conventional farming involves the use of chemical fertilizers, pesticides and GMOs in large quantities to increase yields. Due to this biodiversity, soil fertility and ecosystem health are compromised. Production from this type of farming is not beneficial for anything other than food security and the economy.

This study aims to compare and contrast these two systems, examining their production methodologies, environmental impacts, health implications, economic considerations besides consumer perception and market demand.

Production Practices

- **Organic Agriculture**

It is a production system that avoids the use of synthetic pesticides and fertilizers, and instead emphasizes the use of organic inputs such as composted manure, crop rotation, and natural pest control. Organic agriculture also involves the use of biological pest control, companion planting, the use of organic seeds, and natural soil management. It promotes biodiversity and maintains soil quality, improving soil health, attracting beneficial organisms, and reducing soil erosion. It emphasizes the significance of animal welfare, and livestock under organic agriculture must have access to the outdoors, and they should not be administered any antibiotics except in case of an injury or illness.

Organic agriculture practices mainly focus on enhancing crop production and soil quality through the following natural ways:

- **Crop Rotation**

Crop rotation means changing the species according to the seasons in the same field. This protects soil from nutrients depletion as diverse plants promote the release of nutrients, thus eliminating the need for synthetic fertilizer application.

- **Cover Cropping**

This approach of agriculture means covering the field with any plant species. Cover crops prevent soil erosion, improve water filtration eliminate weeds by hiding unwanted vegetation from sunlight.

- **Green Manure**

Green manure refers to dead plants that are uprooted and mixed with the soil. These plants help in improving the fertility of the soil.

- **Livestock Management**

Organic farming tends to promote livestock rearing so as to utilize manure from domestic animals to increase the fertility and sustainability of agriculture land. Also, organic farming aims to promote the welfare of farm animals by providing them with a natural habitat and ensuring that their welfare needs are met. Organic farming restricts the use of antibiotics and growth hormones.

- **Composting**

Composting is a critical part of organic farming. It is the process of decomposing organic matter, such as manure, food waste, and crop residue, into a nutrient-rich soil amendment. Composting helps to improve soil fertility and structure, enhance water retention, and promote beneficial microbes.

- **Conventional Agricultural**

Conventional agriculture, on the other hand, relies heavily on chemical fertilizers, synthetic pesticides, GMOs and herbicides. These chemicals usually harm the environment and impair the soil quality. Conventional agriculture focuses on high-input, high-yield production and tends to be more mechanized. This production approach has brought about increased yields, which have alleviated the global food crisis and poverty in many countries. However, the overreliance on chemicals and extensive monoculture have caused detrimental environmental consequences and negatively impacted human health.

- **Pesticides**

Pesticides are substances that are used to kill insects and other organisms that have negative effect on crop yield. These pesticides are used inappropriately and indiscriminately without following proper directions, thus causing more harm than benefits.

- **Chemical Fertilizers**

Fertilizers are substances or chemicals that are supplied to the soil in order to improve its nutrient quality for growth of plants. Natural fertilizers are beneficial to both the humans and the environment, but chemical fertilizers are harmful for both.

- **GMOs**

A genetically modified organism (GMO) is an organism whose genetic material has been altered using genetic engineering techniques. Genes from animals can be inserted into the plant genome to create a new transgenic plant. So GMOs into the human food pose greater health risk.

Environmental Impact

Agriculture is extremely vulnerable to climate change, and conventional agriculture has often been criticized for negative environmental impacts. It compels over-reliance on chemical fertilizers and pesticides, which contribute to soil degradation and contamination of water and air. In comparison, organic farming has a much lower environmental impact as it employs natural processes and materials to sustain soil fertility and reduces the reliance on harmful chemicals. Organic agriculture sequesters more carbon in the soil, reducing greenhouse gas emissions. Soil conservation practices such as the use of cover crops, crop rotation, and soil mulching improve air quality, water quality and mitigate climate change.

Impact of Organic Farming on Environment

Organic agriculture has positive long term effects on the ecosystem as it promotes biodiversity and preserves natural resources. In organic farming, natural fertilizers are used instead of chemical and synthetic fertilizers, so it is environment friendly. Apart from providing healthy and tasty food it is also a source of employment because it requires labour intensive techniques. Promotes sustainable development, improve soil fertility through crop rotation and uses of organic fertilizers.

In many parts of the country groundwater pollution is a major problem due to rampant use of chemical fertilizers and pesticides. This problem can be mitigated by adopting organic agriculture because it prohibits use of pesticides and chemical fertilizers. Also, the absence of chemical inputs creates suitable habitats for wildlife.

Impact of Conventional Agriculture on Environment

Conventional agriculture system causes soil erosion, water pollution, increased greenhouse gas emissions, negative effect on human health and decline in soil productivity. This is due to erosion of top soil by wind and water, loss of organic soil matter, decreased water holding capacity and soil degradation.

Health Implications

Organic food consumption may reduce the risk of allergic diseases. Consumers of organic food are less likely to be overweight and obese as they live healthier lifestyles. Some studies have reported adverse effects of pesticides on children's cognitive development [2].

Organic farming reduces health risk to agricultural workers, their families and consumers by reducing exposure to toxic chemicals on farm and food.

Chemicals used in conventional agriculture put humans at risk of diseases such as cancer, allergies, obesity, diabetes, high blood pressure, heart disease, birth defects and Alzheimer's.

Conventional agriculture is responsible for air pollution related deaths each year because of emissions of ammonia due to use of synthetic fertilizers in farms.

Long term pesticide exposure has been linked to a number of health problems including developmental disorders, cancer, reproductive and endocrine problems, neurodegenerative disorders, heart disease and respiratory conditions.

Not only do organic products help to reduce public health risks, growing evidence shows that organically grown food is richer in nutrients such as vitamin C, iron, magnesium and phosphorus. Also, organically grown produce reduces the risk of nitrates and pesticides residues in processed fruits and vegetables [3].

Economic Considerations

Organic agriculture has higher production cost, higher selling prices and certification cost when compared to conventional agriculture because organic produce must be certified by a recognised certification authority. Also, organic farming can be more risky than conventional farming because of the limited availability of organic pest control methods and the potential for lower yields. This may make organic farming unaffordable for low-income farmers and areas. Therefore, policies that support organic farming such as subsidies and tax incentives could help in promoting sustainable practices.

Green revolution has also given impetus to chemical based agriculture to address global food security issues. But the excessive use of chemical pesticides and fertilizers has had detrimental effect on the environment and human health. This has resulted in increase in the demand for organic products. Also, on the other hand increased cost of chemical inputs, and pesticides are also making farmers tilt towards organic agriculture inspite the fact that organic agriculture yields are lower than the conventional agriculture because of the use of chemical fertilizers.

Conventional agriculture incorporates rapid technology innovation, large capital investments in equipments, high yield hybrid crops, extensive use of pesticides and fertilizers. Due to this reason it has more yields as compared to organic farming.

While the high-yield production efficiency of conventional agriculture leads to lower food prices, it is not sustainable or environmentally responsible in the long-term. Organic agriculture is often viewed as a premium product, resulting in higher prices and attracting consumers willing to pay more for organic produce. Organic agriculture provides an environment that encourages ecological balance and biodiversity while prioritizing consumer health.

Some studies have reported that organic farmers experienced 14 to 19 percent less input costs and 12 to 18 percent lower yields than conventional farmers. The net result was a marginal increase in profitability compared to traditional agriculture. The economy-wide economic surplus model indicates that there will be a reduction in producer and consumer surplus due to reduced crop yields [4].

Consumer Perception and Market Demand

Organic food is increasingly attracting the interest of consumers as it is considered to be healthier than that produced by conventional agriculture. Also, it positively affects the environment. Earlier, organic produce which was available only in a few specialty stores is now readily available in most supermarkets. The percentage of consumers aware about the benefits of organic food is steadily rising. The size of the organic market is about US dollar 80 billion [5]. The demand for organic products has increased manifold in the last decade.

Area coverage under organic farming has increased in all regions of the world. Global sales of organic food and drinks have risen by more than 106 billion Euros in 2019. According to the latest Fibl survey on organic agriculture, total area brought under organic farming increased by 1.1 million hectares and organic retail sales have seen a continuous rise [6].

Conclusion

Organic agriculture can provide significant benefits to human health and the environment. However, as the yield of organic agriculture is less, this may increase food cost and land demands. But, it has many long term benefits for environment and human. If more people will start organic farming then

this will result in more production and due to this there is a possibility of reduction in the cost of production. The balance between environment and livelihood becomes extremely important due to the risk caused by conventional agricultural practices and at the same time there is also a need to maintain environmental sustainability which can be achieved through organic farming.

This comparative study provides an overview of the key characteristics, strengths, and limitations of organic agriculture and conventional agriculture. While organic agriculture offers several benefits such as reduced chemical inputs, improved soil health, and enhanced biodiversity conservation, it may face challenges related to lower yields and higher production costs. On the other hand, conventional agriculture has demonstrated higher productivity and cost-effectiveness but often raises concerns about environmental pollution, soil degradation, and potential health risks. The choice between these two systems should be context-specific, considering local conditions, market demand, and sustainability goals. Future research should focus on developing innovative approaches that combine the strengths of both systems to achieve sustainable and resilient food production systems.

Thus, the comparative analysis of organic agriculture and conventional agriculture suggests that organic farming practices are effective in improving sustainability, biodiversity, quality of produce, and promoting healthy ecosystems, leading to long-term economic viability. Therefore, in creating and implementing agricultural policies, there is a need to prioritize environmental sustainability while also considering the long-term economic benefits of organic farming.

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